



RESEARCH ARTICLE

CONSTRUCTION CONTRACTOR PREQUALIFICATION AND SELECTION CRITERIA FOR
SEMI-GOVERNMENT ORGANIZATIONS IN SAUDI ARABIA

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ARTICLE INFO

Article History:

Received 25th February, 2016
Received in revised form
23rd March, 2016
Accepted 04th April, 2016
Published online 31st May, 2016

Key words:

Prequalification,
Contractor selection,
Construction industry,
Saudi Arabia.

ABSTRACT

One of the main causes of defaults and disputes in the public construction projects of Saudi Arabia is attributed to the lack of adequate contractor prequalification and selection. Typically, contractor selection decisions are based merely on price, with absence of better selection criteria. The focus of this paper, therefore, is to identify essential criteria for contractor prequalification and selection processes at semi-government organizations in Saudi Arabia, under the design-bid-build approach for competitive tenders. At first, initial criteria were identified from the literature. Afterwards, three rounds of Delphi process were used to revise the initial criteria and to establish a consensus towards their acceptance. As a result, two sets of criteria were identified: 29 for prequalification and 40 for contractor selection. After the second and third round surveys, all levels of criteria were accepted except for some criteria with low level of importance. Once all the criteria were identified, their weights were determined based on consultation with expert professionals. The identified criteria and weights represent important steps towards improving the competitive tendering practices in Saudi Arabia and can be directly used to properly select contractors to avoid construction performance problems.

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Citation: Mohamad A. Bajaber, Mahmoud A.Taha, Ph.D. and Tarek Hegazy, Ph.D. 2016. "Construction contractor Prequalification and Selection Criteria for Semi-Government Organizations In Saudi Arabia", *International Journal of Current Research*, 8, (05), 32196-32204

INTRODUCTION

In the public construction sector of Saudi Arabia, many projects witness numerous interruptions, defaults and claims (Alhazmi, 1987; AlSobiei et al., 2005; Sirajaddin & Bajaber, 2010). In 2012, the Saudi defaulted project symposium, held in Jeddah at the 8th annual meeting of Saudi Society for Civil Engineering (SSCE), called for a revision of the competitive tendering strategies at the public construction sector of Saudi Arabia. They revealed about 18% of a sample of 2,262 projects defaulted or failed. Half of the disputes were due to the contractor responsibility (Sirajaddin & Bajaber 2010). One of the key reasons behind these defaults and disputes, as revealed by the symposium, is attributed to the easy way that unqualified contractor can enter into the industry and the lack of adequate competitive strategies at the owner organization. As a response to the call for revisions, the local practices in the construction industry of Saudi Arabia was explored in a preliminary study by Bajaber and Taha (2012). It was found that the contractor

selection strategy in government organizations follows the open tender strategy in conjunction with a general classification of contractors. The final selection discriminates between bidders merely on price criterion and this prone to be ineffective and causes many project defaults and failures (Holt et al., 1993; Griffith et al., 2003; Topcu, 2004; lai et al., 2004). The general classification also is rigid and lacks of a detailed prequalification process (Alsugair & Abuthnain, 2011). It was also found that another category of organizations called "semi-government", in which the government owns more than 50%, is more flexible and is interested in improving their contracting strategies. They apply their own prequalification to eliminate disqualified contractors and, after that, they choose a contractor based on price criterion alone. Although their selection strategy is better than government strategy (Alsugair & Abuthnain, 2011), still the contractor evaluation is based on subjective individual experience, with an absence of a better understanding of the evaluation criteria (Merna & Smith, 1990; Holt et al., 1993; Bubshait & Al-Gobali, 1996). Therefore, revising the selection strategy at the semi-government organizations in Saudi Arabia is focused upon in this study, where the design-bid-build (DBB) approach being the most common approach for competitive tenders (Halpin, 2006). In the literature, many researchers examined the selection process

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and suggested some ideas to improve the selection of a contractor. A summary of key research efforts with the commentaries is shown in Table 1. In this table, the focus is on the general strategy for the qualification and selection processes suggested by various researchers. As shown in the table, a multiple criteria analysis for both prequalification and selection is needed for taking a decision. Since the criteria are essential and considered as an integral part of the selection approach, and due to the absence of ideal criteria that are suitable for the environment of Saudi Arabia, it is highly desirable to identify these criteria according to the research objective and limitations.

results; imposing some preconceptions or omitting other contributions may generate an artificial consensus; the experts, if not selected properly, may produce low level of reliability. With regard to the selection of expert survey participants, they are selected based on a purposive method (Saunders *et al.*, 2002) in which the experts are chosen according to: different departments; different stakeholders; knowledge and experience; well-known respected individuals; and willingness to participate (Loo, 2002; Skulmoski *et al.*, 2007; Hus & Sandford, 2007). With regard to the sample size, a minimum of seven is recognized in the literature as a mandatory

Table 1. Different contractor selection processes in the literature

Model of Solution	Comments
Russell, 1992, 1996, 2000, USA.	<ul style="list-style-type: none"> The selection is based on price only, which is a main cause of many defaults and failures. Contractor evaluation is based on surety ship companies and a project-by-project prequalification. However, Surety ship evaluation is financial in nature and could not focus at the project level whereas prequalification for each project consumes effort and cost.
Latham, 1994, UK.	<ul style="list-style-type: none"> The selection is based on multiple criteria but no criteria are identified. Uses a general classification of contractors done by an external agent (not the owner), focusing on the general characteristics of the construction industry as a whole.
Alsugair, 1999, KSA.	<ul style="list-style-type: none"> The selection is based on multiple criteria but the criteria don't discriminate between different owner types or different contracting approaches. Uses post-qualification (during bid evaluation) which is not suitable for competitive DBB approach
Holt et al., 1993,94a,94b, UK.	<ul style="list-style-type: none"> The selection is based on multiple criteria. Uses both general and project by project prequalification. However, the general prequalification is to eliminate disqualified contractors and is not connected to the final decision. Also, doing both evaluations is almost double the work and consumes effort and cost.
Topcu, 2004, Turkey.	<ul style="list-style-type: none"> The selection is based on price and non-price criteria with a filter element on price criterion to eliminate outliers. However, the filter is based on bidder estimation which might not be accepted by owners since bidders may work together to delude owners by increasing their prices and rotate bidding chance among them. Uses prequalification for each project which consumes effort and cost. In addition, many evaluations during prequalification stage are based on project estimation value which might be come to contractors, destroying the required competition.
Lai et al, 2004, China.	<ul style="list-style-type: none"> The selection is based on multiple criteria with a filter element on price criterion to eliminate outliers. However, the filter is based on owner estimation solicited from past historical records which might not reflect the latest actual prices. In addition, criteria don't discriminate between different contracting approaches. The evaluation work consists of general classification and post qualification but neither one is enough for competitive tendering approach.

MATERIALS AND METHODS

This research aims to identify the contractor prequalification and selection criteria that are suitable for semi-government owners in Saudi Arabia. The research methodology has a combination of literature review, survey, and Delphi analysis as shown in Fig. 1 (Yousuf, 2007; hus and Sandford, 2007). At first, the initial criteria are to be identified from the literature. Then, multiple rounds of Delphi group process are to be used to generate different viewpoints and reduce the divergent opinions of participants to reach an acceptable consensus (Needham, 1990). The Delphi technique has the following advantages (Brooks, 1979; Yousuf, 2007; Hus & Sandford, 2007): it overcomes many communication barriers by anonymous responses; it can state disagreements or unpopular views; it can modify previous opinions; it can reduce communication noises through controlling feedback; it can achieve consensus among different opinions through its iterative process; it has the same efficiency of usual meeting since experts can communicate at any time and from anywhere; it is inexpensive; and it is conducive to independent thinking and share of information. However, the technique is criticized with the following drawbacks (Linstone and Turoff, 1975; Yousuf, 2007): poor presentation may affect group-opinion

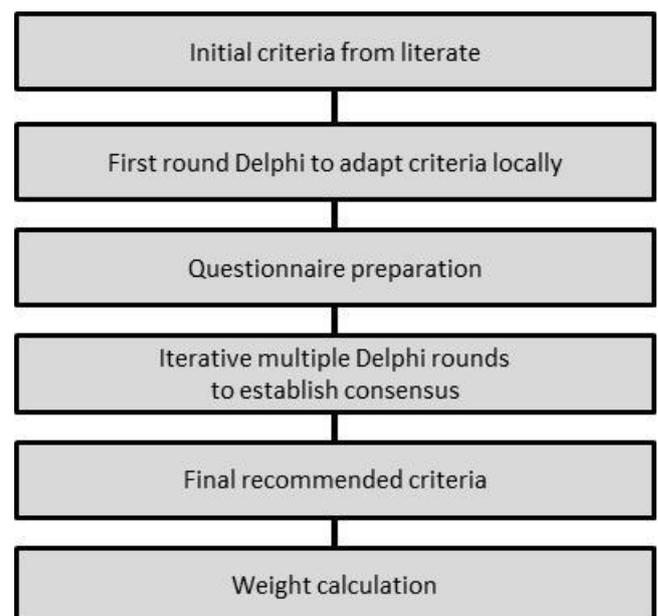


Figure 1. Research Methodology

requirement (Hallowell and Gambatese, 2010; Sourani and Sohail, 2015). In the first round of the survey, the Delphi technique will revise the initial criteria. Afterwards, in the next rounds, it will establish a consensus towards the acceptance of the recommended criteria. The first round survey is conducted through a semi-structured interview which is used as a proper research instrument that fits the exploration strategy of the first round (Saunders *et al.*, 2002). The second round survey is conducted through a questionnaire technique which is recommended as a proper research instrument to fit the descriptive strategy of the second round (Saunders *et al.*, 2002). The questionnaire can be administered either independently or through an interviewer to guide participants and answer any raised questions. To ensure maximum participation, four aspects are taken in the questionnaire design (Dillman 2000): good visual appearance; fast filling time (deVaus' 2002); simple wording and structure; and easy-to-understand question style. In addition to that, the questionnaire will be undergone through a pilot investigation to check its adequacy and appropriateness. In the third round survey, the investigation will be exclusive for those criteria that have significant area of disagreement. It will be conducted through a self-administered questionnaire which is used as a proper research instrument to fit the explanatory strategy of the third round. It shows respondents their attitude toward the consensus of acceptance, giving them the chance to come into the consensus or justify their opinions. Finally, the relative weight of the recommended criteria will be identified by using pairwise comparison method in a survey conducted for a particular type of construction. Recording comparisons and its analysis will be in a matrix form according to Haplin (2006).

METHOD IMPLEMENTATION AND RESULTS

First Round Survey

An extensive analysis of the literature was first conducted about the prequalification and selection criteria (Russell & Skibniewski, 1990; Russell *et al.*, 1992; Russell, 1996; Holt *et al.*, 1993; 1994a, 1994b; Assaf & Jannadi, 1994; Bubshait & Algobali, 1996; Hatush & Skitmore, 1998; Alsugair, 1999; Ng and Skitmore, 1999; Topcu, 2004; Lai *et al.*, 2004; Egemen & Mohamed, 2005; Elsawalhi *et al.*, 2007; Elsawalhi, 2009; Huang, 2011; Isaac, 2012; Horta *et al.*, 2013; Alzober & Yaakub, 2014). The identified criteria were grouped under different categories: finance, experience, performance, resources, reputation, capabilities, etc. Some of the individual criteria such as reputation and management capabilities are subjective in nature and respondents have unclear views about them. Based on this analysis, a preliminary set of criteria was identified and was presented to the interviewees of the first round investigation. Twelve experts were selected for this round with an average experience of 21 years. Experts were chosen to represent the following areas: prequalification, contracting, claims, design/ specifications, project management, and safety. They represented the diverse perspectives of owners, designers, and contractors, and have experts in the following activities: electricity generation, transmission, and distribution; water and sewage; gas and national petroleum; and telecommunications. All experts belong to semi-government organizations who are familiar with prequalification practices for DBB contracts.

As a result of this first round survey, 29 criteria were identified and grouped under six prequalification categories (as shown in the top part of Table 2). Also, 40 criteria were identified and grouped under five selection categories (bottom part of Table 2). Four criteria have been added in the table by the local experts in which two of them relate specifically to Saudi Arabia as; performance-bond confiscation (PBC) and manpower outsourcing plan (RMP). The first one is available and easy to obtain from local banks. It is considered as a replacement for contractor failure. Although the failure criterion is important, such information might be not easy to obtain. This is attributed to its sensitivity at the construction industry of Saudi Arabia and to the absence of good historical records. The other criterion fits unstable labor of the construction environment of Saudi Arabia in which most of them are from abroad. It is important to mention that the "contractor prequalification level" (CPL) criterion links between the two sets of criteria at the prequalification and selection levels in an integrated process that can suit DBB contracts in the best way.

Second Round Survey

In order to establish a consensus towards accepting the previous criteria, a second round survey was conducted with more experts participating from different Saudi Arabian cities. The total number of experts was twenty one, with an average experience of 18 years. A structured questionnaire was then prepared and was administered through an interview process. An effort was made to improve the visual appearance of the questionnaire. Simple questions were designed logically asking for direct information and sensitive questions about the final settlement process were kept at the end of the questionnaire. In the interview process, financial questions were skipped for the participants who were not familiar with financial issues. With regard to the question style, a five-level Likert scale was used: (1) strongly agree, (2) agree, (3) partially agree, (4) disagree, or (5) strongly disagree. Additional space is also given at the end to add comments, if any. Finally, the adequacy of the questionnaire was checked through a pilot investigation conducted with three experts. After completing all the interviews with experts, an analysis of the results was conducted. Accordingly, the percentage of respondents who agree/somewhat agree/disagree with the criteria categories was compiled as shown in Figure 2 and 3, for the prequalification and selection phases, respectively. From Fig. 2, it is clear that the main levels (categories) of the prequalification criteria were all accepted. Categories such as experience (E), performance (P), and finance (F) were accepted by (95-100%) of the respondents. Other categories such as managerial image (M), manpower resource (RM), and equipment resource (RE) received less acceptance by respondents (68-74%), which indicates their lower levels of importance. With respect to the main levels of the selection criteria (Fig. 3), categories such as bid price (Pr), project management (PM), contractor ability to take additional projects (ATAP), and contractor ability to manage resources (AMR) were all approved by the respondents. Whereas the contractor prequalification level (CPL) has a significant level of rejection (21%), which reflects a cautious attitude in Saudi Arabia to use contractor prequalification as a main selection criterion.

Table 2. Factors and criteria considered for prequalification and selection stages

Stage	Factor	Criteria Abb.	Criteria Description	
prequalification	Experience (E)	ET	Type and size of experience	
		EO	Experience with the owner	
		EG	Geographic experience	
	Performance (P)	PQ	Quality performance	
		PT	Time performance	
		PC	Cost performance	
		PS	Safety performance	
		PR	Contractor responsiveness	
		PD	Contractor debarment	
		PBC	Bond confiscation ²	
	Organization finance (F)	FR	Bank reference	
		FG	Contractor Growth	
		FOM	Max ability to meet current obligations	
		FOI	Immediate ability to meet current obligations	
		FP	Profitability	
		FDR	Contractor ability to avoid debt risk	
	Managerial image (M)	MCQ	Organization commitment to quality	
		MCS	Organization commitment to safety	
		MCh	Organizational chart	
		MF	Facilities assessment ²	
		MR	Trade references	
		MOA	Organization age	
		Manpower resource (RM)	RMG	General manpower
RMT	Technical manpower			
RMD	Technical manpower distribution ²			
RMP	Outsourcing plan ²			
Equipment resource (RE)	REA		Equipment availability	
	REC	Equipment condition		
	REM	Equipment maintainability		
Selection	Price (Pr)	---		
	CPL	Contractor Prequalification Level based on prequalification criteria		
	ATAP	Contractor current ability to take additional project Based on workload (WL) and maximum capacity (MC)		
	AMAR	Contractor ability to manage adequate resources Based on largest project (LP)		
	Project Manag. (PM)	PMC	Individual career experience	
		PML	Individual experience with contractor (loyalty)	
		PMI	Individual international experience	
		PMD	Individual Academy	
		PMT	Individual Training	
		PMM	Individual Professional membership	
		PMA	Individual Age	

² Recommended by experts.

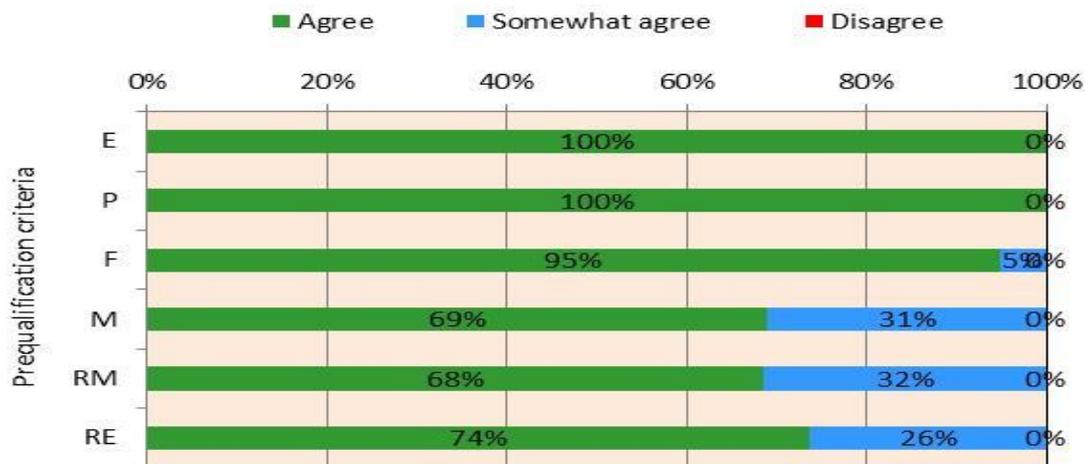


Figure 2 Percentage of respondents who agree/disagree with the prequalification criteria

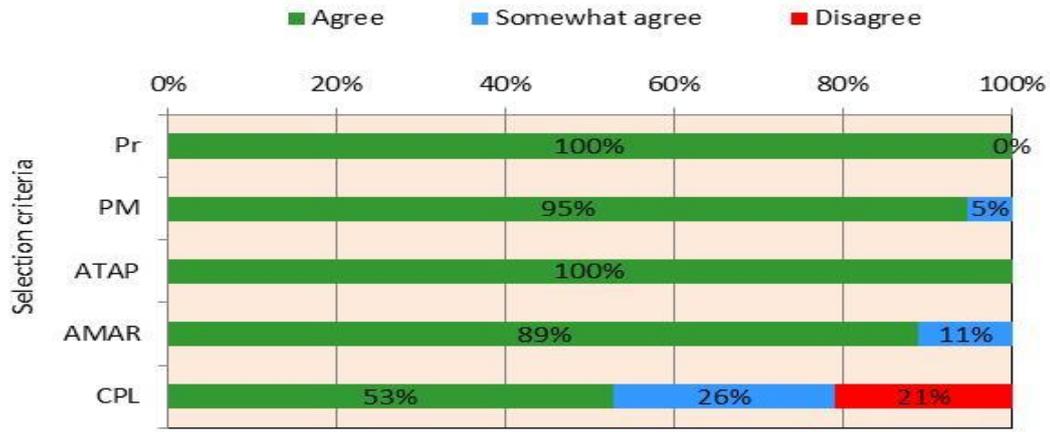


Figure 3 Percentage of respondents who agree/disagree with selection criteria

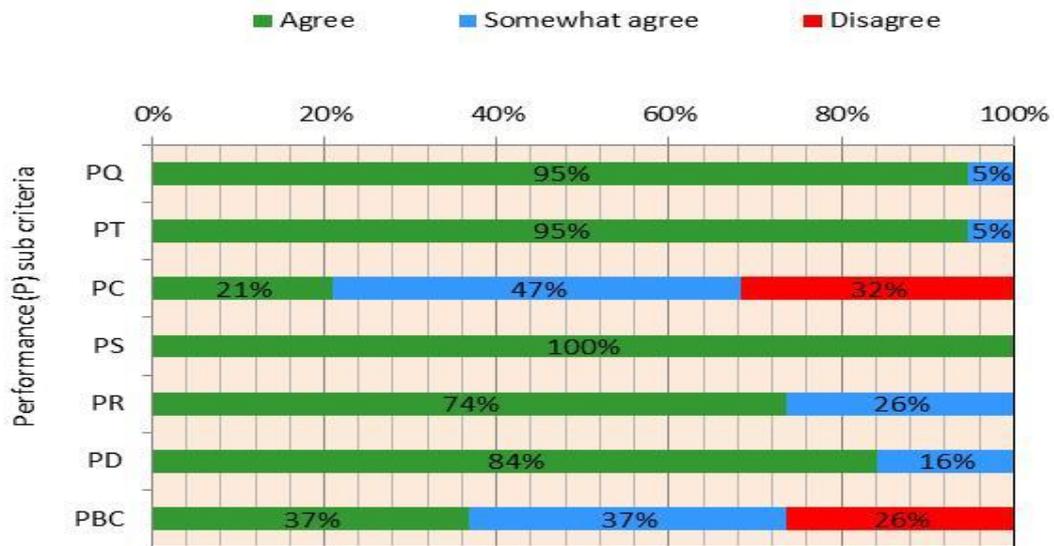


Figure 4 Percentage of respondents who agree/disagree with the sub criteria related to performance (P)

Table 3. The percentages of acceptance and nonacceptance after the second and third rounds

Stage	Sub Criterion	2 nd round		3 rd round attempt 1		3 rd round attempt 2	
		Agree	Dis-agree	Agree	Dis-agree	Agree	Dis-agree
Prequalification	Geographic experience (EG)	84%	16%	95%	5%	-	-
	Cost performance (PC)	68%	32%	84%	16%	91%	9%*
	Performance bond confiscation (PBC)	74%	26%	80%	20%	89%	11%*
	Total manpower (RMG)	84%	16%	89%	11%	-	-
	Equipment maintainability (REM)	79%	21%	95%	5%	-	-
	Organization age (MOA)	74%	26%	84%	16%	92%	8%*
	Organization profitability (FP)	82%	18%	91%	9%	-	-
Selection	Professional membership (PMM)	79%	21%	89%	11%	-	-
	Individual age (MPA)	74%	26%	89%	11%	-	-

* The criterion is accepted with reservation.

To better understand this attitude and its reasons, the sub criteria used in the prequalification and selection stages were further analyzed. As an example of this detailed analysis, the performance (P) category in Fig. 2 was expanded as shown in Fig. 4. Criteria such as meeting specifications (PQ), finishing on time (PT), finishing safely (PS), contractor responsiveness (PR), and contractor debarment (PD) show high level of acceptance. Among these criteria, the level of somehow agreement was significantly increased (26% & 16%) at the PR and PD sub criteria indicating their lower level of importance. On the other hand, sub criteria such as cost performance (PC) and performance bond Based on this analysis, the sub criteria that have significant area of disagreement (i.e., level graters than 10 percent) are:geographic experience (EG), cost performance (PC), performance bond confiscation (PBC), professional membership (PMM), individual age (MPA), organization age (MOA), the total permanent manpower (RMG), equipment maintainability (REM), and organization profitability (FP).

Third Round Survey

After completing the second round survey and its related analysis, a self-administered questionnaire was used to focus on and provide better understanding of the areas of disagreement. The questionnaires were sent by e-mail to 14 dissenters. The first part of the questionnaire feeds them back with a summary of their opinions showing them their attitude toward consensus of acceptance. The second part gives them the chance to come into the consensus or justify their opinions. As a result of this process, some of the dissenters came into consensus after one attempt while the others came into consensus after two attempts. With respect to the main criterion CPL at the selection decision, the significant level of disagreement dropped down after two attempts from 21% to 12%. However, the change in attitude was coupled with the availability of a good prequalification system, which shall be strong enough to be considered at the final decision.

With respect to the prequalification and selection sub criteria, that have significant area of disagreement, the results are shown in Table 3. As shown by the table, the level of disagreement for the criteria; EG, PMM, PMA, RMG, REM, and FP dropped down after one attempt from an average level of 20% to 9% raising their average acceptance level to 91%. The level of disagreement for the other criteria; PC, PBC, and MOA take two attempts at the third round to reach the consensus. They dropped down from an average level of 28% to 9% raising their average acceptance level to 83% but with the following reservations: In order to consider the cost performance (PC), the contract shall be fair and just in distributing responsibilities between its parties; For admitting bond confiscation criterion (PBC), banks of Saudi Arabia should be granted the authority to reveal about the bond information when it is required; For the organization age criterion (MOA), a minimum age of three years is enough to adopt a contractor.

Criteria Weight Assessment

After criteria had been identified, they were weighted according to the opinion of 7 experts who are deeply involved

in building construction. The criteria were listed at the left side of a matrix form (Halpin, 2006) as shown in Fig. 5.

Prequalification criteria matrix		4 major preference 3 above average preference 2 average preference 1 - slight preference - no preference (letter/letter)						
Participant:								
E	Experience							
P	Performance	P1						
F	Finance	E/F	E1					
M	Managerial image	P1	P2	E1				
R	Resources	F1	P2					
		M/R	F1					
			R					
				M				
					F			
						P		
							E	
Total Score			2/7	2/7	4/7	7/7	4/7	× 7/19
Relative weight			0.11	0.11	0.21	0.37	0.21	

Figure 5 Matrix form for assessing criteria weights

In this form, the expert compares between each two criteria at the right side of the matrix in a diamond shape box, where the symbol of the preferred criterion is written first. A degree of preference was used for all comparisons according to a standard preference scale from 1 to 4 interrupted as: major preference for degree 4, above average preference for degree 3, average preference for degree 2, and slight preference for degree 1. If there is no preference, then the symbols of both criteria has to be written in the diamond in which each one scores a degree. For example, when comparing experience (E) with performance (P), P was preferred with a slight degree of preference. Therefore, P1 was placed in the diamond box between these two criteria, as shown in the figure. This process continued until all criteria were compared. Afterwards, all criteria scores were aggregated, recorded, and converted to a percentage weight at the lower part of the matrix as shown by the figure. Finally, all participants' opinions were averaged. The final weight assessments of all criteria are shown in Table 4.

PROPOSED CONTRACTOR PREQUALIFICATION AND SELECTION PROCESS

Based on the analysis of the identified criteria, a new process was developed for the Saudi Arabia market, in two phases, as shown in Fig. 6, which overcomes the current shortcomings in the existing process. The first phase for contractor prequalification incorporates three steps: registration & preliminary evaluation; advance evaluation; and shortlisting. Contractors will be registered for similar projects and evaluated on annual basis using the identified prequalification criteria.

Table 4. Weights of the prequalification and selection criteria

Stage	Category	Weight		Criterion	Weight				
		Percentage	Linguistic		Percentage	Linguistic			
prequalification	E	0.19	H	ET	0.58	VH			
				EO	0.32	M			
				EG	0.10	VL			
	P	0.25	VH	PQ	0.20	H			
				PT	0.21	VH			
				PC	0.08	L			
				PS	0.22	VH			
				PR	0.12	M			
				PD	0.10	M			
				PBC	0.07	L			
	F	0.20	H	FR	0.24	VH			
				FG	0.11	M			
				FOM	0.22	VH			
				FOI	0.16	M			
				FP	0.09	L			
				FDR	0.18	H			
				M	0.13	M	MCQ	0.28	VH
	RM	0.12	M	MCS	0.27	VH			
				MCh	0.12	M			
				MF	0.15	M			
MR				0.12	M				
MOA				0.07	L				
RMG				0.17	M				
RMT				0.29	VH				
RMD				0.28	VH				
RMP				0.26	H				
RE				0.10	M	REA	0.49	VH	
Selection	Pr	NA	NA	REC	0.31	M			
				REM	0.20	M			
				CPL	0.14	L			
				ATAP	0.22	M			
				AMR	0.22	M			
				PM	0.42	VH	PMC	0.24	VH
				PML	0.18	H			
				PMI	0.14	M			
				PMD	0.18	H			
				PMT	0.12	M			
PMM	0.07	L							
PMA	0.06	L							

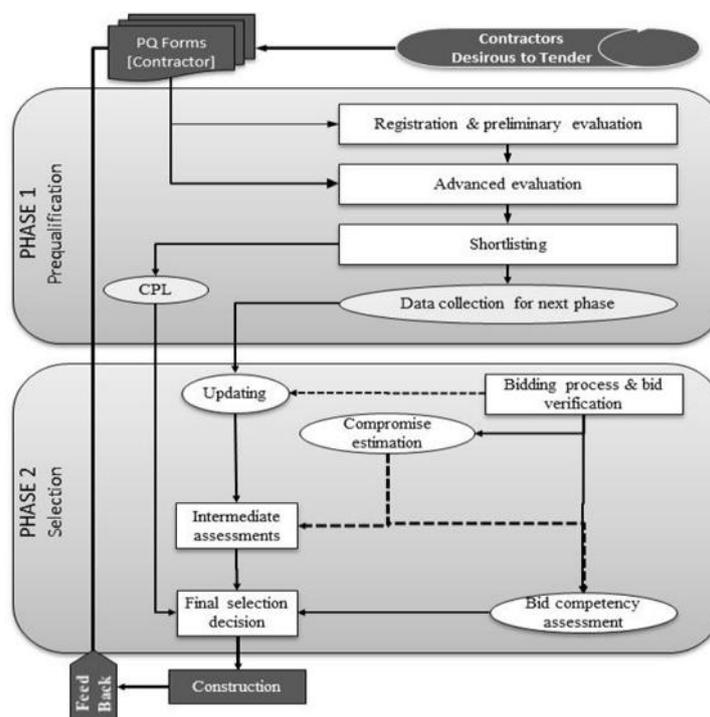


Figure 6 General framework for contractor prequalification and selection

This process has less subjective evaluation and promotes confidence among contractors because past performance is incorporated with the evaluation process. The second of contractor selection for a specific project incorporates the following steps: bidding process, intermediate assessment, and final decision. The contractor prequalification level is an essential connection in linking the two phases to work as an integral part in the contractor selection that can suit DBB contracts in the best way. Currently, the proposed framework is being examined for application in a major Saudi semi-government organization. The results will be documented in a separate paper.

Conclusion and Recommendations

The focus in this research is to identify essential criteria to use for both contractor prequalification and selection processes at semi-government organizations in Saudi Arabia, under the design-bid-build approach for competitive tenders. Following a Delphi group process, two sets of criteria were identified: 29 for prequalification and 40 for contractor selection relate specifically to Saudi Arabia environment. As a result of the second round survey, the contractor prequalification level at the selection process, which has a low importance of weight according to the perception of the local experts. However, after a third round survey, it was accepted but coupled with availability of a good prequalification system. For the sub criteria, the third round survey resulted in the acceptance of all criteria except for three low-importance-weight criteria that were accepted only with the following conditions:

- Cost performance: contract terms need to be revised to redistribute visible risks fairly between its parties. The unforeseen risk shall be put aside dealing with it whenever it is occurred through activating the engineering arbitration which is considered as an extension to the contract agreement. For this reason, independent entities that provide alternative dispute resolution services including arbitration shall be set up throughout the construction sector of Saudi Arabia. Also, entities that could finance contractors with the required cash shall be set up throughout the construction sector in order to keep contractors running their construction operations without breaking down.
- Performance bond confiscation: banks of Saudi Arabia should be granted the authority to reveal about the bond information when it is required. The bond confiscation criterion should be taken with a caution due to the lack of credibility in some owner judgments. Therefore, an independent association should be set up with the assistance of the major owner organizations in Saudi Arabia to share their reliable judgments and information.
- Organization age: a minimum age of three years is enough to adopt a contractor.

Based on the identified criteria, on-going research by the authors targets to establish a complete system for efficient prequalification and selection of contractors in Saudi Arabia, which currently has not exist.

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