



Framework to improve contractor selection criteria in Saudi Arabian Construction sector

Mohammed Al-Otaibi¹, M.Sadique Nawab²

¹Assistant Professor, Civil Engineering Department, Shaqra University

²Lecturer, Civil Engineering Department, Shaqra University
Al Dawadmi, Riyadh Province, Saudi Arabia

Abstract: The selection of construction contractors is an essential component in the success of any project. However in Saudi Arabia, lack of skilled manpower and lack of experience have been observed in terms of managing major projects. Thus, there is a need to design an appropriate framework to select, evaluate, measure and monitor the performance of construction contractors. This paper analyses and evaluates current techniques for pre-selecting contractors and identifies the most appropriate techniques, thereby developing a framework to improve contractor selection criteria that could be adopted in Saudi Arabia. This has been achieved by undertaking a critical analysis of the literature and by carrying out preliminary interviews with practitioners, which formed basis of questionnaires and interviews with Saudi professional working in field. Then proposed framework was validated, validation process focused on the main criteria of the framework and their sub-criteria. The six main criteria namely: culture, management process, previous project experience, financial ability, resources, and health and safety were validated to ensure their importance and appropriateness on the pre-selection process. These criteria were found to be important and justified. The contractor's financial ability received a higher score compared with other criteria related to contractor's resources. This was followed by the contractor's previous performance.

Keywords: Construction Industry, contractor performance, framework, evaluation, validation

I. Introduction

In recent time, construction industry in the Kingdom of Saudi Arabia (KSA) is experiencing sharp development and expansion due to changes in socio-economic development policies. The main drivers for the socio-economic changes were the increase in oil production and price, as well as changes in Saudi lifestyle. This expansion in construction industry is mainly due to the high demand in the Saudi construction industry market driven by the government strategy and re-building process for the Kingdom infrastructure.

The governmental strategy and the change in the socio-economy of the society created a large number of projects in the Kingdom, like construction of new roads, bridges, sports facilities, residential, and governmental offices. The vast majority of these projects are funded by the government. These projects attracted regional, national and international contractors to enter the Saudi construction industry.

The contractor is one of the key players in the construction industry. The performance of construction contractors is an essential and critical part of project success in KSA, due to its cost implications, and its impact on the SCPA's plan, strategy and quality of project completion. Therefore, the SCPA (Saudi Construction Public Authority) needs appropriate, efficient and effective tools to evaluate/measure and monitor construction contractor performance.

The aim of this research is to analyse the current methods of selecting, and proposing a new assessment method of contractor selection in Saudi Arabia scenario based on a set of pre-defined criteria, and to develop framework to improve contractor selection criteria that could be adopted in Saudi Arabia. The main drivers are "to assess and evaluate the overall project performance".

II. Evaluation of Contractor Performance

Selecting a potential contractor for a specific project is critical and important for the processes of project management selection and contractor evaluation. Therefore, careful consideration and attention need to be given in establishing contractor performance to help in establishing a model that can be used to help decision makers in the selection of appropriate and potential contractors for projects.

Contractor evaluation and selection is a difficult and challenging task plagued with many uncertainties (Watt et al., 2008). The relation between the client's decision and contractor's attributes is non-linear and always complicated, when incorporating subjective evaluation and the decision maker's evaluation experience (Lam et al., 2000).

Watt *et al.* (2008) identified the following principal evaluation categories of criteria, such as organisation expertise, workload/capacity, physical resources, company standing (reputation), client-Supplier relations, technical expertise, and method/technical Solutions.

In the contractor selection process, the literature identifies several methods and techniques that can be used. The common procedure used in the contractor selection process is based on prequalification, negotiation and open tender (Kumaraswamy, 2001, p.36). However, several methods are explored in the literature for contractor selection and evaluation (Harp, 1990; Russel *et al.*, 1992; Tam and Harris, 1996; Palaneeswaran and Kumaraswamy, 2000). Tam and Harris (1996) developed a discriminate analysis model, while Palaneeswaran and Kumaraswamy (2000) developed the benchmarking contractor selection practices conceptual model.

One of the methods used in the decision making process for selecting and identifying appropriate potential contractors is the use of prequalification. Li *et al.* (2007) proposed a fuzzy framework to solve construction prequalification problems. The proposed framework includes decision criteria analysis, weights assessment, and ranking orders determination of contractors.

Kumaraswamy (1996, p. 275) developed a four criterion category, criteria and indicators examples. The criterion category included finance, technology, personnel and experience. He also developed an evaluation model through appraisal of inputs and assessment of output. The model includes feedback, feed forward and the project process. The input to the proposed system was the contractor's resources, and the system output was the construction output.

Bassioni *et al.* (2008) evaluated and analysed the criteria and sub-criteria of a construction excellence model developed earlier by Bassioni *et al.* (2005) and Bassioni *et al.* (2004). The proposed criteria and sub-criteria for the excellence model were supported by empirical data.

In summary, the literature revealed that there is no generic accepted approach towards the contractor selection process (Wong *et al.* 2000b) that can be adopted for the Saudi Arabia contractor selection. However, the literature survey provided a framework that can be used as a theoretical framework to develop a technique that can be more appropriate in Saudi Arabia.

III. General aspects of contractor pre selection

The first step in contractor assessment is the pre-selection process. Ng and Chow (2004) argued that pre-selection is an essential part of the contractor selection process in order to distinguish which contractors are capable of meeting the requirements before inviting them to submit technical and fee proposals to the assigned consultants. Russel (1992) defined the prequalification process as the screening of the contractors while Ng *et al.* (1999) indicated that the pre-qualification process involves the establishment of a standard for measuring and assessing the capabilities of potential tenders. The required standard is based on a set of prequalification criteria (PQC), intended to reflect the objectives of the client and the requirements of the project (Ng *et al.*, 1999: 1554).

IV. Contractor Selection, Performance and Evaluation in Saudi Arabia

Contractor selection in the Saudi construction industry mainly depends on a generic government list of criteria to be filled by the contractors themselves. This form falls short in fulfilling the requirements of project clients, and has proven ineffective, many contractors failed to meet project requirements and failed to meet their performance promises.

The models developed by Holt *et al.* (1994); Kumaraswamy (1996); Bassioni *et al.* (2004, 2005, 2008) are appropriate research models for this work to build upon. There are more criteria that need to be considered in developing more appropriate models, which can be adopted in KSA. Some of these criteria were explored in the qualitative data, such as the national culture that influences the organisation's culture, and the behaviour of individuals within project activities. The other important criteria that need to be considered are the management and administration style adopted in KSA. This has been explored as a contributing factor affecting contractor performance.

V. Contractor Selection Criteria

There are several factors that need to be considered in this selection process. Hatush and Skitmore (1997) argued that selection criteria can be classified into five categories. These categories include financial soundness, technical ability, managerial capability, safety and reputation. Similarly, Holt *et al.* (1994) argued that the selection criteria factors should include the contractor's organisation, financial considerations, management resources, past experience, past performance, project specifics and others. This indicates that there are several factors that are common among the researchers.

There are more criteria that need to be considered in developing more appropriate model that can be adopted in the Saudi Arabia. Some of these criteria explored in the qualitative data, such as the national culture that influenced the organisation culture and the behaviour of individual within the project activities. The other important criteria that need to be considered the management and administration style adopted in Saudi Arabia. This has been explored as a contributing factor on the contractor performance.

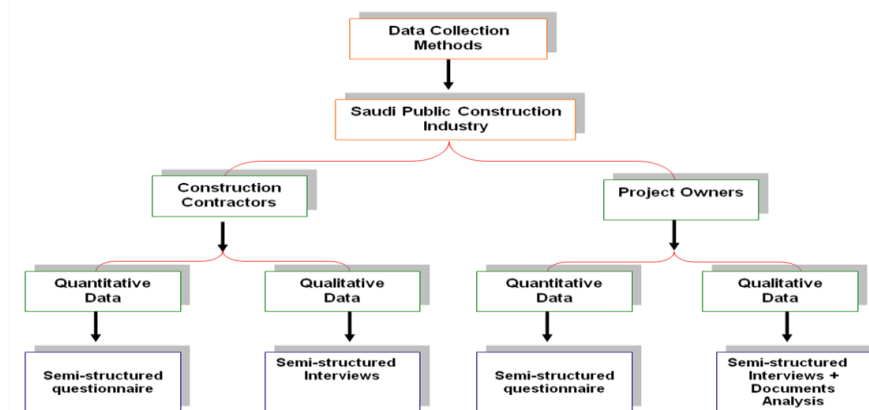
A. Criteria for Contractor Evaluation and Measurement in KSA

The literature survey explored several factors that may be beneficial, and can be adopted to evaluate Saudi contractor performance. These factors identified in the literature include financial capacity, technical ability, reputation and management capability. The proposed model, the initial model for the evaluation of contractors in KSA, includes the culture factor, and makes completion time, and health and safety the main criteria.

VI. Research Methodology

Quantitative questionnaires were used to provide a large number of responses from the Saudi main public construction sector at reasonable time and cost. The distributed questionnaire was designed to identify the Saudi public construction sectors current pre-selection process and the main criteria used in measuring contractor performance. The collected quantitative data was analysed using Statistical Package of Social Sciences (SPSS). The following model shows the main methods used in this research (Figure 1).

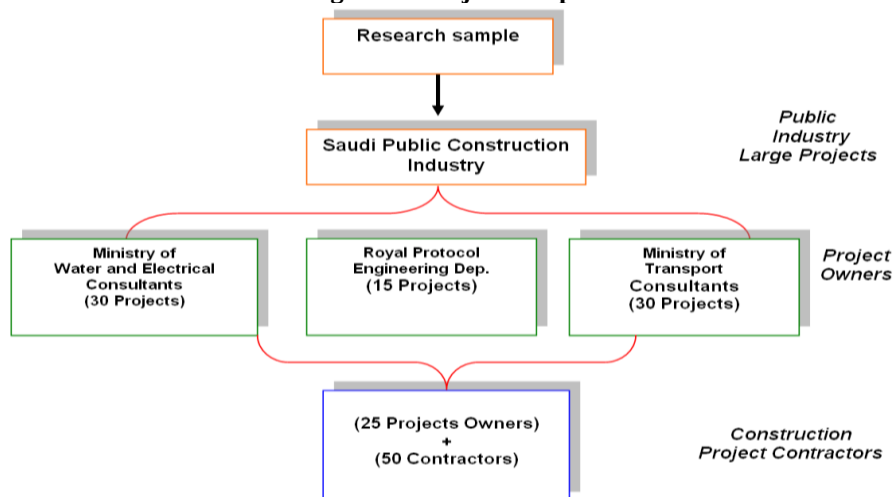
Figure 1 Data Collection methods



A. Research Sampling

Public construction in KSA is mainly overseen by two ministries, namely the Ministry of Public Works and Housing and Ministry of Municipalities and Rural Affairs as well as the Saudi Royal Protocols. There are other public projects in other Ministries, but the number of their projects is relatively small compared with the number of the projects selected as a sample. They mainly use local and international contractors to carry out their projects. The initial number of contractors for each selected sample is shown in Figure 2.

Figure 2 Project Sample



B. Experts Interviews

The semi-structured interviews were carried out with 15 experts from three main public construction organisations. They were selected based on their expertise and responsibility within public construction projects, and expertise and involvement in selecting contractors and measuring their performance. The interviewees' were chosen from the organisations with different expertise and knowledge to provide the relevant information.

The total number of interviews are 15; one official from each ministry, two ministry consultants and two contractors from each ministry. Also, one official and two contractors from the Royal protocols will be interviewed. The interviews will be with the consultants of the Ministries, while the interviews will be with the decision makers of the engineering departments (Table 1).

Table I : Interview Sampling

Organisations	Size of the Sample
Ministry of Transport	Official (2)
	Consultants (2)
	Contractors (2)
Ministry of Water and Electricity	Official (2)
	Consultants (2)
	Contractors (2)
Royal Protocol Engineering Dept.	Engineering Department (1)
	Contractors (2)
Total Number	15

The main aim was to provide a detailed assessment of experience and understanding of the selection process and performance measurement by the Saudi public construction ministries. These are main five objectives fulfilled by interviewing:

1. To identify knowledge and understanding of contractor selection/performance measurement in construction organisations.
2. To assess the practices and effectiveness of the current selection process measurement practise to the organisations.
3. To identify the pre-selection models/frameworks used by the Saudi organisations.
4. To explore, identify and discuss contractors selection criteria
5. To explore and identify the main challenges and strategies of contractors selection process

Field data was collected from project owners, public construction industry consultants and contractors. The collected (quantitative and qualitative) data were gathered from the public construction industry in KSA.

The final distributed questionnaire consisted of several questions grouped under seven major sections. These sections are:

- In *contractor's personal & organisation details*, we identified age, working position, work experience, nature of organization, guidelines to be followed during selection, evaluation of decision.
- In *technical capabilities*, previous experience of staff, specialized knowledge of project were identified. .
- In *financial capability* consideration, we identify Financial stability, Credit rating, Banking arrangement, Financial status, Working capital, Current and fixed assets and Turnover.
- In *health & safety criteria*, management of safety accountability, Company safety policy, safety record were accounted.
- In *reputation*, key points included are Past project failure, Past client relationship, relationship with suppliers, contracts and contractual dispute.
- In *management ability*, key points identified are past management performance, Qualification & experience of management staff, Present workload & capability to support new project.
- In *organization culture*, we identified Familiarity with local working culture, Contractor familiarity with local suppliers, Familiarity with regulating authorities, Experience in region, relationship with subcontractors.

VII.Results and Discussions

This section presents the statistical analysis of the collected responses.

A. Classification of Sample Respondents

The first part of the analysis divided the 75 sample responses into different groups based on age, work position, years of experience, organizational nature of activities, and organization. The majority of respondents were aged over 36 years of age, 62.6 percent. Only 5.3 percent of the respondents were under 35 years old.

Table II: Classification of respondents by their age

Age	<25 Years	26-30 Years	31-35 Years	36-40 Years	41-50 Years	>50 Years
Frequency	4	10	14	22	18	7
Percentage	5.3	13.3	18.7	29.3	24	9.3

The majority of the respondents were engineers (28) followed by Company owners (19%).

The vast majority of respondents had 11-15 years of work experience, i.e. 38.7 percent, while 85.3 percent have over 5 years experience.

Table III: Respondents' years of experience

Experience	<5 Years	5-10 years	11-15 years	16-20 years	Over 20 years
Frequency	11	20	29	7	8
Percentage	14.7	26.7	38.7	9.3	10.7

The survey covered the main three main public construction organizations. The majority of responses were obtained from the Ministry of Water and Electricity, 32 out of 75 (42.7%). The response ratio of the Saudi Royal Protocol and Transport Ministry were 29.3% and 28% respectively.

The majority of the respondents indicated civil engineering as the main nature of their ministry, 33.3 percent, followed by building construction, 36.7 percent, and only 9.3 percent indicated site preparation.

B. Quantitative data for Pre-selection Contractor Performance in Saudi Arabia

One of the main objectives of this research was to identify the significant factors that have impact on contractor performance. This data are needed to develop a framework for measuring and evaluating contractors' performance in KSA. The questionnaire was designed to investigate and evaluate these factors, which this section presents and analyses.

- Under Technical Capability, the contractors' **qualification and the experience of their technical staff** is identified as an extremely important or very important (62%) criterion for contractor pre-selection. This was followed by **"Previous experience on similar type and size of project completed (61%)"**, & **"Specified Knowledge of specified project (58.7%)"**
- Under Financial Capability of Contractor, majority (66) of the respondents identified **financial stability (88%)**; 57 mentioned **turnover (76%)** as extremely or very important, followed by **Credit Rating (72%)**.
- Under health & safety records, majority of respondents (57) identified **safety records (76%)** followed by **OSHA incidence rate (69.3%)** and Management **Safety Accountability (54.6%)** as extremely or very important criteria that needed to be considered in the pre-selection process.
- Under reputation of contractor, the contractor's **past project failure** are extremely or very important in contractor selection (65.3%). This indicates the importance of the contractor's reputation. The second extremely or very important criterion is **Number of similar completed projects (61.3%)** followed by **"Percent of previous work completed on schedule (60%)"**. This indicates the importance of time in Saudi construction projects.
- Under Management ability, The contractor's present **workload and capability to support the new project** is extremely important or very important (60%). This may be related to the contractors' involvement in many projects because of the sharp expansion in Saudi construction projects. The second most important criterion identified is the **qualification and experience level of the project manager (56%)**, followed by **Past management Performance (52%)**
- Under culture of Construction Industry, the majority of respondents are familiar with **the local working culture (24%)**. This is because Saudi society has a strong Arabian Bedouin culture, and secondly, there are a large number of non-Saudis in the construction industry. The second criterion was **contractor familiarity with the regulatory issues (21.33%)**, followed by **Contractor's familiarity with weather conditions (20%)**.

Table IV: Parameters ranking under each criteria

Criteria	Rank 1	Rank 2	Rank 3
Technical Capability	Qualification and the experience of their technical staff (62%)	Previous experience on similar type and size of project completed (61%)	Specified Knowledge of specified project (58.7%)
Financial Capability	Financial stability (88%)	Turnover (76%)	Credit Rating (72%)
Health & safety records	Safety records (76%)	OSHA incidence rate (69.3%)	Management Safety Accountability (54.6%)
Reputation of contractor	Past project failure (65.3%)	Number of similar completed projects (61.3%)	Percent of previous work completed on schedule (60%)
Management ability	Present workload and capability to support the new project (60%)	Qualification and experience level of the project manager (56%)	Past management Performance (52%)
Culture	Familiarity with local working culture (24%)	Familiarity with regulating authority (21.33%)	Contractor's familiarity with weather conditions (20%)

C. Validation of Developed Framework

The developed framework (in form of questionnaire) was then validated by distributing to 20 subjects from the three main organisations involved in the research, namely the Ministry of Water (7), the Ministry of Transport (7) and the Saudi Royal Protocol (6). The questionnaire was distributed and collected in person to ensure 100% responses, and to answer any questions relating to the questionnaire.

Table V: Type and number of questionnaire participants

Participant	Ministry of Water	Ministry of Transport	Royal Protocol
Client	3	3	2
Consultant	2	2	2
Contractor	2	2	2
Total	7	7	6

The main aim of the focus group was to discuss and explore the validation of the framework. The discussion also included the usefulness, clarity and appropriateness of the framework for the KSA construction sector.

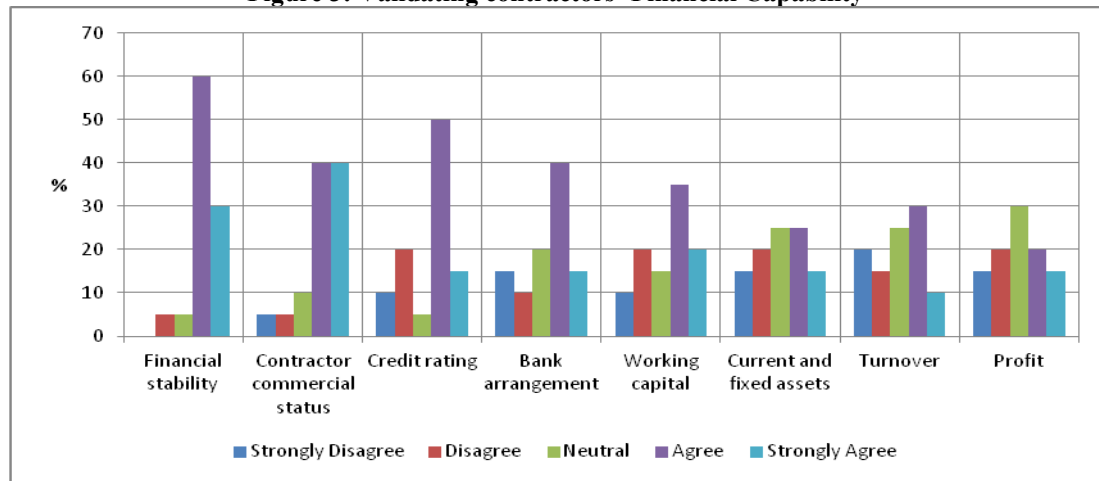
D. Validation Data Analysis and Discussions

The focus of the collected data was the framework and its components. The questionnaire participants and the focus groups participants were asked to express their opinions and views on the proposed framework. This section presents and discusses the main outcomes of the data analysis.

Framework component: Financial Capability Criteria

100% of respondents agreed or strongly agreed with the importance of contractor financial capability. The second and most important sub-criteria, in the view of the questionnaire respondents, relate to the contractor's commercial status. The third and most valued sub-criteria were the contractor's credit rating. The least valued sub-criteria based on the questionnaire responses were the contractor's profit.

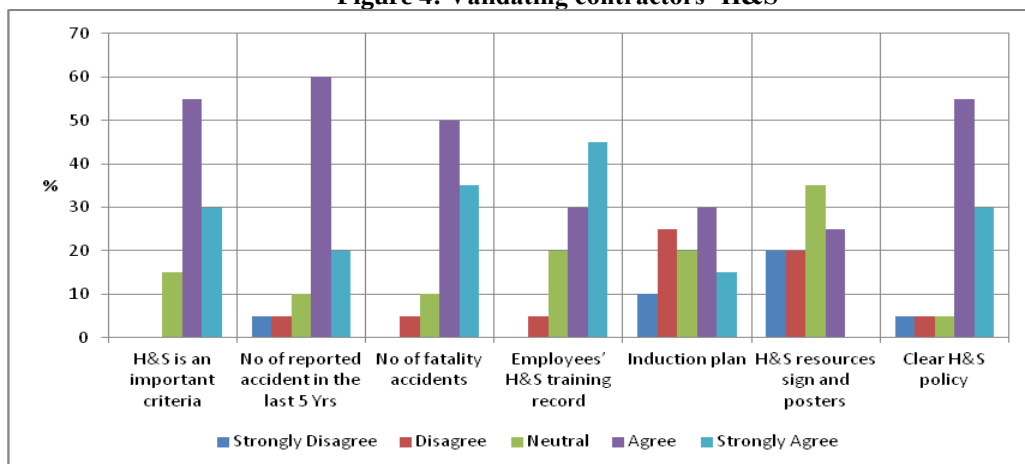
Figure 3: Validating contractors' Financial Capability



E. Framework component: Health & Safety

The vast majority (80%) of the respondents strongly agreed or agreed that the number of reported accidents in the last five years is important to be included in the contractor pre-selection performance evaluation. 75% of the questionnaire respondents strongly agreed or agreed that employee health and safety record needs to be added as sub-criteria of the health and safety criteria, and only 5% of the respondents strongly disagreed or disagreed. On the other hand, the vast majority 85% strongly agreed or agreed that clear health and safety policy is an important sub-criterion, and only 10% strongly disagreed or disagreed.

Figure 4: Validating contractors' H&S

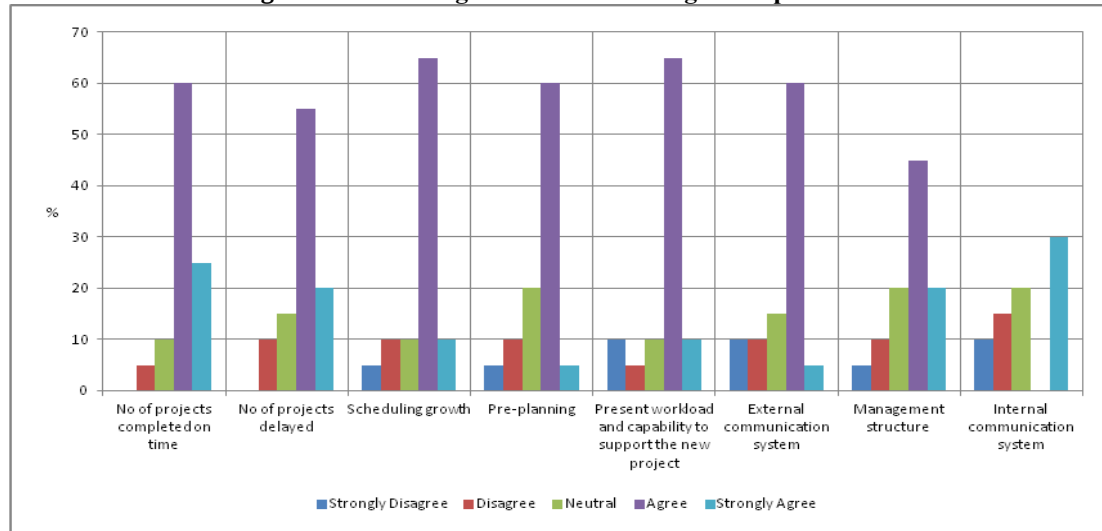


F. Framework component: Management Process

The vast majority, 85%, of the respondents strongly agreed or agreed, and only 5% strongly disagreed or disagreed that the number of projects completed on time is important on the pre-selection evaluation. 75% of the respondents strongly agreed or agreed that previous projects delayed is an important sub-criterion in the pre-selection evaluation process, while only 10% strongly disagreed or disagreed.

The other sub-criteria identified as important is the scheduling growth, where 75% strongly agreed or agreed, and only 15% strongly disagreed or disagreed. The vast majority of the respondents strongly agreed or agreed, 75%, and only 15% of the respondents strongly disagreed or disagreed with the contractor's "present workload and capability to support the new project".

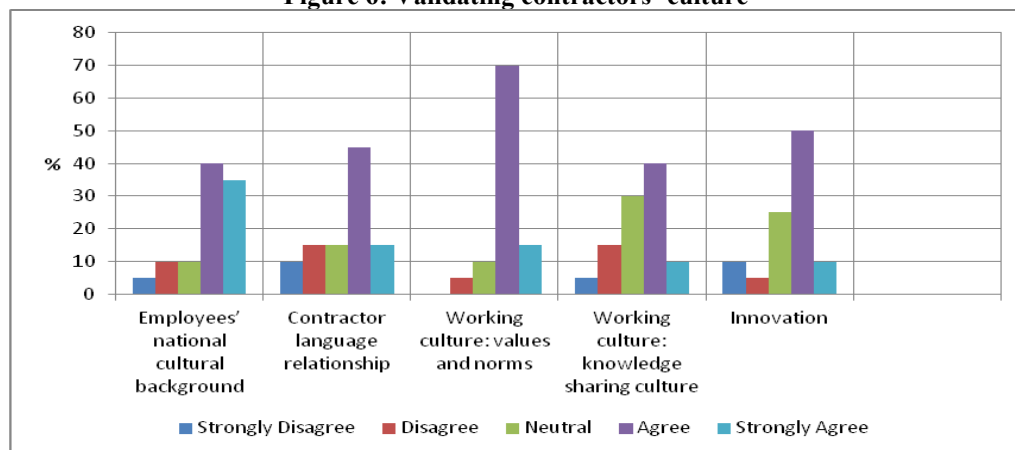
Figure 5: Validating contractors' management processes



G. Framework component: Culture

The vast majority, 75% of the respondents strongly agreed or agreed, and only 15% strongly disagreed or disagreed, that employees' national cultural background is important in the pre-selection process. On the importance of the contractor's language relationship, majority of respondents, 60% strongly agreed or agreed, and only 25% strongly disagreed or disagreed. The contractor's knowledge sharing culture was also identified as important for contractor's pre-selection. 70% strongly agreed or agreed compared with only 20%, who strongly disagreed or disagreed. Similarly, 60% agreed or strongly agreed while only 15% disagreed on the innovation sub-criterion.

Figure 6: Validating contractors' culture

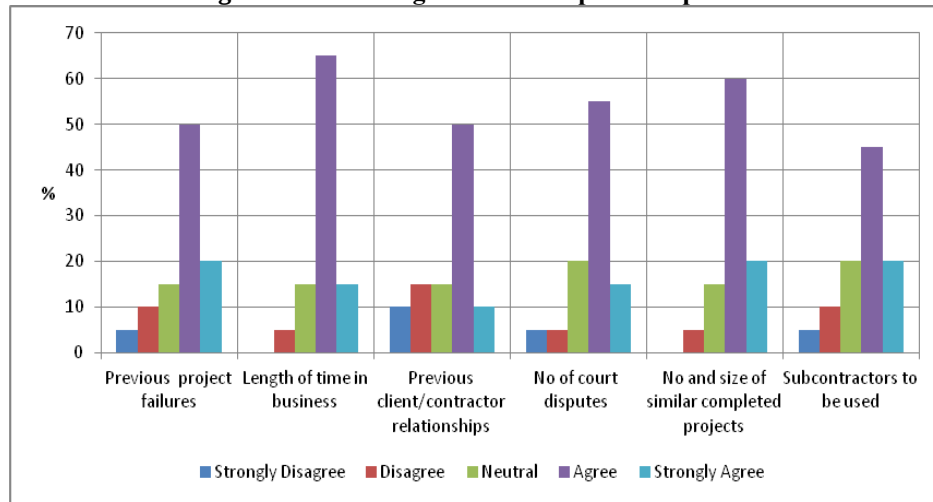


H. Framework component: Previous Project Performance

The majority of respondents, 70%, strongly agreed or agreed, and only 15% strongly disagreed or disagreed that contractor's previous project failure is an important sub-criterion for evaluation of the contractor's previous project performance. The vast majority or 80% of questionnaire respondents strongly agreed or agreed that length of time in business is important, while only 5% strongly disagreed or disagreed with this statement. The vast

majority, 80%, of the respondents strongly agreed or agreed that number and size of similar completed projects is an important sub-criterion to be included in the contractor's previous project performance.

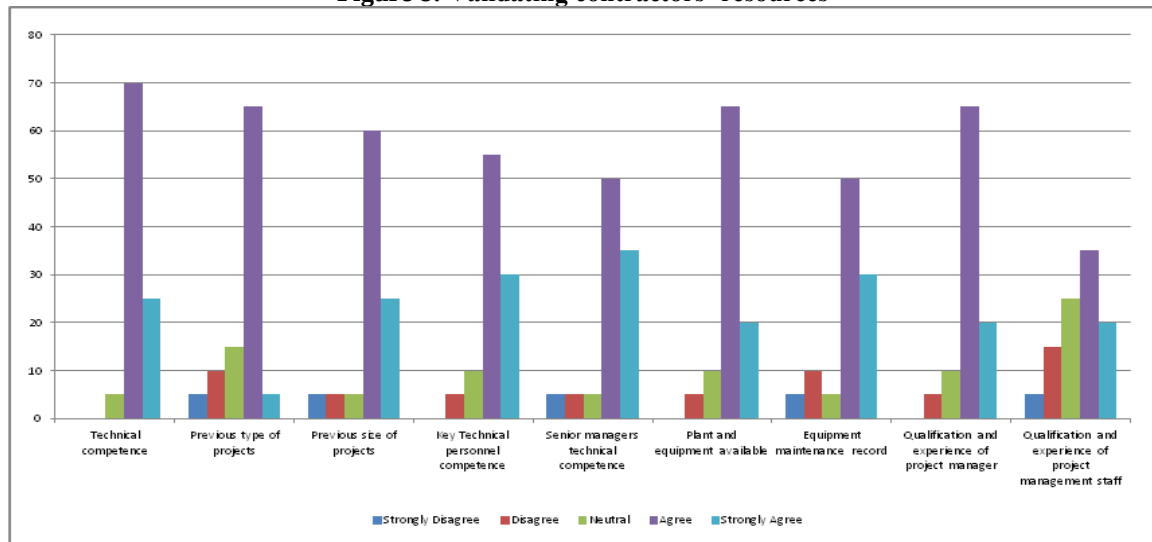
Figure 7: Validating contractors' previous performance



I. Framework component: Resources

The majority of respondents, 85%, strongly agreed or agreed with the importance of the key technical personnel competence as contractor's sub-criterion, while only 5% disagreed. The other important sub-criterion explored was the qualification and experience of the project manager. 85% of the questionnaire participants strongly agreed or agreed with the statement, "Qualification and experience of project manager", while only 10% strongly disagreed or disagreed. 85% of the questionnaire responses strongly agreed or agreed that Project senior managers technical competence is important criteria, while only 10% strongly disagreed or disagreed with it.

Figure 8: Validating contractors' resources



VIII. Conclusion

The main outcome of the validation is that the developed framework was found to be practical and met the needs of the KSA construction industry. One of the main values of the developed framework, is that it is appropriate to the KSA construction industry, and the participants stressed that it was the most appropriate framework for the industry. The validation also indicated that the overall framework and the sub-criteria were clear to the framework users.

The validation process focused on the main criteria of the framework and their sub-criteria. The six main criteria namely: culture, management process, previous project experience, financial ability, resources, and health and safety of the framework were validated to ensure their importance and appropriateness on the pre-selection process.

The contractor's financial ability received a higher scored compared with other criteria related to contractor's resources, followed by the contractor's previous performance. The validation feedback recommended some

changes to the framework, particularly in moving some of the sub-criteria from one criterion to another. This was taken into consideration and the framework was modified to reflect the feedback.

.

References

- [1] Assaf, S., and Al-Hejji, S. (2006) Causes of delay in large construction projects, *International Journal of Project Management*, 24, 349-357.
- [2] Bassioni, H., Hassan, T. and Price, A.D.F. (2004) Performance measurement in construction. *Journal of management in Engineering*, 20(2), 42-50.
- [3] Bassioni, H., Hassan, T., and Price, A. (2005) Building a conceptual framework for measuring business performance in construction: an empirical evaluation. *Construction Management and Economics*, 23(5), 495-507.
- [4] Chan, D., and Kumaraswamy, M. (1996) An Evaluation of construction time performance in the building industry, *Building and Environment*, 31(6), 569-578.
- [5] Kim, G., An, S., and Kang, K. (2004) Comparison of construction models based on regression analysis, neural networks, and case-based reasoning. *Building and Environment*, 39, 1235-1242.
- [6] Li, Y., Nie, X., and Chen, S. (2007) Fuzzy approach to prequalifying construction contractors. *Journal of Construction Engineering and Management*, 133(1), 40-49.

Acknowledgments

The authors are thankful to professionals working in Construction sector and ministry for their valuable suggestions and feedback and timely response of questionnaires.