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THE IMPACT OF INCOMPETENT CONTRACTOR ON THE PROJECT SCHEDULE

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Abstract: The Iraqi construction remains challenging because of lack of basic amenities and is associated with enormous risks and terrorist actions. This status compels clients to wisely select the most efficient contractor that complies with both standard and special circumstances. This study aims to investigate the impact of choosing incompetent contractor on project schedule. The criteria of selection contractor that satisfy Iraqi construction industry were also investigated. Data were collected using an extensive historical data of 352 projects from the database of Diyala Governorate as well as conducting structured interviews with construction professionals from public organizations. Analysis of data showed that the current bidding process significantly impacts the performance of projects. In addition, the analysis revealed that the five most important criteria for selecting Iraqi contractors are: security and safety management, financial stability, past performance, relevant experience, and plant and equipment. Results would enhance the awareness of managers to the importance of tenders' evaluation based on transparency and fairness.

Keywords: *Bidding Process, Contractor, Selection Criteria, Bid Price, Construction Projects.*

تأثير المقاول غير الكفؤ على الجدول الزمني للمشروع

الخلاصة: يعاني قطاع البناء العراقي من عدم وجود المرافق الأساسية مقترنا بمخاطر الأعمال الإرهابية. هذا الوضع يفرض على اصحاب العمل ضرورة اختيار المقاول الأكثر كفاءة الذي يتوافق مع كل الظروف القياسية والخاصة .تهدف هذه الدراسة إلى التعرف على تأثير المقاول غير الكفؤ على الجدول الزمني للمشروع كذلك الكشف عن اهم معايير اختيار المقاول لتنفيذ الاعمال الانشائية بما يلبي قطاع البناء والتشييد العراقية. تم استخدام البيانات التاريخية من 352 مشروعا من قاعدة البيانات من محافظة ديالى اضافة الى إجراء المقابلات المهيكلة مع المتخصصين في البناء من العاملين في الشركات الحكومية. أظهر تحليل البيانات أن لعملية تقديم العطاءات الحالية تأثيرات كبيرة على أداء المشاريع. بالإضافة إلى ذلك، كشف التحليل أن المعايير الخمسة الأكثر أهمية لاختيار المقاولين العراقيين المقاولين والتي تلائم ظروف العراق هي: إدارة الأمن والسلامة، الاستقرار المالي، الأداء في الماضي، الخبرة ذات الصلة، والآلات والمعدات. إن النتائج تعزز وعي المديرين بأهمية تقييم المناقصات على أساس الشفافية والعدالة.

1. Introduction

The tardiness of construction projects has become critical in Iraq because the total size of lagging projects has caused heavy losses in the economy [1]. This phenomenon significantly affects social and economic levels. Prior to 2003, the

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General Authority for Buildings was responsible for implementation of large-scale projects in the country; this organization comprises efficient staff and individuals with sufficient experience in the field of construction. This department was renamed as engineering department in every ministry, and the majority of these departments possess inadequate ability to perform work entrusted to them. Furthermore, several inexperienced contractors bid less than actual cost of project to award the tender and remain in business [1]. Subsequently, competent contractors discard submitting bids because they cannot compete with other contractors. Therefore, subjective selection of a contractor and establishment of professional ethos for public contract procurements are crucial to revive the image of the Iraqi construction industry.

This research aims to provide evidence of the shortcoming of the current methods used in choosing contractors, determine consequences of using these methods, and propose criteria that satisfy the Iraqi construction industry and provide the best value. Results highlight the sequence of choosing incompetent contractors in terms of adherence to project schedule. This study justifies adopting weighted criteria for choosing contractor to increase of possibilities to achieve the required outcomes.

2. Tender Evaluation Process

Tender evaluation is a process of screening and classifying contractors to assess their capabilities to perform the projects based on specific criteria [2, 3]. These criteria incorporate a wide set of qualitative and quantitative measures [4], and "low price" is not the leading criterion [5].

Tender evaluation is a vital step in construction management [6, 7]. Selection of a competent contractor increases the chances of successful construction project [8, 9]. In the same context, studies affirmed that awarding tender to incapable contractors is one of the reasons that caused poor performance and project delivery issues[10].
Previous studies presented selection criteria and theoretical models for tender evaluation. These models include multiattribute utility theory[3], fuzzy multi-criteria decision making [11], integrated goal programming[12], Data Envelopment Analysis [13], Analytic Network Process[14], Analytic Hierarchy Process [15-17], PERT approach[18], SWOT [19], classification model and general regression model[20], fuzzy decision support [21], and genetic-neural network [22]. However, the bidding systems are still in their basic form [23], and most construction owners highly consider the price of the submitted bid [24].

3. Selection Contractor Criteria

Topcu [25] suggested that lowest bidder is awarded the contract, if the contractor passed first stage of evaluation process that contractors are scored with respect to four main pre-qualification criteria. Lai et al. [26] also claimed that bid price should be compared with the base number of the project bids. Accepting the lowest price may not offer the best value and does not guarantee supplementation of resources to sustain the project because of high costs and reduced profit margin [23]. Eventually,

the possibility of delayed projects and costs overruns is escalated. Likewise, Wang et al. [27] pointed that awarding contracts to the lowest bidder causes delays and end up in contractual disputes. Wang et al. [27] proposed the unit-price-based approach to distinguish the unreasonable bid price.

The clients' insistence of awarding lowest price bids has been attributed to some reasons. The first reason is economic recession and restricted economic power of the clients [23]. Second, the presented theories are narrow or use many simplifying assumptions, which differ from the realities and intricacies of the world of construction practice [28]. Third, most theories are written and discussed in manners that confine them exclusively within the limits of academic scopes [22]. Fourth, in many countries, government agencies have traditionally used the policy that construction contracts must be awarded to the lowest responsible bidder [29]. These reasons are not necessarily convincing in all cases. For instance, the variance scores between a good submission and a satisfactory submission does not overshadow a significant price difference [30].

Despite the extensive history of academic research that proposed many criteria for selecting an appropriate contractor, few studies investigated Iraqi construction projects. Selection criteria differ depending on the construction project delivery method and the characteristics of the project [20, 31]. Therefore, suggested criteria in previous studies cannot be replicated in Iraq because these criteria may vary in emphasis according to the characteristics of the Iraqi projects. This study attempts to fill this gap and explore selection criteria relevant to the demands of the Iraqi construction industry.

4. Methodology

Extensive historical data were collected from the database of Diyala Governorate to scrutinize the performance of construction projects. Structured interviews were conducted with a total of 11 construction professionals from public organizations. Questions were structured as closed-ended, with an option to provide additional information. Judgment sampling was used to select knowledgeable people who have meaningful perspectives [32]. Therefore, candidates were selected based on their experiences and qualifications as well as their roles in tendering committees. Preliminary meetings were held with candidates to build up trust and generate abundant data and descriptions without asking many questions during interviews [33]. Such meetings were also conducted to determine changes needed in the interview guide.

The questions start with general demographic characteristics of the participants (title, age, educational level, experience, etc.) to warm up and build confidence with them. The other questions aimed to investigate the respondents' viewpoint about the currently used tendering process. In addition, the participants were invited to rate criteria that should be considered during bid evaluation on a five-point Likert scale, where 1 represents not important, 2 minimal important, 3 moderately important, 4 very important, and 5 extremely important.

Relative importance index (RII) was used to determine the relative importance of the criteria using following equation:

$$RII = \Sigma ai\ xi / A \times N$$

where ai is the weight of the ith response, xi is the percentage of the total responses for each criterion, A is the highest weight, and N is the total number of respondents.

5. Results and Discussion

5.1. Historical data

Of the total of 859 projects, 352 projects were selected; these projects were completed during 2010-2016 in Diyala Governorate and executed by 93 contractors. As shown in Table 1, about one third of the projects (34.1%) were roads and bridges, and the remaining projects ranged from 19% to 0.3%.

Table 1. Types of projects

No.	Project type	Frequency	Percent	Cumulative Percent
1	Electricity	67	19.0	19.0
2	Roads and bridges	120	34.1	53.1
3	Municipalities	45	12.8	65.9
4	Health Ministry	7	2.0	67.9
5	Education Ministry	16	4.5	72.4
6	Interior Ministry	8	2.3	74.7
7	Sewerage	20	5.7	80.4
8	Water Resources	48	13.6	94.0
9	Local Administration	10	2.8	96.9
10	Sport and Youth	6	1.7	98.6
11	Telecommunications	2	.6	99.1
12	Civil Defense	1	.3	99.4
13	Justice Ministry	2	.6	100.0
	Total	352	100.0	

Table 2 shows that the performances of contractors (in terms of adherence to schedule) are highly dispersed because the standard deviation is extremely high. Of 352 projects, 261 projects (74.1%) were delayed.

Table 2. Measures of Central Tendency

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Delay (day)	352	722.00	-169.00	553.00	42.9176	73.09582
Delay%	352	573.20	-66.50	506.70	23.9384	48.13767

Fig. 1 illustrates the different behavioral patterns of the contractor performance in terms of percentage delay. However, incompetent contractors were awarded more than one tender. For example, contractor number 37 who was responsible for the highest delay percentage (506.70%) was awarded with three projects at an average

cost of (275.634) Million Iraqi Diners. This is a result of ignoring past performance of a contractor [34].

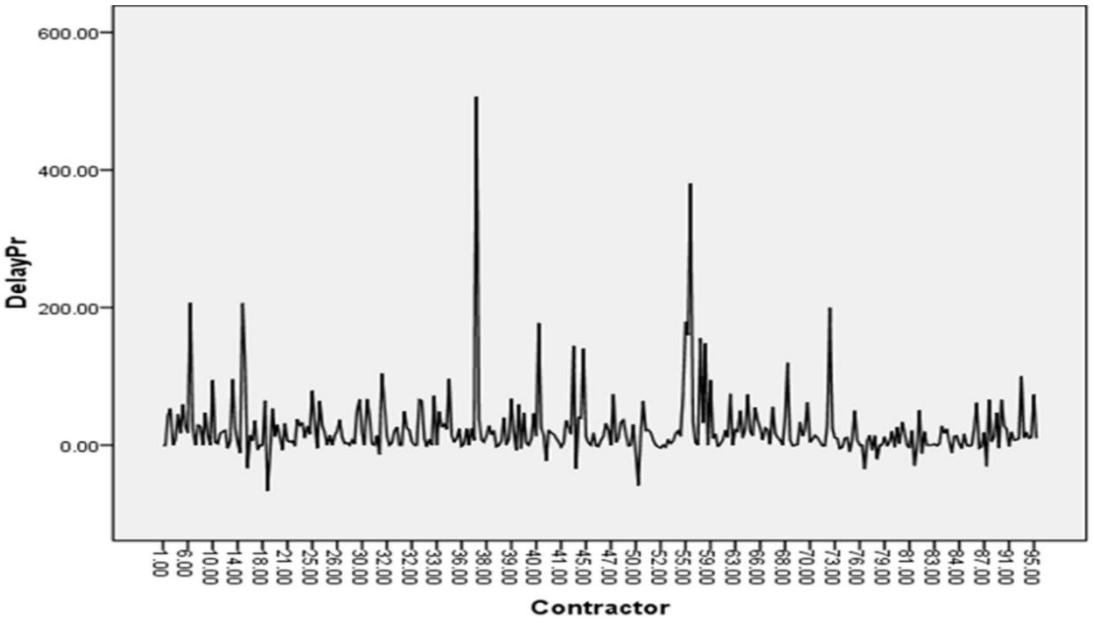

Figure 1. Behavioral patterns of the contractors' performance

Table 3 tabulates the number of projects for each contractor, the average cost of projects and the average percentage delay. The top ten frequent contractors are 32, 40, 84, 26, 38, 41, 33, 51, 45, and 83, who were awarded with 13, 12, 10, 9, 9, 9, 8, 7, 7, and 7 tenders, respectively. These contractors had percentage delays of 56.45%, 57.08%, 47.43%, 49.62%, 46.22%, 45.83%, 44.76%, 45.57%, 38.18%, and 52.80% respectively.

The ANOVA test was conducted to determine the effect of contractor on project delay. The results are tabulated in Table 4. These results ascertain that contractor is the most significant factor affecting project delay at a confidence level of 99%. This result is in line with the findings of Sweis [35] to some extent, who categorized the "poor planning and scheduling of the project by the contractor" as second factor that contributes to the overall time overrun. In other words, the poor performance of contractor leads to delay.

In the same context, the results revealed that the correlation of delay percentage with project cost is significant at a confidence level of 95%. This result is consistent with that reported by Shrestha et al. [36], Who found that construction cost is significantly correlated with schedule overruns.

Table 4 also shows the correlations of between delay percentage and other parameters (client, location, and project time) are not significant at any confidence level. This finding opposes those of Shrestha et al. [36] and Ismail [37], Who found that the correlation of schedule overruns with project duration is significant.

Table 3. The average percentages of delay and costs of projects*

Contractor	No of projects	Avr. projects Cost (M. ID)	Avr. Delay%	Contractor	No of projects	Avr. projects Cost (M. ID)	Avr. Delay%
1	2	550.650	-0.17	39	5	430.193	24.50
2	2	207.925	48.58	40	12	282.452	32.29
3	2	377.404	3.85	41	9	481.621	6.91
4	2	543.966	31.31	42	3	411.068	26.20
5	2	279.600	43.07	43	3	159.104	50.58
6	2	413.138	112.40	44	2	246.609	89.23
7	2	198.588	11.83	45	7	2310.099	5.44
8	2	468.098	28.22	46	2	463.276	22.20
9	2	535.400	23.60	47	3	422.327	32.00
10	3	626.110	36.09	48	3	690.855	15.79
11	2	4248.013	3.06	49	3	1113.887	17.35
12	2	830.023	18.49	50	5	102.737	-4.75
13	2	616.843	8.47	51	7	382.444	18.65
14	4	492.721	32.32	52	4	311.579	0.31
15	3	1313.944	-10.32	53	2	713.929	4.06
16	2	1498.418	161.19	54	2	354.119	18.67
17	2	1068.101	21.23	55	3	416.088	88.53
18	3	721.812	-2.22	56	2	236.415	269.91
19	4	895.388	9.15	57	3	277.758	12.52
20	4	525.555	11.65	58	2	1574.284	93.94
21	3	746.932	14.08	59	3	304.840	80.80
22	5	40681.947	24.76	60	2	615.267	13.37
23	4	179.296	17.99	61	2	392.751	-0.20
24	3	337.270	23.48	62	3	1293.055	13.69
25	3	138.103	43.04	63	3	123.279	32.34
26	9	472.892	17.11	64	4	557.258	26.12
27	3	330.085	17.10	65	4	643.648	40.48
28	3	984.167	3.50	66	3	362.803	22.67
29	2	451.424	25.90	67	6	7481.967	22.14
30	3	532.928	28.16	68	5	414.712	34.42
31	3	1955.444	50.04	79	6	36509.360	-0.65
32	13	429.558	12.53	80	6	363.920	16.18
33	8	4099.335	35.03	81	4	573.990	-3.07
34	6	207.680	39.88	82	2	626.063	23.55
35	3	294.255	12.48	83	7	247.816	1.18
36	4	2838.934	5.90	84	10	387.934	8.74
37	3	275.634	179.38	85	4	323.079	3.70
38	9	652.264	13.91	86	3	368.037	27.23
87	2	561.440	8.20	91	3	2608.452	13.63
88	4	1837.060	12.98	92	2	4108.990	7.59
89	2	552.919	21.35	93	4	1571.994	34.93
90	2	422.669	46.88	94	2	680.067	10.85
				95	2	138.773	41.82

*Database of Diyala Governorate

Interestingly, all interviewees were convinced that the methods currently used to analyze bids are inadequate to identify competent contractors. This result is logical according to the poor performance of construction projects evident from analysis of the historical data presented in this study. This finding adds further evidence of the deficiency of selecting contractors based on the lowest price.

5.2 Interviews

Table 4. ANOVA test

Parameter	Sum of Squares	df	Mean Square	F	Sig.
Contractor	377661.530	94	4017.676	2.370	.000
Client	31193.104	12	2599.425	1.127	.337
Location	46192.674	22	2099.667	.900	.595
Project cost	812911.682	348	2335.953	16.006	.020
Project time	309075.364	219	1411.303	.369	1.000

Table 5 displays the demographic backgrounds of the interviewees. Most of the interviewees (90.9%) hold Bachelor's degree, and one of them (9.1%) has Master

Degree. Less than half of the candidates (45.5%) were aged between 35-39 years. About 18.2% of the respondents are aged 40-44 years, another 18.2% are aged above 45 years, and the remaining respondents are aged between 25-34 years. To be more specific, the majority of interviewees (81.9%) are above 35 years old.

The interviewees occupy various different positions, such as two directors, one manager, two heads of department, two resident engineers, three project engineers, and one quantity surveyor. Most of the interviewees participated in committees for evaluation of bids. Relating to the experience pattern of the interviewees, slightly more than a quarter of respondents (27.3%) have an experience between 15-19 years, the same percentage has an experience of 20-24 years, and the remaining proportions have more than 25 years. For the remaining two respondents, one of them has an experience less than 9 years, and the other one has less than 14 years of experience.

Participants were asked about the current methods they used to analyze bids. The majority (90.9%) of the interviewees affirmed that they followed the lowest bid, and only one of them (9.1%) stated that his firm considered contractor's class according to the Iraqi Contractors Union (ICU) classification, as shown in Table 6. This result slightly differs from that obtained by Mohamed and Majeed [38].

However Mohamed and Majeed [38] indicated that the prequalification process is ignored and denoted that only 50% of the respondents never exercise the prequalification process. In addition, they claimed that 45% of the respondents' organization always depends on ICU. The difference might due to the methodology used to gather data. Mohamed and Majeed [38] used questionnaire survey; by contrast, in the present study, data were gathered using interview.

Table 5. Demographic Background

Characteristic	Groups	Frequency	Percent	Cumulative Percent
Educational	Diploma	0	0.0	0.0
	Bachelor	10	90.9	90.9
	Master	1	9.1	100.0
	PhD	0	0.0	100.0
Age	25-29 yrs	1	9.1	9.1
	30-34 yrs	1	9.1	18.2
	35-39 yrs	5	45.5	63.6
	40-44 yrs	2	18.2	81.8
	45 + yrs	2	18.2	100.0
Occupation	Quantity Survey	1	9.1	9.1
	Project Engineer	3	27.3	36.4
	Resident/ site Engineer	2	18.2	54.5
	Head of Dep.	2	18.2	72.7
	Manager	1	9.1	81.8
	Director	2	18.2	100.0
Experience	5 - 9 yrs	1	9.1	9.1
	10 - 14 yrs	1	9.1	18.2
	15 - 19 yrs	3	27.3	45.5
	20 - 24 yrs	3	27.3	72.7
	25 + yrs	3	27.3	100.0

The result proves that the situation in Iraq does not differ from those in many developing and developed countries, such as Pakistan [23], Kuwait [39], Nigeria [40], Ghana [41], Lithuania [42],and the Netherlands [43].

Table 6. Current methods used to analyze bids

Choices	Frequency	Percent	Cumulative Percent
Lowest bid	10	99.9	99.9
Contractor's class	1	9.1	100

The interviewees provided various reasons for continuously following methods for selection of contractors, despite of its limitations. The most number of participants (72.7%) agreed that corruption is the most frequent reason for awarding incompetent contractor bids, as shown in Table 7. In fact, corruption is probable in the construction industry and may occur in any phase of construction project [44-46]. Moreover, construction has been perceived as the most corrupt industry worldwide [47]. This finding is due to the fact that the construction industry has strong competitiveness in the market and involves many stakeholders who have different psychological human behavior [45, 48]. Other participants declared that some of the contractors won tenders, regardless of their competence because of their relationships to higher authorities in the state.

Table 7. Reasons for following lowest bid selection method

Choices	Frequency	Percent	Cumulative Percent
Higher authorities Instructions	3	27.3	27.7
There are no other methods	0		27.7
Others:			
Corruption and bribery	8	72.7	100

The interviewees were asked to provide their opinions about the importance of 14 criteria were selected from the literature in view of the Iraqi environment and culture. The results of analysis are presented in Table 8. The analysis revealed that the five most important criteria are security and safety management (0.87), financial stability (0.82), past performance (0.82), relevant experience (0.80), and plant and equipment.

Similar results can be found in other countries with a situation similar to Iraq to some extent, such as Iran. Ebrahimi [49] obtained that security is of the highest order of eight criteria of Iranian contractor evaluation, then technical ability of human force and equipment. Even in some European countries, such as Lithuania [42], safety is found to be the most important criterion. The results differ from the findings of Mohamed and Majeed [38] in Iraq. In their study, safety comes in the thirteenth among the nineteen criteria for contractor evaluation. The results showed that financial situation is the most important criteria, followed by technical expertise and contractor companies on the black list. This difference can be attributed to research methodology, as explained above. In addition, Mohamed and Majeed [38] included contractors (17%) and international organizations (8%) in the sample, whereas the sample in the present study was limited to governmental participants.

In other countries, studies showed different priorities for these criteria. For example, in Saudi Arabia, Balubaid and Alamoudi [50], suggested that past performance is the most important criterion for contractor selection, followed by resources and financial capacity. Similarly, Watt et al. [51] found that past performance is the most important criterion for selection Australian contractors, followed by technical expertise, and tendered price. For Egyptian construction, Salama et al. [31] prioritized experience as the most important criterion, followed by resources then financial status. In Ghana, Enyinda et al. [41] ranked the experience as the most important criterion, followed by manpower and financial stability. Data analysis for Trivedi et al. [52] showed that the most three important criteria for selecting Indian constructers are past experience, financial turnover, and past performance.

In Nigeria, the most three prominent prequalification criteria are ability to handle the project, past performance, and type of past projects [9]. Topcu [25] proposed two stages for the selection of contractors in Turkey. At the first sage, contractors are evaluated and scored with respect to four main pre-qualification criteria: organizational expertise, ability to timely complete projects, availability of experienced technical staff, and availability of resources. At the second stage, the lowest bidder is awarded the contract. These differences confirm that the priorities

of selection criteria vary according to the circumstances of the country and justify the need for this search.

In fact, safety is a critical issue in Iraq. Contractors should assess and identify the emerging threats and manage these threats to ensure safety. Huang [53] claimed that an effective safety management helps to reduce the cost of construction and maintain the quality and productivity.

Table 8. The relative importance of contractor selection criteria

Criteria	choices	Frequency	Percent	Cumulative Percent	RII	Ranking
Security and Safety Management	Important	1	9.1	9.1	0.87	1
	Very Important	5	45.5	54.5		
	Extremely Important	5	45.5	100.0		
Financial Stability	Important	3	27.3	27.3	0.82	2
	Very Important	4	36.4	63.6		
	Extremely Important	4	36.4	100.0		
Past Performance	Important	2	18.2	18.2	0.82	3
	Very Important	6	54.5	72.7		
	Extremely Important	3	27.3	100.0		
Relevant Experience	Not important	1	9.1	9.1	0.8	4
	Important	1	9.1	18.2		
	Very Important	5	45.5	63.6		
	Extremely Important	4	36.4	100.0		
Plant and Equipment	Slightly important	1	9.1	9.1	0.78	5
	Important	3	27.3	36.4		
	Very Important	3	27.3	63.6		
	Extremely Important	4	36.4	100.0		
Quality Control system	Not important	1	9.1	9.1	0.76	6
	Slightly important	1	9.1	18.2		
	Important	2	18.2	36.4		
	Very Important	2	18.2	54.5		
	Extremely Important	5	45.5	100.0		
Reputation	Slightly important	1	9.1	9.1	0.75	7
	Important	4	36.4	45.5		
	Very important	3	27.3	72.7		
	Extremely Important	3	27.3	100.0		
Technical Ability	Slightly important	1	9.1	9.1	0.71	8
	Important	5	45.5	54.5		
	Very Important	3	27.3	81.8		
	Extremely Important	2	18.2	100.0		
Current Workload	Slightly important	1	9.1	9.1	0.69	9
	Important	5	45.5	54.5		
	Very Important	4	36.4	90.9		
	Extremely	1	9.1	100.0		

Table 8 (Continued). The relative importance of contractor selection

Criteria	Important choices	Frequency	Percent	Cumulative Percent	RII	Ranking
Qualification of Staff	Slightly important	2	18.2	18.2	0.67	10
	Important	4	36.4	54.5		
	Very important	4	36.4	90.9		
	Extremely Important	1	9.1	100.0		
Project Management Tools	Slightly important	2	18.2	18.2	0.67	11
	Important	4	36.4	54.5		
	Very important	4	36.4	90.9		
	Extremely Important	1	9.1	100.0		
Resource Availability	Slightly important	2	18.2	18.2	0.65	12
	Important	5	45.5	63.6		
	Very important	3	27.3	90.9		
	Extremely Important	1	9.1	100.0		
Maintenance System	Not important	1	9.1	9.1	0.6	13
	Slightly important	1	9.1	18.2		
	Important	6	54.5	72.7		
	Very important	3	27.3	100.0		
Environmental Management System	Slightly important	4	36.4	36.4	0.58	14
	Important	4	36.4	72.7		
	Very important	3	27.3	100.0		

5. Conclusions and Recommendations

The study showed that the bid price is still the most dominant criterion in the bid evaluation process. The main reasons for awarding bids to the incompetent contractors can be attributed to the administrative corruption and bribery. Security and safety management has perceived to be the most crucial criterion for selection contractor, followed by financial stability and past performance.

The study would inspire managers to discard the current bidding process and exert more effort to evaluate contractors by using weighted criteria to determine the tender that offers the best value.

The study is limited to investigation of the effect of contractor selection on project schedule because data fundamentally covers public construction projects under the government of Iraq. Therefore, the real costs of projects are indefinite. Further research is recommended to study the effect of tendering process on projects costs.

7. References

1. Abd- alrazak, R. (2014). "Innovation a mathematical computer modelling to tackle the retardation of construction projects in Iraq and support the economy

and development projects". Proc. of The Second Scientific National Conference for Women.Baghdad, Iraq, pp. 1-22.

2. Hatush, A.Z. and Skitmore, M.R. (1998). "Contractor selection using multi-criteria utility theory: an additive model". Building and Environment, Vol. 33, No. 2-3, pp. 105-115.
3. Hatush, Z.A. (1996) "Contractor Selection Using Multi-Attribute Utility Theory ", Ph.D. Thesis, School of Construction Management, Department of Surveying; University of Salford, Salford, UK.
4. Elsayah, O., Gupta, N., Zhang, B. et al. (2013). "Contractor Selection Using an Integrated AHP and TOPSIS Model". International Journal of Civil and Environmental Engineering, Vol. 35, No. 1, pp. 1116-1126.
5. Wong, C.H., Holt, G.D., and Harris, P. (2001). "Multi-criteria selection or lowest price? Investigation of UK construction clients' tender evaluation preferences". Engineering, Construction and Architectural Management, Vol. 8, No. 4, pp. 257-571.
6. Kozlovská, M., and Struková, Z. (2012). "Integration of Occupational Safety to Contractors` or Subcontractors` Performance Evaluation in Construction Projects". Journal of Civil Engineering, Vol. 8, No. 1, pp. 13-24.
7. Puri, D., and S.Tiwari (2014). "Evaluating The Criteria for Contractors' Selection and Bid Evaluation". International Journal of Engineering Science Invention, Vol. 3, No. 7, pp. 44-48.
8. Alhazmi, T., and McCaffer, R. (2000). "Project procurement system selection model". Journal of Construction Engineering and Management, Vol. 126, No. 3, pp. 176-184.
9. Ajayi, O.M., and Ogunsanmi, A. (2012). "Decision Maker's Perceptions on Contractor Prequaification Criteria". Interdisciplinary Journal Of Contemporary Research In Business, Vol. 4, No. 6, pp. 174-203.
10. Holt, G., Olomolaiye, P., and Harris, F. (1995). "A review of contractor selection practice in the U.K. construction industry". Building and Environment, Vol. 30, No. 4, pp. 553-561.
11. Nieto-Morote, A., and Ruz-Vila, F. (2012). "A fuzzy multi-criteria decision making model for construction contractor prequalification". Automation in Construction, Vol. 25, pp. 8-19.
12. Chaghooshi, A.J., Khanmohammadi, E., Faghei, M. et al. (2014). "Contractor Selection Using Integrated Goal Programming and Fuzzy Elevtre". International Journal of Strategic Decision Science, Vol. 5, No. 3, pp. 65-86.
13. Amin-Tahmasbi, H., Tavakkoli-Moghaddam, R., and Najafi, S.E. (2015). "Contractor Selection with a two-level DEA in Presence of Unfavorable Inputs and Undesirable Outputs". GMP Review Vol. 16, No. 2, pp. 214-225.
14. Cheng, E.W.L., and Li, H. (2004)."Contractor selection using the analytic network process". Construction Management and Economics, Vol. 22, No. 10, pp. 1021–1032.

15. Alptekin, O. (2004). "Multi-Criteria Decision Making Approach in Contractor Selection". Internatıonal Journal of Natural and Engineering Sciences, Vol. 8, No. 2, pp. 06-09.
16. Gholipour, R., Jandaghi, G., and Rajaei, R. (2014). "Contractor selection in MCDM context using fuzzy AHP". Iranian Journal of Management Studies, Vol. 7, No. 1, pp. 151- 173.
17. Al-Harbi, K.M.A.-S. (2001). "Application of the AHP in Project Management". International Journal of Project Management, Vol. 19, pp. 19-27.
18. Hatush, Z., and Skitmore, M.R. (1997). "Criteria for contractor selection". Construction Management and Economics, Vol. 15, No. 1, pp. 19-38.
19. Izadi, L., and G.Mohammadi (2013). "Group decision making process for contractor selection based on SWOT in fuzzy Environment ". International Journal of Computer and Information Technology, Vol. 2, No. 1, pp. 142-151.
20. Chaovalitwongse, W.A., Wang, W., Williams, T.P. et al. (2012). "Data Mining Framework to Optimize the Bid Selection Policy for Competitively Bid Highway Construction Projects". Journal of Construction Engineering and management, Vol. 138, No. 2, pp. 277-286.
21. Chen, V.Y.C., Lien, H.-P., Liu, C.-H. et al. (2011). "Fuzzy MCDM Approach for Selecting the Best Environment-Watershed Plan". Applied Soft Computing, Vol. 11, pp. 265-275.
22. El-Sawalhi, N., Eaton, D., and Rustom (2007). "Contractor pre-qualification model: State-of-the-art". International Journal of Project Management, Vol. 25, No. 5, pp. 456-474.
23. Khan, T.H., and Khan, A.Q. (2015). "Effects of Lowest Bidding Bid Awarding System in Public Sector Construction Projects in Pakistan". Global Journal of Management and Business Research: G Interdisciplinary, Vol. 15, No. 1, pp. 1-15.
24. Walraven, A., and de Vries, B. (2009). "From Demand Driven Contractor Selection Towards Value Driven Contractor Selection". Construction Management and Economics, Vol. 27, No. 6, pp. 597-604.
25. Topcu, Y.I. (2004). "A Decision Model Proposal for Construction Contractor Selection in Turkey ". Building and Environment, Vol. 39, pp. 469 – 481.
26. Lai, K.K., Liu, S.L., and Wang, S.Y. (2004)."A Method Used for Evaluating Bids in the Chinese Construction Industry". International Journal of Project Management, Vol. 22, pp. 193-201.
27. Wang, W.-C., Wang, H.-H., Lai, Y.-T. et al. (2006). "Unit-Brice-Based Model for Evaluating Competitive Bids". International Journal of Project Management, Vol. 24, pp. 156-166.
28. Sylla, C., Otegbeye, M., and Bolunmez, B. (2010). "A hybrid approach to construction contractors evaluation and selection". Journal of Academy of Business and Economics, Vol. 10, No. 1, pp. 167 – 181.
29. Merna, A., and Smith, N.J. (1990) "Bid Evaluation for UK Public Sector Construction Contracts". Proc. Int. conf. of The Institution of Civil Engineers, United Kingdom, Vol. 88, No. 1, pp. 91-105.
30. The State of Victoria (2013). "Investment lifecycle and High Value High Risk guidelines". Department of Treasury and Finance, Australia.

31. Salama, M., Abd El Aziz, H., Sawah, H.E. (2006) "Investigating the Criteria for Contractors' Selection and Bid Evaluation in Egypt," Proc. Of 22nd Annual ARCOM Conference, Birmingham, UK, pp. 531-540.
32. Harrell, M.C., and Bradley, M.A. (2009). " Data Collection Methods Semi-Structured Interviews and Focus Groups". RAND Corporation.
33. Englander, M. (2012). "The Interview: Data Collection in Descriptive Phenomenological Human Scientific Research". Journal of Phenomenological Psychology, Vol. 43, pp. 13-35.
34. Padhi, S.S., and Mohapatra, P.K.J. (2010). "Centralized Bid Evaluation for Awarding of Construction Projects – A Case of India Government". International Journal of Project Management, Vol. 28, pp. 275-284.
35. Sweis, G.J. (2013). "Factors Affecting Time Overruns in Public Construction Projects: The Case of Jordan". International Journal of Business and Management, Vol. 8, No. 23, pp. 120-129.
36. Shrestha, P.P., Burns, L.A., and Shields, D.R. (2013)."Magnitude of Construction Cost and Schedule Overruns in Public Work Projects". Journal of Construction Engineering and management, Vol. 2013, pp. 1-9.
37. Ismail, A.A. (2014). "Time and Cost Overruns in Public Construction Projects in Qatar". M.Sc. Thesis, Department of Engineering Management, College of Engineering, Qatar University.
38. Mohamed, S.R., and Majeed, R.A. (2016). "Pre-qualification of contractors in Iraq". Applied Research Journal, Vol. 2, No. 2, pp. 77-87.
39. Al-Reshaid, K., and Kartam, N. (2005). "Design–Build Pre-qualification and Tendering Approach for Public Projects". International Journal of Project Management Vol. 23, pp. 309-320.
40. Olatunji, O.A. (2008). "A comparative analysis of tender sums and final costs of public construction and supply projects in Nigeria". Journal of Financial Management of Property and Construction, Vol. 13, No. 1, pp. 60 – 79.
41. Enyinda, C.I., O, A., Clayton, O. (2011). "A Decision Support Model for Contractor Selection in a Government Procurement Supply Chain: Evidence from an Emerging Market". Journal of Management Policy and Practice, Vol. 12, No. 7, pp. 9-17.
42. Banaitienė, N., and Banaitis, A. (2006). "Analysis of criteria for contractors' qualification evaluation". Technological and Economic. Development of Economy, Vol. 12, No. 4, pp. 276-282.
43. Favié, R., Mass, G., Abdalla, G. (2007). "The Best Criteria for the Selection of Contractors in the Dutch Construction Industry". Proc. of the CME25: Construction Management and Economics: Past, Present and Future, UK, pp. 1-9.
44. Tabish, S.Z.S., and Jha, K.N. (Year). "Important Factors for Success of Public Construction Projects,". Proc. of 2nd International Conference on Construction and Project Management, Singapore, pp. 64-68.
45. Sohail, M., and Cavill, S. (2008). "Accountability to prevent Corruption in Construction Projects". Journal of Construction Engineering and management, Vol. 134, No. 9, pp. 729-738.
1. 46. Nawaz, F. (2010). " Programmatic approaches to address corruption in the construction sector". Research Report No.254, U4 Anti-Corruption Resource Centre, Bergen, Norway.
2. 47. Kenny, C. (2009). "Transport construction, corruption and developing countries". Transport Reviews Vol. 29, No. 1, pp. 21-41.

48. Nordin, R.M., Takim, R., and Nawawi, A.H. (2012). "Transparency Initiatives (TI) in Construction: The Social Psychology of Human Behaviours". Procedia - Social and Behavioral Sciences, Vol. 50, pp. 350 – 360.
49. Ebrahimi, A., Alimohammadlou, M., and Mohammadi, S. (2016). "Identification and prioritization of effective factors in assessment and ranking of contractors using fuzzy multi-criteria techniques ". Decision Science Letters, Vol. 5, pp. 95-108.
50. Balubaid, M., and Alamoudi, R. (2015). "Application of the Analytical Hierarchy Process (AHP) to Multi-Criteria Analysis for Contractor Selection". American Journal of Industrial and Business Management, Vol. 5, pp. 581-589.
51. Watt, D.J., Kayis, B., and Willey, K. (2010). "The Relative Importance of Tender Evaluation and Contractor Selection Criteria". International Journal of Project Management Vol. 28, pp. 51-60.
52. Trivedi, M.K., Pandey, M.K., and Bhadoria, S.S. (2011)."Prequalification of Construction Contractor using a FAHP". International Journal of Computer Applications, Vol. 28, No. 10, pp. 39-45.
53. Huang, X. (2011)." An Analysis of the Selection of Project Contractorin the Construction Management Process". International Journal of Business and Management Vol. 6, No. 3, pp. 184-189.