

A CONCEPTUAL MODEL FOR A/E CONSULTANT SELECTION (CCSM) IN SAUDI ARABIA.

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ABSTRACT: As public sector considers engaging Architectural Engineering Consultants (A/Es) for Professional services, many factors participate in making the A/E selection process quite inconsistent and complicated. As such the Saudi Public sector needs a consistent, comprehensive, and flexible methodology that will ensure successful selection of A/Es. Thirty- (30) public sector organizations and thirty (30) consultants were surveyed to identify the major selection criteria of an A/E. Thirteen (13) major selection criteria were recognized which were summarized into eight criteria to be used in developing a practical and flexible consultant conceptual selection model (CCSM) in view of analytic hierarchy process methodology (AHP) .

INTRODUCTION

Efficiency, convenience and quality of any construction project are affected by the important decisions that have to be taken at the early stages of initiating the project. An architectural Engineer firm (A/E) selection is one of these decisions that will have an effect on the projects construction stages {1,5}.

In Saudi Arabia, among the public sector organizations, the selection of a competent A/E firm for any proposed project is a very frustrating procedure and a challenging task as well {4}. This is due to the many factors influencing the selection, such as strong opposition to a competitive fee practice as the basis for A/E selection project size and complexity and the availability of many A/Es with different levels of education, experience, specialization, staffing design capabilities and management approaches {2,11}.

There are three general selection methods executed for selecting an A/E, considering certain factor(s) which control the selection :

1. **Direct Selection Method** based on A/E reputation or owner's prior experience with the A/E , or a former client's recommendations.
2. **Competitive Selection Method** based on either fee and/or design criteria .
3. **Comparative Selection Method** based on objective evaluation of the A/E's qualifications and technical experience.

In Saudi Arabia, the selection methods used by the public sector are the competitive bidding, direct selection, design competition method, and nomination with a percentage frequency of 66%, 48%, 39%, and 30% respectively {3}.

As such a research was made in Saudi Arabia to help the public sector in appointing the most qualified A/E for their projects.

*** What is AHP?**

The Analytic Hierarchy Process (AHP) is a multi-criterion decision-making approach (MCDM) developed by Thomas Saaty in 1971 {8,9}. AHP is a powerful decision-aiding tool that can deal with the intuitive, the rational, and the irrational when making decisions considering the suitability of large number of selection factors and alternatives. AHP is an appropriate MCDM approach for conducting both deductive and inductive evaluation that allows the consideration of several criteria and alternatives at a time, along with the benefit of a feedback mechanism and numerical tradeoffs. It is becoming a more popular and practical tools than the traditional multi-attribute utility theory, because it enables the decision-makers to resolve complex problems by simplifying and expediting the natural decision making processes. Basically AHP is a method designed to examine complex issues by breaking down the complex, unstructured problem into its constituent elements; constructing a hierarchy with the ultimate goal at the top level; selecting criteria or objectives that must be satisfied at the next level; listing alternatives at the lowest level; assigning numerical values to subjective judgements on the relative importance of each element; and synthesizing the judgements to determine which alternatives have the highest priority. The AHP is usually done through the following steps:

Step 1: Construct a decision hierarchy by breaking down the decision problem into a hierarchy of its elements.

Step 2: Collect input by a pairwise comparison of decision elements.

Step 3: Determine whether the input data satisfy a consistency test; if not, redo the pairwise comparisons.

Step 4: Calculate the relative weights of the decision elements.

Step 5: Aggregate the relative weight to obtain scores and hence rankings for the decision alternatives.

The overall depth of detail of the hierarchy depends on the person's experience and familiarity with the subject, which will determine what to include and where to include it. When constructing hierarchies one must include enough relative details in order to {10}:

- ◆ Represent the problem as thoroughly as possible, but not so thoroughly as to lose sensitivity to change in the elements.
- ◆ Consider the environment surrounding the problem.
- ◆ Identify the issues or attributes that contribute to the solution.
- ◆ Identify the participants associated with the problem.

RESEARCH OBJECTIVES

1. To identify the selection criteria which are accounted to be the major factors influencing the A/E selection process to determine the best A/E.
2. To develop a conceptual Analytic Hierarchical Process (AHP) model for solving the A/E selection problem to help the public sector in prequalifying and selecting qualified A/Es , who should be "financially capable and technically strong".
3. To test the model.

RESEARCH LIMIMENTATION

The research was limited to the public sector organizations in Saudi Arabia, who require any of the A/Es' wide professional services. It is assumed that members of the public sector selection committee are well trained experienced and capable of performing the selection process.

RESEARCH METHODOLOGY

1. ANALYZE CURRENT CONSULTANT SELECTION CRITERIA

The pre-qualification process is defined as the screening of consultants (A/Es)by owners or their representatives against predetermined set of selection criteria. Previous studies have been investigated to find out the most important selection criteria considered by public sector in A/E pre-qualification and selection. They have indicated that A/E selection is of great importance to public sector and

should not be done without complete evaluation of those criteria influencing and controlling the selection process {6}. Evaluating these related criteria will successfully accomplish the overall objective of the selection process. These criteria were **current work load; experience; economic constraint; quality control; experience in geographic location; firm capacity; firm organization; staff availability and qualifications; head office location; Project management capabilities; reference and past performance.**

Three pre-qualification form samples were also investigated to identify the most common and important criteria used by public sector during selection process. Two forms from Saudi Arabia were analyzed. The first is used by the General Directory of Military Works (GDMW) for projects within Saudi Arabia. The Second is used by the World Islamic for projects within the Islamic countries {7}. The Third is a form used by the U.S. General Services Administration for all U.S Federal Projects. Examination of these forms prevailed that the common criteria used by public sector is determining A/E capability were: **experience of completed works; experience of current works; references and past performance; key personnel and their qualifications; management capability; field of specialization; firm’s capacity; financial references; firm organization.**

2. RANK THE IMPORTANCE OF THESE A/E SELECTION CRITERIA:

The identified selection criteria were used as a basis for formulating the questionnaire form part I (Table 1). A pilot study was conducted to make sure that the important A/E selection criteria were identified, comprehensively covered. Then the questionnaire was personally handed over to thirty (30) public agencies having approved budgets, and thirty (30) consultants. They were asked to rate the selection criteria in order of importance, and to add any criteria they might consider be important to the A/E selection process.

Analysis of Data Received

The collected data, from the questionnaire respondents, was analyzed, and measurements of the importance of each criterion were determined by calculating the average rank for each criterion. Then, the criteria were ranked according to the highest average rank (A.R) and the importance index (I.I). The Average Rank (A.R), and importance Index (I.I) of selection criteria were calculated as follows:

$$\text{Average Rank (A.R)} = \frac{\sum_{i=1}^n (a_i * X_i)}{n} \quad \text{Eq.1}$$

$$\text{Importance Index (I.I)} = \frac{\sum_{i=1}^n (a_i * X_i)}{n} * 100\% \quad \text{Eq.2}$$

Where: a_i = constant expressing the weight given to i^{th} response, $i= 1,2,3,4,5,6,7,8,9$.

X_i =the variable expressing the frequency of the i^{th} response, for $i=1,2,3,4\dots$ and illustrated as follows:

$X_1 = 1$ = the frequency of “Equally important”;

$X_2 = 2$ = the frequency of “Equally to moderately important”;

$X_3 = 3$ = the frequency of “Moderately important”;

$X_4 = 4$ = the frequency of “Moderately to strongly important”

$X_5 = 5$ = the frequency of “Strongly important”;

$X_6 = 6$ = the frequency of “Strongly to very strongly important”;

$X_7 = 7$ = the frequency of “Very strongly important”;

$X_8 = 8$ = the frequency of “Very strongly to extremely important”; and

$X_9 = 9$ = the frequency of “Extremely important”.

The selection criteria were ranked in descending order according to their average rank (A.R) as shown in table 2. Table 3 shows the major and the most important selection criteria as ranked by public sector and consultants. The criteria are: **(1) Staff and Qualifications, (2) Experience, (3) Quality Performance, (4) Project Management Capability, (5) Past Performance, (6) Quality Control, (7) References, (8) Current Work Load, (9) Firm Organization, (10) Firm Capacity, (11) Economic Constraint, (12) Experience in Geographical Area, and (13) Head Office Location.**

Generally, the public sector and the consultants agreed in ranking the identified selection criteria. The small differences in ranks confirmed the strong agreement on the importance of the 13 criteria to the selection process. The agreement in ranking the criteria was measured using the rank correlation theory. The rank correlation coefficient (**rho**) was calculated as follows:

$$\rho = 1 - \frac{6\sum D^2}{N(N^2-1)} \quad \text{Eq.3}$$

Where:

D = Difference between ranks given by public sector and rank given by the A/Es for individual criteria;

N = Number of the criteria, which in our case is 13 criteria.

The calculated rank correlation coefficient, which equaled 0.8242, indicated a strong agreement between public sector organizations and consultants in ranking the selection criteria. The null hypothesis testing that the public sector and consultants do not agree on ranking of the selection criteria ($H_0 = 0$) resulted in confirming the strong agreement by rejecting the null hypothesis ($H_0 \neq 0$).

Table 1,[Questionnaire Part I] : Please circle to rate the following Criteria in term of importance of consultant selection on scale of on to nine. Where one (1) is the least important, and nine (9) is the extremely important.

A/E SELECTION CRITERIA	RATING								
	(1-least important, 9-extremely important)								
1. Current Work Load	1	2	3	4	5	6	7	8	9
2. Experience	1	2	3	4	5	6	7	8	9
3. Experience in Geographical Area	1	2	3	4	5	6	7	8	9
4. Financial Stability	1	2	3	4	5	6	7	8	9
5. Firm Capacity	1	2	3	4	5	6	7	8	9
6. Firm Organization	1	2	3	4	5	6	7	8	9
7. Head Office Location	1	2	3	4	5	6	7	8	9
8. Past Performance	1	2	3	4	5	6	7	8	9
9. Project Management Capability	1	2	3	4	5	6	7	8	9
10. Quality Performance	1	2	3	4	5	6	7	8	9
11. References	1	2	3	4	5	6	7	8	9
12. Staff and / Qualification	1	2	3	4	5	6	7	8	9
13. Quality assurance / Control	1	2	3	4	5	6	7	8	9
Are there any other criteria that you evaluate during the selection process? If so list them and check the appropriate rating.									

Table 2: Summary Report of Questionnaire Part I [Public Sector = PS, Consultants = C, All Parties = AP]

No.	Criteria Description	Party	Rank	1	2	3	4	5	6	7	8	9	Average Rank	Importance Index
				NUMBER OF RESPONSES										
CR.1	Current Work Load	PS	8	0	0	0	0	2	6	10	2	6	7.15	79.49
		C	7	0	0	0	0	4	8	12	0	4	6.71	74.60
		AP	8	0	0	0	0	6	14	22	2	10	6.93	76.95
CR.2	Experience	PS	2	0	0	0	0	0	2	0	10	14	8.38	93.16
		C	1	0	0	0	0	0	0	8	12	8	8.00	88.89
		AP	1	0	0	0	0	0	2	8	22	22	8.19	90.95
CR.3	Experience in Geographic Location	PS	12	0	0	0	0	4	10	6	6	0	6.54	72.65
		C	11	0	0	3	0	12	4	4	4	0	5.67	62.96
		AP	12	0	0	3	0	16	14	10	10	0	6.09	67.71
CR.4	Economical Constraints	PS	11	0	0	0	0	8	6	4	4	4	6.62	73.50
		C	9	0	0	4	4	0	4	8	4	4	5.43	60.32
		AP	10	0	0	4	4	8	10	12	8	8	6.44	71.60
CR.5	Firm Capacity	PS	10	0	0	0	0	4	10	2	6	4	6.85	76.07
		C	12	0	0	8	0	4	8	4	4	0	5.43	60.32
		AP	11	0	0	8	0	8	18	6	10	4	6.11	67.90
CR.6	Firm Organization	PS	9	0	0	0	0	4	6	6	4	6	7.08	78.63
		C	10	0	0	4	4	4	0	8	8	0	6.00	66.67
		AP	9	0	0	4	4	8	6	14	12	6	7.04	78.17
CR.7	Head Office Location	PS	13	0	2	2	0	4	4	12	2	0	5.92	65.81
		C	13	0	0	12	0	4	4	4	0	4	5.14	52.69
		AP	13	0	2	14	0	8	8	16	2	4	5.28	58.67
CR.8	Past Performance	PS	5	0	0	0	0	0	4	2	12	8	7.92	98.29
		C	6	0	0	0	0	12	0	0	12	4	6.86	85.71
		AP	6	0	0	0	0	12	4	2	24	12	7.37	81.89
CR.9	Project Management Capability	PS	4	0	0	0	0	0	4	0	14	8	8.00	88.89
		C	8	0	0	0	4	4	4	4	9	3	6.68	74.21
		AP	7	0	0	0	4	4	8	4	23	11	7.31	81.28
CR.10	Quality Performance	PS	3	0	0	0	0	0	0	2	16	8	8.23	91.45
		C	3	0	0	0	0	4	1	0	12	11	7.89	87.70
		AP	3	0	0	0	0	4	1	2	28	19	8.06	89.51
CR.11	References	PS	7	0	0	0	0	2	2	10	10	2	7.31	81.20
		C	2	0	0	0	0	0	1	4	19	4	7.93	88.10
		AP	5	0	0	0	0	2	3	14	29	6	7.55	83.84
CR.12	Staff and Qualifications	PS	1	0	0	0	0	0	0	2	10	14	8.46	94.02
		C	4	0	0	0	0	0	4	4	12	8	7.86	87.30
		AP	2	0	0	0	0	0	4	6	22	22	8.15	90.53
CR.13	Quality Control	PS	6	0	0	0	0	0	2	14	4	6	7.54	83.76
		C	5	0	0	0	0	0	0	12	9	7	7.82	86.90
		AP	4	0	0	0	0	0	2	26	13	13	7.69	85.39

Table 3: Criteria as Ranked by Public Sector and Consultants.

Ranking by Public Sector	The A/E Selection Criteria	Ranking by Consultants
1	CR12 Staff and Qualifications	4
2	CR2 Experience	1
3	CR10 Quality Performance	3
4	CR9 Project Management Capability	8
5	CR8 Past Performance	6
6	CR13 Quality Control	5
7	CR11 References	2
8	CR1 Current Work Load	7
9	CR6 Firm Organization	10
10	CR5 Firm Capacity	12
11	CR4 Economical Constraints	9
12	CR3 Experience in Geographic Location	11
13	CR7 Head Office Location	13

3. *FILTER THE A/E SELECTION CRITERIA*

Because of similarities between some criteria, the related criteria were combined into one for evaluating A/E ability for selection process. Unwanted criteria were omitted. Table 4 shows the combined selection criteria with their total combined weights and their new criteria number. These criteria and Analytic Hierarchy Process (AHP) theory were used to develop the A/E consultant conceptual selection model (CCSM) {11}.

Table 4: Combined A/E Selection Criteria

No.	Combined Criteria	The A/E Selection Criteria Description	Total Combined % Weight of Criteria	New Criteria No.
1	CR1, CR2	Work Experience (1,2,)	20.20%	CR1
2	CR6,CR9	Project Management, Capability (6,9)	19.60%	CR5
3	CR12	Staff and Qualification	11%	CR7
4	CR10	Quality Performance	10.70%	CR6
5	CR8	Past Performance	10.30%	CR3
6	CR13	Quality Control	9.80%	CR8
7	CR11	References	9.50%	CR4
8	CR5	Firm Capacity	8.90%	CR2
TOTAL WEIGHT			100%	

4. *DEVELOPE THE CCSM MODEL*

The development of the Consultant Conceptual Selection Model (CCSM) is based on the previously obtained A/E selection criteria that were identified as a result of literature search, and by examining the prequalification, and selection criteria of the public sector. These criteria are used as main factors that must be considered during the A/E selection process. Careful consideration of these criteria will contribute in establishment of minimum and acceptable requirements, and ultimately lead to the selection of the most qualified A/E. A detailed description of the main steps of the CCSM model is listed as follows: -

One) List selection criteria

Regardless of owner type, project type, and selection methods used, the A/E selection process requires a predetermined set of “criteria” measures. The A/Es’ qualifications will be evaluated against these criteria so that the minimum and acceptable conditions are met for selecting qualified A/E for a proposed project. They will establish a unified and fair evaluation methodology for the proper and successful engagement of A/E.

Two) Check for major and common criteria

To ensure the effectiveness of the model, the predetermined criteria must be objective and comprehensive. In order to meet the user’s full satisfaction, these criteria must positively satisfy the main goal of the process “ To select the Most Qualified A/E”. Comprehensively, they must consider the A/E work experience, qualification, and the project’s specific conditions.

Three) Add and modify criteria

Depending on the user, project type, and any other specific conditions, the criteria listed can be modified (either increased or shortened as required) to suit the selection process, and ultimately lead towards a positive and defined direction

Four) List Prospective A/Es

Once the main selection measures “criteria and sub-criteria” are identified, the candidates available for selection alternatives (the prospective A/Es) are listed. These alternatives (A/Es) can be obtained by using the predetermined long list of A/Es, or based on invitations directed to a number of A/Es to submit their qualifications and work experience for prequalification. The number of listed A/Es should not be less than five A/Es to conduct wide and fair prequalification.

Five) Pre-qualify for Short List

No matter what selection method may be used for determining the A/Es’ long list, some listed A/Es may not meet the preliminary screening requirements of the selection process. If an A/E fails to meet the preliminary screening requirements, then the A/E will be disqualified in the early stage of prequalification and subsequently removed from the list. The remaining candidates will be the basis for the short list to perform the selection process on.

Six) Apply AHP Model

The complexity of the selection process can be handled and best understood by “applying the principle and techniques of AHP” through breaking it down into its constituent elements, structuring elements hierarchically, and then composing, or synthesizing judgements on the relative importance of the elements at each level of the hierarchy into a set of overall priorities. The highest level is the overall objective “Selecting the most qualified A/E”. The lowest level is

the final actions or alternatives “A/Es”. The intermediate levels of the hierarchy comprise the selection criteria for evaluating the selection process. This application is detailed by using the computerized decision support system (Expert Choice, Version ECpro 9.5) to structure the selection model.

Seven) Test for Consistency

Once the selection problem is completely structured and comparison matrices are developed, then examining consistency is a quality control step that must be carried out. The measurement of consistency ration (CR) is to be conducted to check if the utilized judgements are consistent enough, and that the decision to come up with a successful A/E selection is not based on low consistency. Basically, a CR should be 10 percent or less. If it is more than 10 percent, then judgements must be revised as required.

Eight) Conduct Pairwise Comparison

The Pairwise comparison is the process of comparing the relative preference or importance of the two selection elements with respect to a parent element in the level above {10}. In this study, the comparison process was repeated for all the elements in the selection model. This ultimately led to the derivation of the priorities for each selection alternative under each criterion, and for each criterion under the goal. There are three comparison types available in the Expert Choice for the users to choose either one. These comparisons are as follows:

Importance which is appropriate when comparing one criterion (objective) with another.

Preference which is appropriate and used when comparing the alternatives.

Likelihood which is appropriate when comparing the probability of an outcome. It can be used with either criteria or alternative.

In addition there are three comparison modes available in the Expert Choice:

Verbal which allows for comparing nodes using English language terms.

Graphical which allows for comparing nodes using graphical measures.

Numerical which allows for comparing nodes using numbers in a matrix or questionnaire format.

Nine) Synthesize for Overall Result.

This is achieved by generating the global weights of the nodes by combining the local priorities throughout the entire model. It is the process of converting the local priorities into the global priorities of the selection model, and give the alternatives global weights. The distributive mode is used to perform this synthesis from the goal node to get the overall selection results.

j) Rank A/Es

As a result of the overall synthesis, the distributive synthesis mode priorities prospective A/Es with respect to their relative worth. The distributive synthesis mode can be used to perform the synthesis from the goal node to get the overall selection results. The distributive synthesis mode ranks the prospective A/Es, placing the most qualified consultant in the top.

Eleven) Select A/E

The resulting ranked list of A/Es forms a solid foundation from which to choose the most appropriate A/E firm to perform the required service(s). Those A/Es whose work experiences and qualifications are not compatible with the project’s requirements have now been eliminated from the list. Usually it is advisable to pre-select the top four or five most qualified A/Es for an oral presentation and evaluation.

Twelve) Negotiate and Agree with A/E

The selected A/Es will be ranked first, second, third, and so on. Negotiation begins with the A/E ranked first. During this negotiation the scope of work, contract terms, the detail and structure of the professional fee, and legal and contractual requirements are completely reviewed and included in the discussions. If and when an agreement is reached with the negotiating A/E, then a consultant contract will be prepared for signing to contractually commit the A/E to perform the required services. If an agreement is not reached with the A/E ranked first, then negotiations with that A/E is terminated and the A/E ranked second is invited for negotiations and so on until an A/E is selected and a satisfactory agreement is reached.

Thirteen) Sign A Contact

Finally, when a satisfactory agreement is reached with an A/E firm, signing a contract with that consultant firm (A/E) completes the selection process.

5. TEST THE MODEL

The Model has to be tested by applying it in actual situations. The application of the CCSM model involved two public organizations (PSO1, and PSO2) who agreed to use the CCSM model for conducting the A/E selection process for needed services.

The identified selection criteria (table 4), the AHP, and a computerized decision support system (Expert Choice, Version ECpro 9.5) were used to structure the CCSM model. Figure 1 and 2 display the model trees for CCSM-PSO1 and CCSM-PSO2 respectively. The two organizations (PSO1 and PSO2) were then asked to fill in their judgements in the pairwise comparison matrices (Tables 5 and 6), and hence were used to calculate priorities, and testing consistencies of the judgements of the model’s alternatives. Finally, the distributive mode {10} was used to perform the overall synthesis from the goal node to get the overall results. The distributive synthesis ranked the prospective A/Es with the most qualified consultant at the top. The overall priorities of the synthesis and the inconsistency ratio are shown in Figures 3, and 4.

The overall results were as follows:

Public Sector	Synthesis of Overall Prioritizing of Selection Alternatives				
	1	2	3	4	5
PSO1	A/E3	A/E5	A/E2	A/E1	A/E4
PSO2	A/E2	A/E3	A/E1		

The selected public sector organizations (PS01, PS02) accepted these overall results.

Synthesis of Leaf Nodes with respect to GOAL
 Distributive Mode
OVERALL INCONSISTENCY INDEX = 0.04

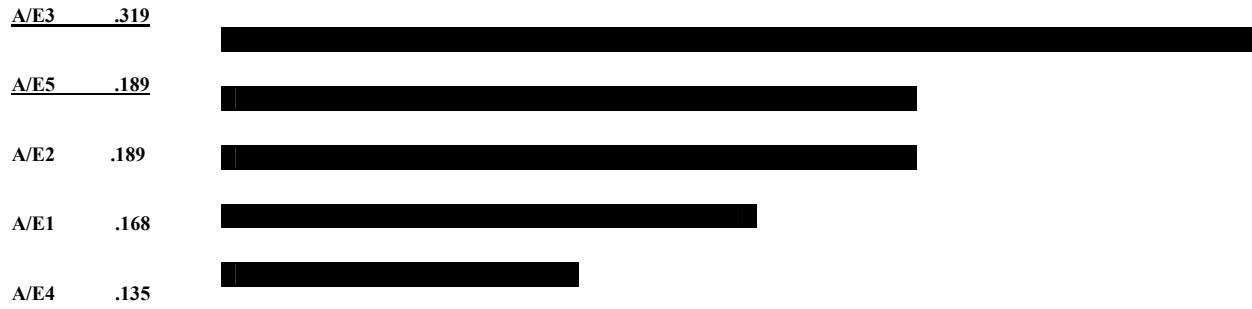


Figure 3: overall synthesis results

Synthesis of Leaf Nodes with respect to GOAL
 Distributive Mode
OVERALL INCONSISTENCY INDEX = 0.04



Figure 4: Overall Synthesis Results

Table 5: Pairwise Comparison Matrix “A/Es As compared By Public Sector with Respect to Criteria”.

Criteria	A/E1	A/E2	A/E3	A/E4	A/E5
A/E1	1				
A/E2		1			
A/E3			1		
A/E4				1	
A/E5					1

Table 6: Pairwise Comparison Matrix “Criteria as Compared by Public Sector” with respect to Goal

GOAL	CR.1WEXP	CR2.FCAP	CR.3PPER	CR.4REFS	CR.5PRMC	CR.6QPER	CR.7SQ	CR.8QC
CR.1WEXP	1							
CR2.FCAP		1						
CR3PPER			1					
CR.4REFS				1				
CR.5PRMC					1			
CR.6QPER						1		
CR.7SQ							1	
CR.8QC								1

RESEARCH FINDINGS

- Thirteen (13) selection criteria were identified as major and most effective selection criteria. Public sector and consultants ranked them as shown in table 5. They were later on summarized to eight (8) selection criteria only to develop the CCSM model. These criteria were: **(1) Work Experience, (2) Project Management Capability, (3) Staff and Qualifications, (4) Quality Performance, (5) Past Performance, (6) Quality Control, (7) References, and (8) Firm Capacity.**
- Questionnaire data analysis indicated a strong agreement between public sector and consultants in ranking the major selection criteria. The agreement was proved by high coefficient of rank correlation ($r_s = 0.8242$), and supported by the hypothesis test which indicated that this correlation is larger than the selected critical value to $t_{0.05} = 0.5549$. This means that the rank correlation coefficient (r_s) lies in the rejected region, concluding there is strong rank correlation between the public sector rank and the consultants' rank. However, the small differences indicated in rank were due to different levels of experience of the respondents.
- Staff and Qualifications criteria are ranked first. This is due to the fact that public sector considers "Staff and Qualifications Criteria" as the most important criteria which must be evaluated for proper and successful selection.
- Public sector ranked "References" seventh among the thirteen selection criteria. They believe that consultants' reference data are not fully updated, and outdated information is usually included, yet they extremely believe that "Experience in Geographical Area" and "Head Office Location" are not so important criteria to the A/E selection process in Saudi Arabia. This is due to the small and closed Saudi geographical location, the country's identical provinces, and the identical codes and regulations.
- "Work Experience" and "Project Management Capability" criteria weigh 40% of total weight. This is due to the fact that these criteria are extremely major and play a major role in the improvement of consultancy practice and success of any project at any stage.
- "Economical constraints" criteria are not as applicable to A/E selection process in Saudi Arabia as it is to selection process of construction contractors. However, the case differs when selecting a design/build team for public projects. The design/build team's financial statement would be carefully examined to establish team credibility.

CONCLUSIONS & RECOMENDATION

The main objectives of the research "Identifying the Major Selection Criteria" and "the Development of A/E Consultant Conceptual Selection Model CCSM", were accomplished. The CCSM Model was implemented for solving the complicated selection problem, in a practical way by comparing prospective A/Es in terms of selection criteria. The CCSM's concept is concerned with the selection of a capable and competent A/E based on qualification and previous work experience to accomplish special professional service within a given time frame and with the required quality. The implementation proved that the CCSM model is a consistent, practical, and effective selection tool for selecting a qualified A/E. The CCSM is flexible enough to meet the public sector demand for accommodating additional criteria as needed. As such this CCSM model is recommended for use by the Saudi Public sector for this purpose.

RECOMMENDATIONS FOR FUTURE STUDIES

- The A/E selection criteria identified and used in this research are the major criteria influencing the selection process. It is recommended, therefore, that a further study of the secondary or sub-criteria be conducted to determine their effect and contribution to the selection process.
- The agreement “**CONTRACT**” between owner and A/E should be reviewed to develop a standard agreement that will take in full considerations about contract conditions, fees, and level of work experience.
- The classification of A/E should be established and enforced to keep up the quality of consultancy and keep the owner informed of true qualifications and the ability of the A/E when considering the engagement of an A/E.
- A similar selection model for the private sector should be developed and validated.

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