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Factors Affecting Contractors' Bidding Decisions for Construction Projects in Saudi Arabia

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Abstract: One of the critical decisions taken by contractors is whether or not to bid for a project. This is due to the complexity and uncertainty surrounding this decision, which is influenced by many factors. Given the above challenge, this study aimed to uncover the critical factors affecting the contractors' bidding decisions in Saudi Arabia-based construction projects. A questionnaire survey, which consisted of 31 factors, was distributed to first-, second- and third-grade contractors. In total, 67 responses were obtained. Median and relative importance index (RII) techniques were adopted for ranking the most critical factors. Based on the received responses, the top six critical factors were "size of the job", "type of the job", "company's strength in the industry", "designer/design quality", "rate of return", and "project cash flow". The least significant factors were "job start time" and "labor environment (union/nonunion/cooperative)". The findings of this study show a level of agreement among all contractors about the critical factors. The findings would benefit contractors and subcontractors by increasing their understanding of the major factors affecting the bidding decision process. Contractors armed with such valuable information will be better able to enhance their bidding decision-making process in terms of efficiency and effectiveness.

Keywords: bidding decision; contractors; Saudi Arabia; construction industry; factors

1. Introduction

A contractor can secure a job in two possible ways. There is direct negotiation with either the client, or the client's representative, and there is bidding [1]. The bidding decision is a vital activity that contractors have to engage in, on a regular basis [2]. Assuming a decision is made to bid, the process of preparing a bid package demands considerable time and resources [3]. Owing to this fact, contractors have to weigh the benefits and costs of preparing a bid. The bidding process is highly complex and unsystematic, requiring numerous factors to be considered simultaneously [3–6]. Factors may be internal or external [7] and may pertain to the unique features of a project and the dynamic changing nature of construction [3]. Added to this already complex situation is the fact that these factors have a high degree of complicated interrelations [8]. In addition, considering these factors in a limited time period presents another constraint [9]. This makes the process of considering all these factors practically impossible for the decision maker [10]. Nevertheless, the bidding decision can have significant impact on the daily operation as well as the long-term performance of a contractor [4]. The bidding decision, which is the first step in undertaking a project, constitutes a strategic decision for any construction company [11]. This decision plays a determining role in both the survival and

prosperity of the contractor [12]. Given the high number of competitors nowadays, the successful execution of the bidding process is very crucial. In developing countries, many medium and small construction companies discontinue within the initial five years of their establishment [13].

In Saudi Arabia, it is customary for each contractor to obtain a classification certificate, depending on size of contractor, which is mandatory for bidding on governmental projects. One of the primary purposes for the enforcement of the classification system is to ensure that contractors bid for projects that match their capacities [14]. Usually, the bidding process entails two important decisions, namely, the decision to bid, and bid price determination [1]. The first decision, whether or not the contractor wants to bid for a specific project, presents the contractor with a dilemma. In particular, a decision of not to bid might translate to an opportunity loss. This opportunity loss could be in the form of failing to leverage the chance to generate profit, enhance the contractor's position in the industry, and establish a working relationship with the client, among other opportunities [15]. On the other hand, a decision to bid will require the contractor to prepare estimates for the direct and indirect costs associated with the project [1]. If the contractor bids for an inappropriate project, significant financial losses could follow which may, in the worst case, lead to a discontinuation of the contractor [15]. The second decision is the determination of the bid price. For example, in the cost plus markup pricing, the contractor prepares the estimate for the direct and indirect cost of the labor, materials, and equipment that will be used in the project. Then, the contractor will add a percentage to cover contingency, office overhead, and profit [1,16].

The findings of this study will benefit both the industry and the research community. With respect to the industry, contractors would gain an increased understanding of the major factors affecting the bidding decision process. Contractors in possession of this information will be better positioned to make more informed bidding decisions, taking into account the most critical factors. This should pave the way to a more efficient and effective bidding process. In addition, this will further help them in selecting projects that match their capacities, leading to higher profits and better performance, in addition to avoiding the possibility of losses from ill-advised decisions. With respect to the research community, the findings will provide valuable information for creating more realistic decision models, which consider the context and the size of the contractors as key variables. The objective of this study, therefore, is to identify and assess the main factors affecting contractors' bidding decisions for construction projects in Saudi Arabia.

2. Research Methodology

The research methodology adopted in this study consisted of the following activities:

- Reviewing previous studies to identify the main factors influencing contractors' bid/no-bid decisions.
- Developing a questionnaire survey to assess the level of importance of the identified factors. The questionnaire survey consisted of two main sections. The first section served to obtain general background information related to the respondents and their respective companies, such as position, years of working experience, educational qualification background, number of employees, and size of projects. The second section, constituting the main part of the questionnaire survey, sought to obtain the respondent's perception of the identified factors, with respect to the extent to which these factors influenced the bidding decision. The respondents were solicited to provide their evaluation of the factors. The questionnaire survey employed to evaluate the factors was a 5-point Likert scale, where 1 represents "insignificant" and 5 represents "extremely significant".
- Distributing the questionnaire survey to contractors based in the Eastern Province of Saudi Arabia. The sample population consisted of professionals working for contractors and subcontractors classified under first, second and third grade. A total of 67 responses were obtained.
- Collecting and tabulating the responses to determine the relative importance index (RII) of these factors based on the ratings given by the contractors, and hence their ranking.

- Developing conclusions and providing recommendations based on the findings of the study.

3. Literature Review

The literature abounds with previous studies that have addressed the topic of bidding strategies. Many of these studies have attempted to identify the main factors affecting the contractors' bidding decisions. In Nigeria, Oyeyipo et al. [17] conducted a study to identify the main factors influencing contractors' bidding decisions in construction projects. Based on the findings of the study, the most significant factors affecting the bid/no-bid decision were "financial capability of clients", "availability of capital", and "availability of material".

In the UK, Shash [1] conducted a study to identify the factors affecting the bidding and markup decisions of contractors. The study identified 55 factors affecting the decision maker throughout the bidding process. Of the 55 factors, three factors were ranked most significant, namely, "the need for work", "number of competitors tendering", and "amount of experience on such projects". Furthermore, it was observed that a majority of the contractors based their decision of bidding and markup size on subjective assessments.

In the US, Ahmad and Minkarah [16] conducted a study that aimed to identify the factors affecting the contractors' bidding decisions. The study identified 31 factors. It was concluded that the bidding process was greatly affected by subjective decisions such as "type of job", "size of job", "the need for work", "owner", "historic profit", "degree of hazard", and "location". However, despite the importance of "profitability" and "competition", they were not ranked among the top factors.

In China, Chen et al. [18] looked at how a contractor's "risk perception and risk propensity" influenced the bidding decision. It was found that there existed a significant negative relationship between "risk perception" of the decision maker and the decision to bid. On the other hand, there existed a significant positive relationship between "risk propensity" of the decision maker and the decision to bid. "Risk perception and risk propensity" were affected by the decision makers' past experiences in the outcome of their decisions.

In Australia, Fayek et al. [19] conducted a questionnaire survey to investigate the bidding practices adopted by Australian contractors. The results of the survey showed that the five most important factors affecting the bidding decisions were "project type", "availability of resources and people", "experience", "need for work", and "location of project". Further, based on the results, it was found that most of the bidding practices were subjective and relied on experienced-based judgment. Moreover, the assessment of competitors was always performed in an informal manner, without any objective references to historical data.

In Canada, Fayek et al. [5] identified 118 factors affecting the bidding decision. These factors were grouped under 12 categories. In this study, the bidding decision comprised four elements of bidding, including "the decision to bid", "the risk allowance", "the opportunity allowance", and "the markup size". The findings of the study indicated that the five most significant factors were "type of project", "potential profit from project", "experience on similar projects", "familiarity with market", and "size of project".

In Saudi Arabia, Bageis and Fortune [14] found the most significant factors influencing the bidding decision to be "the client financial capacity", "prompt payment habit of the client", "the project payment system", "clarity of the work and specifications", and "project cash flow".

In Qatar, Jarkas et al. [11] conducted a study that identified ten critical factors, including "previous experience with the employer", "the need for work", "current workload", "past experience in similar projects", "the size of project", "reputation and identity of the employer in the industry", "employer financial stability", "availability of other projects", "the swiftness of the employer in the payment process", and "the quality level of tender documents".

In Palestine, Enshassi et al. [20] investigated factors affecting the bidders' decisions to bid or not. Overall, 78 factors were identified from a literature review. These factors were ranked according to their degree of impact on the contractors' decisions. It was concluded that the most critical factors

were “contractors’ financial capability”, “owners’ financial capability”, “the project values (financial)”, “the due date of the payments”, “the availability of construction materials in local markets”, and “the stability of the construction industry”.

Another study by Shokri-Ghasabeh and Chileshe [21] in Australia determined that the highly significant factors influencing the bid/no-bid decision were “client financial capability”, “project risk”, and “project future benefits, profitability, and number of competitors/bidders”. The least significant factors, on the other hand, were “contractors’ financial situation”, “project duration” and “contractors’ material availability”.

On the basis of the above review of the literature it can be concluded that the critical factors affecting contractors’ bidding decisions in construction projects share similarities in several aspects, such as “the need for work”, “experience”, “location”, “type of job”, “size of job” and “location”.

4. Assessment of Factors Influencing Decision to Bid

After in-depth review of the literature, the list of factors identified by Ahmed and Minkarah [16] was viewed to be both comprehensive and mostly covering the significant factors identified in several of the reviewed previous studies. Therefore, it was the viewpoint of the authors that the factors presented in the above study were deemed to be suitable in the context of Saudi Arabia. Thus, the study adopted a set of 31 factors influencing the decision to bid from the questionnaire survey developed by Ahmad and Minkarah [16].

These factors were grouped under four different groups, namely: “project characteristics”, “market characteristics”, “contractor characteristics”, and “owner/designer/labor characteristics”. These 31 factors were then included in a questionnaire survey that was distributed to practicing contractors, with different classifications in the Eastern Province of Saudi Arabia. In order to determine the rank of these factors based on ratings given by the contractors, the relative importance index (RII) technique was adopted [22–24]. The formula used to compute the RII for each factor is shown below:

$$RII(\%) = \frac{5(n_5) + 4(n_4) + 3(n_3) + 2(n_2) + n_1}{5N} \times 100 \quad (1)$$

where n_1 , n_2 , n_3 , n_4 and n_5 denote the number of respondents who selected 1, representing “not important”; 2, representing “slightly important”; 3, representing “important”; 4, representing “highly important”; and 5, representing “extremely important”, respectively. N denotes the total number of responses received.

4.1. Sample Size

The Saudi Arabian Ministry of Municipal and Rural Affairs (MOMRA) [25] maintains a detailed record of all contractors practicing in a given region of the Kingdom. This record contains valuable information such as contractor firms’ statuses, names, addresses, degrees of classification and specialty. Recent records indicate that there are 400 registered contractors in the Eastern Province. The size of the sample was determined for contractors classified under the first (contractors allowed to undertake building projects with maximum value exceeding 200 million SAR), second (contractors allowed to undertake building projects with maximum value ranging from more than 50 to 200 million SAR), and third (contractors allowed to undertake building projects with maximum value ranging from more than 15 to 50 million SAR) grades only. Based on the record from MOMRA, the number of contractors’ firms classified under the first, second and third grades are 50, 41 and 77, respectively. This amounts to a total of 168 contractors. Employing the Kish formula [26,27], the appropriate sample size was computed to be 63 contractors. A total of 67 responses were obtained.

4.2. Profile of the Respondents

The distribution of the respondents' positions indicated that 22% occupied senior managerial positions. Thirty percent occupied engineering managerial positions. Another 30% occupied engineering positions. The remainder of the respondents occupied other positions.

The distribution of the levels of education of the respondents indicated that 72% were holders of Bachelor of Science degrees, 25% were holders of higher degrees, and 3% of the respondents were holders of diplomas.

The distribution of the respondents' years of working experience indicated that 20.9% had less than 5 years of experience, 26.9% had between 5 and 10 years of experience, 20.9% had between 11 and 14 years of experience, 13.4% had between 15 and 20 years of experience, and 17.9% of the respondents had more than 20 years of experience. This distribution illustrates the reliability of the responses to the questionnaire survey, whereby the majority (52.2%) of the respondents have more than 10 years of working experience.

The distribution of project types that the respondents were involved in indicated that 58% were involved in building construction projects, 19% were involved in infrastructure projects, 15% were involved in specialized industrial projects, and the remaining 8% were involved in other projects.

5. Findings and Discussion

Table 1 presents the ranking of the 31 factors, arranged according to their respective categories. In addition, the rankings of the various grades of contractors are also presented in the same table. Table 2 presents the overall ranking of the factors arranged in descending order. The six most important factors according to the respondents were "size of the job", "type of the job", "company's strength in the industry", "designer/design quality", "rate of return", and "project cash flow". The last three factors had the same RII and were thus all ranked four. It is interesting to note that these factors primarily come under the project characteristics category. In other words, the most important factors influencing the contractors' bidding decisions, regardless of size, are related to the project characteristics. The findings of this study to some extent agree with that of Fayek et al. [19], in Australia, where it was found that "project type" (corresponding to "type of the job"), "availability of resources and people" (corresponding to "type and number of laborers"), "need for work", and "location of project" (corresponding to "location of the project") were significant. In the present study, "type of the job" was ranked second, in line with this previous study. "Type and number of laborers", "need for work", and "location of the project", on the other hand, were ranked twentieth, twelfth and twenty-fifth, respectively. The findings concur with those of Fayek et al. [5], where "type of project" (corresponding to "type of the job"), "potential profit from project" (corresponding to "rate of return"), and "experience on similar projects" (corresponding to "company's strength in the industry") were among the most significant factors. These findings also agree with a similar study in Saudi Arabia conducted by Bageis and Fortune [14]. In particular, "clarity of the work and specifications" (corresponding to "designer/design quality") and "project cash flow" (corresponding to "project cash flow") were two significant factors. The overall findings of the present study differ from the findings of Oyeyipo et al. [17], conducted in Nigeria, where "availability of capital" was among the most significant factors. By contrast, this factor was ranked nineteenth in the present study. It appears that since Saudi Arabia is a more developed nation, coupled with the relatively large-size contractors who participated in the present study, capital does not represent a significant impediment. The results also disagree with that of Shash [1], in the UK, where "the need for work" (corresponding to "need for work") and "number of competitors tendering" (corresponding to "competition") were the most significant factors. Conversely, the present study found these factors to be ranked twelfth and seventh, respectively. The findings, although agreeing with two of the significant factors, are largely opposed to those of Ahmad and Minkarah [16], in the US. In particular, it was revealed that the major factors influencing the bidding process were "type of job", "size of job", "the need for work", "owner", "historic profit", "degree of hazard", and "location". The present study agreed with the first two factors

ranking them second and first, respectively. However, the remaining factors were ranked twelfth, twenty-third, twelfth, twenty-second and twenty-fifth, respectively. On the basis of the ranking, the least significant factors were “job-related contingency”, “portion of the work to be subcontracted”, “tax liabilities”, “job start time”, and “labor environment (union/nonunion/cooperative)”. For “job-related contingency”, since contingency cost is estimated as a percentage of the overall project cost, and is thus not subject to variation/uncertainty, it is not expected to impact contractors’ decisions to bid. With respect to “portion of the work to be subcontracted”, it is common practice for contractors to subcontract specialized portions of the project to subcontractors. However, despite the prevalence of the practice, subcontracting has minimal impact on the contractors’ decision to bid. There are two possible explanations for this situation. Firstly, because there are a limited number of well-known subcontractors for performing specialized work in the market, in many cases clients will suggest a short list of subcontractors to select from. Secondly, contractors receive quotations from prospective subcontractors prior to bidding. Thus, in these cases contractors possess information relating to how much expenses will be allocated for reimbursing subcontractors. This cost will then be factored into the bid. In relation to “tax liabilities”, because the value of tax liabilities is fixed, contractors are able to consider this figure and factor it into their bids. In terms of “job start time”, if the start time of a project does not affect the duration of the project, it will not have an impact on the estimated cost of the project and will therefore not affect the decision to bid. This is because all associated costs largely depend on the duration of the project and not the starting time. For example, rent, heavy equipment and manpower costs are a function of the project’s duration. Finally, “labor environment” appeared as the least significant factor possibly because labor unions are not effective. As a result, contractors will not assign much weight to this factor.

It can be concluded from the above results that contractors’ decisions to bid or not to bid are strongly influenced by the degree of cost uncertainty. The more uncertainty surrounding the determination of a project’s cost, the more likely it will affect the contractors’ decision to bid.

Table 1. Overall, third-grade, second-grade and first-grade contractors: RII and rank of factors affecting bidding decisions.

No.	Factors Affect Bidding Decision	Overall (N = 67)		Third-Grade Contractor (N = 26)		Second-Grade Contractor (N = 10)		First-Grade Contractor (N = 31)	
		RII	Rank	RII	Rank	RII	Rank	RII	Rank
Project Characteristics									
1.	Size of the job	78.8	1	80.8	2	82	1	76.1	6
2.	Type of the job	77.3	2	81.5	1	68	10	76.8	3
3.	Location of the project	64.5	25	66.9	17	60	19	63.9	26
4.	Duration	69.9	12	71.5	8	74	5	67.1	22
5.	Historic profit on similar jobs	69.9	12	71.5	8	60	19	71.6	14
6.	Job start time	60.6	30	56.154	31	64	15	63.2	27
7.	Degree of difficulty	71.9	8	73.1	5	62	17	73.5	11
8.	Degree of hazards	66	22	67.7	14	52	26	69	19
9.	Project cash flow	73.1	4	72.3	6	70	7	74.8	9
10.	Rate of return	73.1	4	65.4	21	82	1	76.8	3
Market Characteristics									
11.	Competition	72.5	7	72.3	6	68	10	74.2	10
12.	Overall economy (availability of work)	70.1	11	62.3	28	70	7	76.8	3
13.	Time of bidding (season)	69	18	65.4	21	64	15	73.5	11
14.	Risk involved in the investment	71.6	9	63.8	25	78	3	76.1	6
15.	Tax liabilities	60.9	29	61.5	29	60	19	60.6	29

Table 1. Cont.

No.	Factors Affect Bidding Decision	Overall (N = 67)		Third-Grade Contractor (N = 26)		Second-Grade Contractor (N = 10)		First-Grade Contractor (N = 31)	
		RII	Rank	RII	Rank	RII	Rank	RII	Rank
Contractor Characteristics									
16.	Need for work	69.9	12	66.9	17	52	26	78.1	2
17.	Current workload	69.3	17	66.9	17	56	25	75.5	8
18.	Confidence in your workforce	71.6	9	73.8	4	66	13	71.6	14
19.	Type and number of supervisory persons required /available	64.8	24	65.4	21	50	29	69	19
20.	Type and number of laborers	66.6	20	71.5	8	52	26	67.1	22
21.	Type and number of equipment required /available	63.9	26	67.7	14	46	31	66.5	25
22.	Portion of the work to be subcontracted	61.5	28	63.1	27	60	19	60.6	29
23.	Reliability of subcontractors	69.9	12	69.2	12	66	13	71.6	14
24.	Company’s strength in the industry	77	3	71.5	8	76	4	81.9	1
25.	General (office) overhead	66.6	20	67.7	14	58	24	68.4	21
26.	Uncertainty of the estimate	69.9	12	68.5	13	72	6	70.3	17
27.	Capital requirement /availability	67.5	19	64.6	24	68	10	69.7	18
28.	Job-related contingency	63.6	27	66.2	20	60	19	62.6	28
Owner/designer/labor Characteristics									
29.	Previous experience with owner	65.1	23	63.8	25	62	17	67.1	22
30.	Designer /design quality	73.1	4	74.6	3	70	7	72.9	13
31.	Labor environment (union /nonunion /cooperative)	57.3	31	57.7	30	48	30	60	31

Note: RII: relative importance index.

Table 2. Factors arranged according to their respective ranks.

No.	Factor	RII	OR (N = 67)
1	Size of the job	78.8	1
2	Type of the job	77.3	2
24	Company's strength in the industry	77	3
9	Project cash flow	73.1	4
10	Rate of return	73.1	4
30	Designer/design quality	73.1	4
11	Competition	72.5	7
7	Degree of difficulty	71.9	8
14	Risk involved in the investment	71.6	9
18	Confidence in the workforce	71.6	9
12	Overall economy (availability of work)	70.1	11
4	Duration	69.9	12
5	Historic profit on similar jobs	69.9	12
16	Need for work	69.9	12
23	Reliability of subcontractors	69.9	12
26	Uncertainty of the estimate	69.9	12
17	Current workload	69.3	17
13	Time of bidding (season)	69	18
27	Capital requirement/availability	67.5	19
20	Type and number of laborers	66.6	20
25	General (office) overhead	66.6	20
8	Degree of hazards	66	22
29	Previous experience with owner	65.1	23
19	Type and number of supervisory persons required/available	64.8	24
3	Location of the project	64.5	25
21	Type and number of equipment required/available	63.9	26
28	Job-related contingency	63.6	27
22	Portion of the work to be subcontracted	61.5	28
15	Tax liabilities	60.9	29
6	Job start time	60.6	30
31	Labor environment (union/nonunion/cooperative)	57.3	31

Note: RII: relative importance index; OR: overall ranking.

With respect to the assessment of the factors based on contractor size, for the third-grade contractors, the factor “type of the job” was the most important, with an RII of 81.53. A possible explanation for this result might be because third-grade contractors are less flexible in selecting work as they are highly specialized. In addition, based on the classification system, these contractors are restricted from bidding for projects that exceed a certain value. Thus, the type of work becomes a major influence in the decision to bid. For the second-grade contractors, the factors “size of the job” and “rate of return” were most important, with an RII of 82. It is likely that second-grade contractors assign a high priority to expanding their business, and thus focus more on the capacity of a project to generate a healthy income. Finally, for the first-grade contractors, the factor “company’s strength in the industry” was the most important, with an RII of 81.94. This seems to suggest that as contractors grow, their expertise in the industry becomes a decisive factor in their decision to bid. Furthermore, these contractors may be concerned with maintaining their classification status, which among other factors, depends on the number of completed and ongoing projects [14].

Table 3 presents the RII values of the four categories. For the third-grade contractors, the category “contractor characteristics” was found to be the most important category influencing the contractors’ bidding decisions. This indicates that third-grade contractors are highly sensitive to internal factors. This could be attributed to their limited capital, resources, and lack of experience in the market. This also supports the previous observation where it was noted that the type of job was a principal factor in their decision to bid. More specifically, because these contractors have many internal constraints, the type of job greatly affects their decision to bid. The findings agree with those of Ma [28], where “experience and familiarity of your firm with this specific type of work” and “current financial situation of the company” were among the most important factors reported by third-grade contractors. On the other hand, for both the second-grade and first-grade contractors, the category “market characteristics” was found to be the most important category influencing the contractors’ bidding decisions. Once a contractor has become established, internal factors become relatively less important in comparison to external factors, such as the economy and competition.

Table 3. Overall, third-grade, second-grade and first-grade contractors’ RII values and ranks of categories affecting bidding decisions.

Category Affecting Bidding Decision	Overall		Third-Grade Contractor		Second-Grade Contractor		First-Grade Contractor	
	RII	Rank	RII	Rank	RII	Rank	RII	Rank
Project Characteristics	70.51	1	65.077	3	61	2	64.97	4
Market Characteristics	68.84	2	65.077	3	68	1	72.26	1
Contractor Characteristics	67.83	3	67.93	1	60.15	3	70.22	2
Owner/designer/labor Characteristics	65.17	4	65.38	2	60	4	66.67	3

Note: RII: relative importance index.

6. Test of Agreement

The rankings of the factors by the different contractor grades were tested for agreement using the Spearman’s rank correlation coefficient (r_s). The Spearman rank correlation coefficient (r_s) was computed by using the following formula:

$$r_s = 1 - \frac{\sum_1^{31} d_i^2}{n(n^2 - 1)} \quad (2)$$

where r_s denotes the Spearman’s rank correlation coefficient; d_i^2 denotes rank difference between the two variables for each factor; and n denotes the total number of factors in one set of variables (31 factors in this case). The Spearman rank correlation coefficient value ranges from -1 to $+1$, representing strong disagreement and strong agreement, respectively.

The test yielded a 57% correlation between second- and first-grade contractors, 42% correlation between third- and first-grade contractors, and 30% correlation between third- and second-grade contractors. Although the result of this test indicates a positive correlation among all parties, the correlation was not strong, with the highest score being 57%. Nevertheless, the results show a level of agreement among the different grades of contractors in terms of the ranking of the most important factors affecting the bidding decision.

7. Conclusions and Recommendations

In conclusion, the factors affecting the contractors' bidding decisions for construction projects in Saudi Arabia were investigated, taking the Eastern Province as a case study. 31 factors were identified from a review of the literature in this field. These factors were categorized into four main groups, namely, "project characteristics", "market characteristics", "contractor characteristics", and "owner/designer/labor characteristics". The questionnaire survey was answered by 67 respondents, working in contractor organizations in the Eastern Province of Saudi Arabia. The results indicated that the top six most important factors were: "size of the job", "type of the job", "company's strength in the industry", "designer/design quality", "rate of return", and "project cash flow". The latter three factors received equal weights (i.e., 73.1%) and were thus all ranked four, explaining the appearance of six factors as the top five factors.

The most important factor for each grade of contractors was determined. Among the four main groups under which the factors are categorized, the respondents identified that the "project characteristics" group of factors was the most important group, followed by "market characteristics", "contractor characteristics", and "owner/designer/labor characteristics" groups, respectively. The Spearman's rank correlation coefficient indicated a positive correlation among all parties. The largest agreement (57%) was between second- and first-grade contractors. The lowest agreement (30%) was between third- and second-grade contractors. The study recommends the following measures to improve the bidding process:

- Among the five most important factors identified by the respondents, a majority of them belonged to the "project characteristics" category. Some of the contractors who participated in the study recommended allocating adequate time for examining the project characteristics before a decision is made to bid for a particular project. Such characteristics should cover the type, size, and difficulty of the project. These aspects should be measured against the company's capability and area of specialty. Adopting such a practice would ensure that more projects undertaken by the contractors are successful.
- One of the top five most important factors was "designer/design quality", which was ranked fifth. One way of tackling this issue is through increasing the awareness of the significance of applying the constructability concept. This can be achieved through selecting a project delivery method, which integrates the design and contractor team. Examples of project delivery methods that foster this integration include design-build-operate-transfer (DBOT); design-build (DB); and engineering, procurement and construction (EPC). This will facilitate the early involvement of the contractors during the design stage. The value of this approach is that it allows the incorporation of the contractor's construction experience at an early stage of the project. This should lead to better design quality [29,30].
- Some of the respondents suggested adding other factors to be investigated in future studies, such as "progress payments", "clear information and details about project", "specifications required and weather conditions", "involvement of all departments of companies", "current market conditions" and "contractor's previous experience with other competitors and other projects".

The findings of this study would increase the knowledge of contractors to understand the factors affecting bidding decisions in several ways. By improving their bidding decision process,

the contractors' effectiveness will be enhanced. In addition, this will further aid them in selecting the appropriate project, resulting in better performance and higher profits.

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References

1. Shash, A.A. Factors considered in tendering decisions by top UK contractors. *Constr. Manag. Econ.* **1993**, *11*, 111–118. [\[CrossRef\]](#)
2. El-Mashaleh, M.S. Decision to bid or not to bid: A data envelopment analysis approach. *Can. J. Civ. Eng.* **2010**, *37*, 37–44. [\[CrossRef\]](#)
3. Ravanshadnia, M.; Rajaie, H.; Abbasian, H.R. A comprehensive bid/no-bid decision making framework for construction companies. *Iran. J. Sci. Technol. Trans. Civ. Environ. Eng.* **2011**, *35*, 95–103.
4. Ahmad, I. Decision-support system for modeling bid/no-bid decision problem. *J. Constr. Eng. Manag.* **1990**, *116*, 595–608. [\[CrossRef\]](#)
5. Fayek, A.; Ghoshal, I.; AbouRizk, S. A survey of bidding practices of Canadian civil engineering construction contractors. *Can. J. Civ. Eng.* **1999**, *26*, 13–25. [\[CrossRef\]](#)
6. Chua, D.K.H.; Li, D. Key factors in bid reasoning model. *J. Constr. Eng. Manag.* **2000**, *126*, 46–57. [\[CrossRef\]](#)
7. Chisala, M.L. Quantitative bid or no-bid decision-support model for contractors. *J. Constr. Eng. Manag.* **2017**, *143*, 4017088. [\[CrossRef\]](#)
8. Chua, D.K.H.; Li, D.Z.; Chan, W.T. Case-based reasoning approach in bid decision making. *J. Constr. Eng. Manag.* **2001**, *127*, 35–45. [\[CrossRef\]](#)
9. Olatunji, O.A.; Aje, O.I.; Makanjuola, S. Bid or no-bid decision factors of indigenous contractors in Nigeria. *Eng. Constr. Archit. Manag.* **2017**, *24*, 378–392. [\[CrossRef\]](#)
10. Deng, P. Using case-based reasoning for decision support. In Proceedings of the Twenty-Seventh Hawaii International Conference on System Sciences, Wailea, HI, USA, 4–7 January 1994; IEEE: Piscataway, NJ, USA, 1994; Volume 4, pp. 552–561. [\[CrossRef\]](#)
11. Jarkas, A.M.; Mubarak, S.A.; Kadri, C.Y. Critical factors determining bid/no bid decisions of contractors in Qatar. *J. Manag. Eng.* **2013**, *30*, 05014007. [\[CrossRef\]](#)
12. Yan, P.; Liu, J.; Skitmore, M. Individual, group, and organizational factors affecting group bidding decisions for construction projects. *Adv. Civ. Eng.* **2018**, *3690302*, 1–10. [\[CrossRef\]](#)
13. Aje, I.O.; Oladinrin, T.O.; Nwaole, A.N.C. Factors influencing success rate of contractors in competitive bidding for construction works in South-East, Nigeria. *J. Constr. Dev. Ctries.* **2016**, *21*, 19–34. [\[CrossRef\]](#)
14. Bageis, A.S.; Fortune, C. Factors affecting the bid/no bid decision in the Saudi Arabian construction contractors. *Constr. Manag. Econ.* **2009**, *27*, 53–71. [\[CrossRef\]](#)
15. Bagies, A.; Fortune, C. Bid/no-bid decision modelling for construction projects. In Proceedings of the 22nd Annual ARCOM Conference, Birmingham, UK, 4–6 September 2006; pp. 511–521.
16. Ahmad, I.; Minkarah, I. Questionnaire survey on bidding in construction. *J. Manag. Eng.* **1988**, *4*, 229–243. [\[CrossRef\]](#)
17. Oyeyipo, O.; Odusami, K.T.; Ojelabi, R.A.; Afolabi, A.O. Factors affecting contractors' bidding decisions for construction projects in Nigeria. *J. Constr. Dev. Ctries.* **2016**, *21*, 21–35. [\[CrossRef\]](#)
18. Chen, Y.Q.; Zhang, S.J.; Liu, L.S.; Hu, J. Risk perception and propensity in bid/no-bid decision-making of construction projects. *Eng. Constr. Archit. Manag.* **2015**, *22*, 2–20. [\[CrossRef\]](#)
19. Fayek, A.; Young, D.M.; Duffield, C.F. A survey of tendering practices in the Australian construction industry. *Environ. Eng. Manag. J.* **1998**, *10*, 29–34. [\[CrossRef\]](#)
20. Enshassi, A.; Mohamed, S.; El Karriri, A.A. Factors affecting the bid/no bid decision in the Palestinian construction industry. *J. Financ. Manag. Prop. Constr.* **2010**, *15*, 118–142. [\[CrossRef\]](#)

21. Shokri-Ghasabeh, M.; Chileshe, N. Critical factors influencing the bid/no bid decision in the Australian construction industry. *Constr. Innov.* **2016**, *16*, 127–157. [[CrossRef](#)]
22. Kometa, S.; Olomolaiye, P.; Harris, F. Attributes of UK construction clients influencing project consultants' performance. *Constr. Manag. Econ.* **1994**, *12*, 433–443. [[CrossRef](#)]
23. Kumaraswamy, M.; Chan, D. Determinants of construction duration. *Constr. Manag. Econ.* **1995**, *13*, 209–217. [[CrossRef](#)]
24. Fugar, F.; Agyakwah-Baah, A. Delays in building construction projects in Ghana. *Constr. Econ. Build.* **2010**, *10*, 103–116. [[CrossRef](#)]
25. Ministry of Municipal and Rural Affairs (MOMRA). Contractor Classification, Riyadh, Saudi Arabia. Available online: <https://contractors.momra.gov.sa/listofclassifieddefaultnewaj.aspx> (accessed on 16 October 2017).
26. Kish, L. *Survey Sampling*; Wiley: New York, NY, USA, 1965.
27. Shash, A.A.; Abdul-Hadi, N.H. The effect of contractor size on mark-up size decision in Saudi Arabia. *Constr. Manag. Econ.* **1993**, *11*, 421–429. [[CrossRef](#)]
28. Ma, H. Factors affecting the bid/no bid decision-making process of small to medium size contractors in Auckland. Master's Thesis, Unitec Institute of Technology, Auckland, New Zealand, November 2011.
29. Song, L.; Mohamed, Y.; AbouRizk, S. Early contractor involvement in design and its impact on construction schedule performance. *J. Manag. Eng.* **2009**, *25*, 12–20. [[CrossRef](#)]
30. Iyer, K.; Sagheer, M. Optimization of bid-winning potential and capital structure for build-operate-transfer road projects in India. *J. Manag. Eng.* **2012**, *28*, 104–113. [[CrossRef](#)]



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