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Exploring Factors Affecting Bidding Decision of Construction Firms in The New Era of Construction Industry in Egypt

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ABSTRACT Construction industry, like any other sector, is a profitable business and plays a significant role in a country's economy. Therefore, it is crucial to adopt a realistic bidding strategy with a systematic approach which covers all aspects that may affect the bidding decision rather than depending only on experience that may miss valuable factors and their impact on the taken decision. The goal of this research is to help contractors to make the most suitable decision with minimum risk between the alternatives in the Egyptian market by the following:

1- Exploring, investigating, and analyzing the critical factors affecting the biding decision for the construction firms in the Egyptian construction industry.
2- Ranking different factors based on the importance level provided by experienced people in the tendering process.
3- Developing a decision-making tool to assist construction firms in bidding stage to quantify the risk and take the most suitable decision.

To achieve the research objective, after investigating the previous studies, a questionnaire was distributed among construction firms in Egypt. The findings revealed that the most significant factors influencing bidding decisions were "Size of the project" and "Type of the project". On the other hand, factors such as "Public opinion of the project" and "Government approvals required" were ranked as lower priority. After ranking all the factors with its RII, a decision matrix analysis developed to help the construction firms in taking the proper bidding decision which serve their goals, align with their vision and respect the market conditions.

Keywords: Construction industry, Bid/No-bid decision, Contractors' firm

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1. Introduction

Globally, the construction industry has continued to play significant and critical role in economies of both developed and developing nations. In Egypt, the new era of the construction industry refers to the last decade (2013-2022), during which both the state and private sector have increasingly focused on the construction industry as a key driver of development, playing a crucial and foundational role in the Egyptian economy. According to Ministry of planning in Egypt, GDP from Construction in Egypt reached 345,213.39 EGP Million in the fourth quarter of 2022.

The following chart illustrates the significant growth in the construction industry for each quarter, particularly from 2013 to 2022, and compares it to the preceding decade.

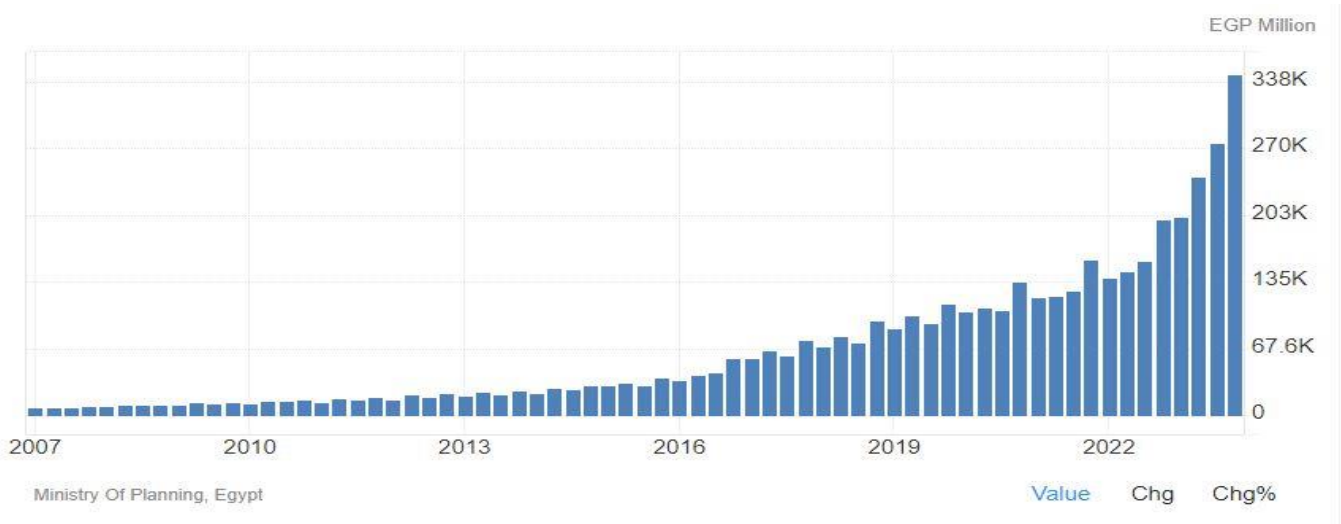


Figure 1. The significant growth in the construction industry from 2007 to 2022

As shown, GDP from Construction in Egypt averaged 65,902.08 EGP Million from 2007 until 2022, reaching an all-time high of 345,213.39 EGP Million in the fourth quarter of 2022 from 7,307.30 EGP Million in the first quarter of 2007. While this orientation towards construction has created an exciting opportunity for the contracting sector to thrive, it is important to acknowledge that the construction industry is inherently uncertain [1, 2].

In competitive bidding, deciding whether to participate is a crucial choice for construction companies. Since many projects come from bids and contractors only award a small percentage of the bids they submit, the decision-making process can be complex and challenging [3, 4].

Decision-making under risk is common in this industry, and factors such as market fluctuations and project complexities can contribute to this uncertainty [5, 6]. The decision of whether to bid or not to bid for construction projects is a critical and primary task that significantly impacts the success of a project. It is a strategic decision that plays a crucial role in the survival and prosperity of contractors in the construction industry [7,8]. Therefore, the aim of this study is firstly, to identify the crucial factors that impact contractors' decision to bid or not to bid in the Egyptian context, secondly, to rank these critical factors and identify its degree of importance and after that to develop a decision-making tool to help the construction firms in taking the proper bidding decision. The study is limited to the construction sector in Egypt and the objective is to assist construction firms in making well-informed

decisions regarding whether to bid or not for a project and to aid them in selecting the most suitable project from among available alternatives.

2. Problem Statement

The decision-making process for entering or abstaining from tender bids is a critical challenge for Egyptian construction companies. This complexity stems from a multitude of factors including market volatility, regulatory environments, financial constraints, and competitive pressures.

Understanding the factors that influence tender decision-making is crucial for enhancing the strategic capabilities of Egyptian construction companies. There is a pressing need for research that explores the interplay between these decision-making processes and the broader evolution of the construction industry in Egypt in this era which involves many more variables than before. This study aims to fill this gap by analyzing the determinants of bid/no-bid decisions and their impact on the competitiveness and sustainability of firms in the Egyptian construction sector.

3. Research Objectives

This paper aims to specific objectives that include:

1- Exploring, investigating, and analyzing the critical factors affecting the biding decisions for the construction firms in the Egyptian construction industry.

2- Ranking different factors based on the importance level or rating provided by the respondents from the stakeholders.

3- Developing a decision-making tool using a decision matrix analysis to assist construction firms in bidding stage to quantify the risk and take the most suitable decision.in a systematic approach.

4.Research Limitations:

1- This research is limited to the construction industry in Egypt.

2- This research is limited to the firms which in 3rd class or higher in the classification of Egyptian Federation of Construction and Building Contractors

5. Literature Review

After investigating the previous studies and Focusing on the studies related to Egypt or countries with similar conditions in the construction field, the factors can be classified and divided into 4 main groups [9,10,11,12,13,14]:

A. Factors relating to “Project Characteristics”.
B. Factors relating to “Market Characteristics”.
C. Factors relating to “Contractor Characteristics”.
D. Factors relating to “Bidding”.

Factors relating to" **Project Characteristics"** refer to specific attributes or features of a project that can influence various aspects of its execution and outcome. These factors concluded as per the following:

1. Size of the project.
2. Type of the project.
3. Monthly cash flow required
4. Financial capacity of the client.
5. Type of the client (Public or Private).
6. Estimated project duration.
7. Firms' technical capacity.
8. Specialization in required construction tecق hnique.
9. Location of the project.
10. Clarity on existing site conditions of the project.
11. Possibility of construction and payment delays.
12. Climate of the project area.
13. Public opinion of the project.
14. Government approvals required.

Factors relating to" Contractor Characteristics" refer to particular characteristics or elements of a project that can affect different parts of how it's carried out and what results it produces. These factors are outlined below:

15. Financial capacity to execute the work.
16. Experience on similar type of project.
17. Adequate information om construction resources.
18. Having qualified material suppliers.
19. Current workload
20. Management of project of similar size.
21. Possessing enough equipment and plant for the job.
22. Possibility to enhancing firms' branding in the market.
23. Having committed subcontractors.
24. Keeping a hold of existing key personnel and workforce.

Factors relating to **"Market Characteristics"** refer to attributes and conditions of the market environment in which a project or business operates. These factors can significantly impact business operations and project outcomes. Key market characteristics include:

25. Fluctuation of the resource price.
26. Previous relationship with the client
27. Availability of qualified workforce and staff in the market.
28. Availability of qualified subcontractors in the market.
29. Equipment availability and hire rates in the market.
30. Upcoming bids of profitable projects in the near future.
31. Difficulty of obtaining finance.

Factors relating to **"Bidding"** refer to various elements that influence the process of submitting a proposal or offer for a project or contract. These factors can impact the success or failure of a bid and include:

32. Type of contract.
33. Ability to fulfil pre-qualifications requirements.
34. Accuracy of the bid documents.
35. Required guarantee/bond capacity.
36. Value of liquidated damages.
37. Time of preparation and submission of bid is enough.
38. Penalties for not completing the project on time.
39. Numbers of competitors' participating.
40. Time of bidding (season).
41. Bidding document price.

Besides identifying important factors affecting bidding decisions, some studies have developed models to assist construction contractors in project decision-making. These models aim to reduce errors and randomness in the decision-making process [15]. However, in practice, contractors often rely on past experiences and subjective judgments. There is a clear need for simple, practical, and easy-to-use bid/no-bid decision models that objectively evaluate relevant factors systematically [16]. El-Mashaleh (2012) proposed a bid/no-bid decision approach based on data envelopment analysis (DEA), which integrates subjective management expertise to guide contractors through their decisions. For the DEA approach, it is recommended that contractors maintain a database of all bidding opportunities they have considered. Reviewing historical projects, often exceeding 50, can be labor- and time-intensive, making it unfeasible given the limited decision-making period [17,18]. Lowe and Parvar (2004) recommended statistical analysis of previous bidding opportunities. While assessing the contractor's historical performance is essential, time limitations can make their model impractical. Using the decision matrix can effectively facilitate bid/no-bid decision-making. This approach a powerful tool that provides clarity, enhances decision-making, and supports effective resource allocation and risk management. Its structured approach and visual representation make it an invaluable method in various fields and applications. Useful and simple to use and adjust by the responsible people in construction firms.

6. Research Methodology

6.1. Literature review

It is an important tool to identify the factors' investigated by other researchers and consider it as a start point of this research by studying the previous thoughts, and the contribution of others to this subject, it would be easier and valuable to build new facts over the old ones.

6.2. Data Collection and Analysis

To achieve the objectives of this research, a questionnaire was developed based on key factors identified from the literature review. This questionnaire was distributed to key stakeholders in construction firms, and the collected data were then analyzed and ranked accordingly.

6.3. Data Validation

To validate the results, a statistical analysis was conducted using the ANOVA test to ensure their reliability.

6.4. Developing Decision Making Tool

To achieve the objectives of this research a decision-making tool developed using matrix analysis to help the construction firms in taking the proper bidding decision between the alternatives in a systematic approach.

7.Data collection and analysis

Based on the **4 main categories** obtained from the previous studies and the **including 41 factors**, a structured questionnaire addressed to seniors, team leaders and managers from tender, estimation, controls, and operation departments who were involved in bidding decisions for their firms. The questionnaire was sent by mail. Seventy respondents have been collected. the questionnaire was conducted among construction firms in Egypt with different classes 1st, 2nd, and 3rd .

Sample size

Ensuring an adequate sample size is crucial for obtaining reliable conclusions based on research findings. This study encompasses contracting firms across the first, second, third, categories involved in construction projects. Assigned sampling was employed to select samples from each contractor category level, allowing for representative data collection. The formula which is shown in the below equation was used to determine the sample size of an unlimited population [19,20].

$$n = (Z^2 * p * (1 - p)) / (E^2) \quad \textbf{(1)}$$

Equation 1. Sample size

Where:

n is the required sample size.

Z is the Z-score corresponding to the desired level of confidence (e.g., 1.645 for a 90% confidence level).

p percentage of picking a choice, expressed as a decimal (0.5 used for sample size needed).

E is the desired margin of error.

n = (1.645^2 * 0.5 * (1 – 0.5)) / (0.1^2) = 67.9~68

Sample taken = 70.

7.1. Results & Findings

Job Title: A large majority of the respondents in the survey were tender managers as they are presenting around 24%, followed by 21% working as project controls manager, 14% working as CEOs, and around 40% from other disciplines. Distribution of respondents by specialization is shown in the below Figure 2.

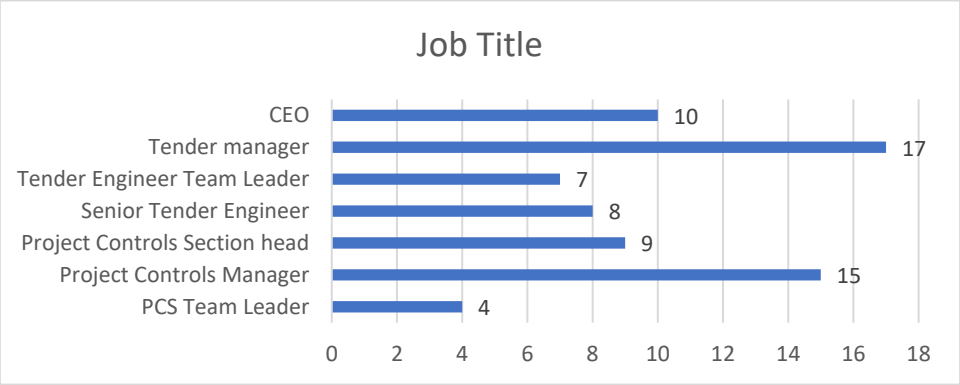


Figure 2. Job Title

Experience: A large majority of respondents had experience between 11-15 years (50%), followed by 30% having experience more than 15 years in second, 20% having experience between 6-10 years in third. The average experience of the respondents was found to be 14 years' experience. This shows that the respondents had good experience to provide correct information in the survey. Distribution of respondents by experience is shown in the below Figure 3.

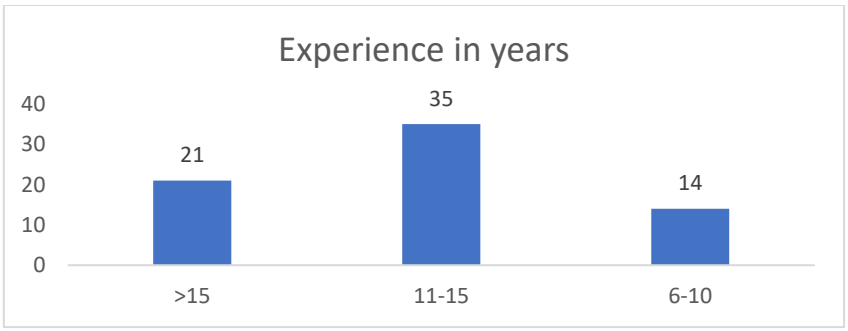


Figure 3. Experience in years

Category of the Company: A large majority of respondents are representing 1st category as 61% from the respondents are working in 1st class companies, and 24% are working in 2nd class companies, and lastly 15% are working in lower categories. Distribution of companies based on their categories is shown in the below figure 4.

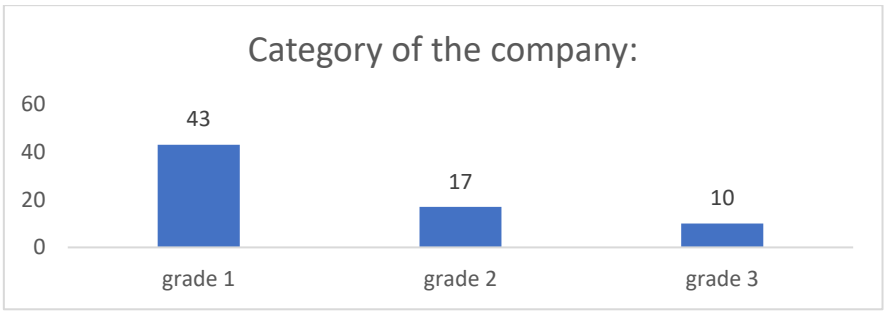


Figure 4. Category of the company

Years of experience does the company have in building projects: A large majority of respondents responded that they are working in companies which have more than 20 years of experience in building projects with a percentage of 46%, and 34% from the respondent are working in companies which

have 10-20 years of experience, and 20% for 5-10 years of experience. Distribution of respondents by Years of experience does the company have in building projects is shown in the below figure 5.

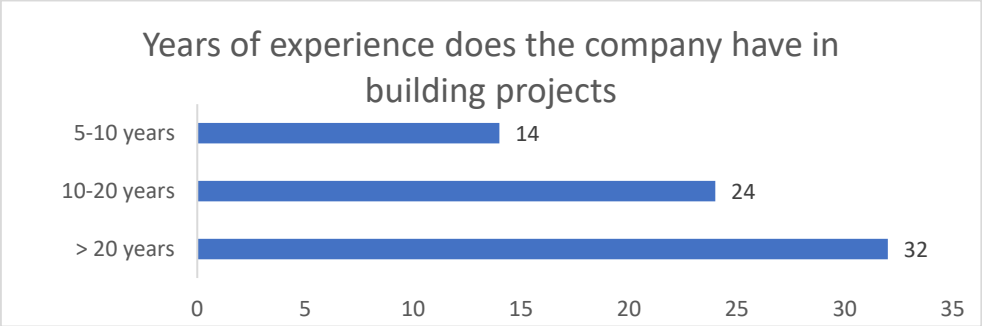


Figure 5. Years of experience does the company have in building projects

Type of works that company specializes in: This was a multiple option question where the respondents were allowed to choose more than one option if applicable. Twenty-nine respondents responded that their company specialized in building projects, twenty-three respondents responded that their company specialized in road projects, ten respondents responded that their company specialized in bridge projects, eight respondents responded that their company specialized in other projects. This shows that the survey had covered companies working in various domain as part of the study. Type of work that respondents' companies specialize on is shown in the below Figure 6.

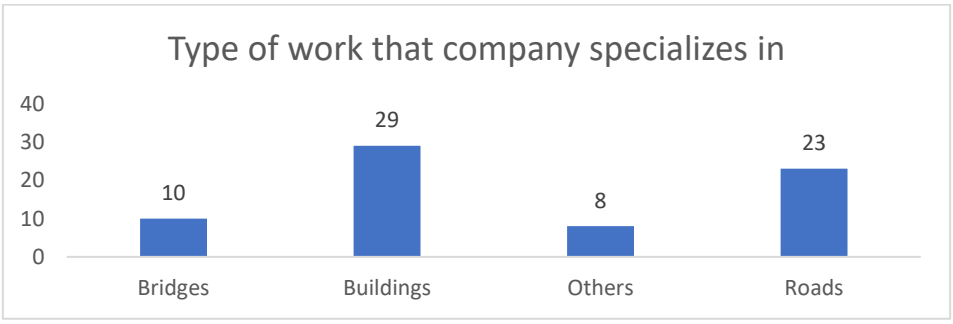


Figure 6. Type of work that firm specializes in

7.2. Factors' Ranking

41 factors influencing bidding decisions of contractors were identified from the literature and the respondents were asked to provide agreement on importance of these factors on a five-point Likert Scale. RII calculated from the survey could provide insights on how factors that are related to the project could influence contractors' bidding decisions [11,12].

$$RII = \frac{5(n5) + 4(n4) + 3(n3) + 2(n2) + n1}{5(n1 + n2 + n3 + n4 + n5)} \quad \textbf{(2)}$$

Equation 2.RII

where n1, n2, n3, n4, and n5 are the number of respondents who selected 1, for no effect; 2, for little effect; 3, for moderate effect; 4, for strong effect; and 5, for very strong effect, respectively. The RII, with values ranging from 0 (not inclusive) to 1.00 was used to determine the rank of each factor surveyed. This made it possible to cross-compare the relative importance perceived by each grade category of the respondents: the higher the RII value, the stronger was the perceived effect of the factor on the bid/no bid decision. According to the findings, the 41 factors have been summarized in the following Charts:

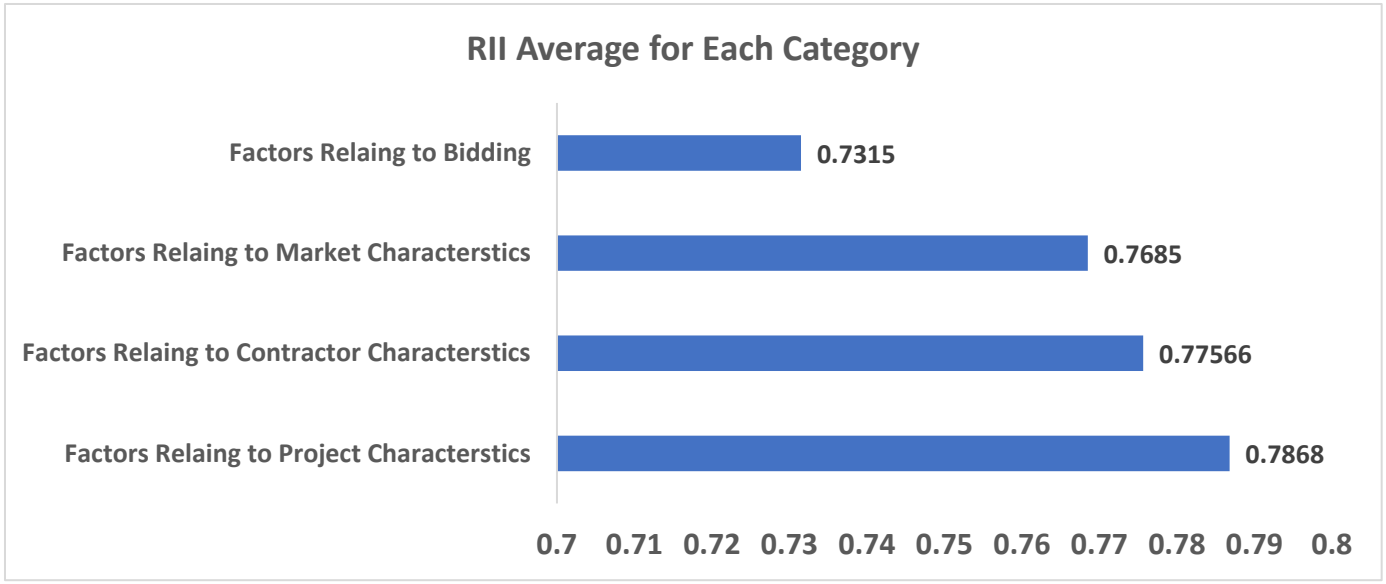


Figure 7. RII average for each group of factors affecting bidding decisions with ascending ranking

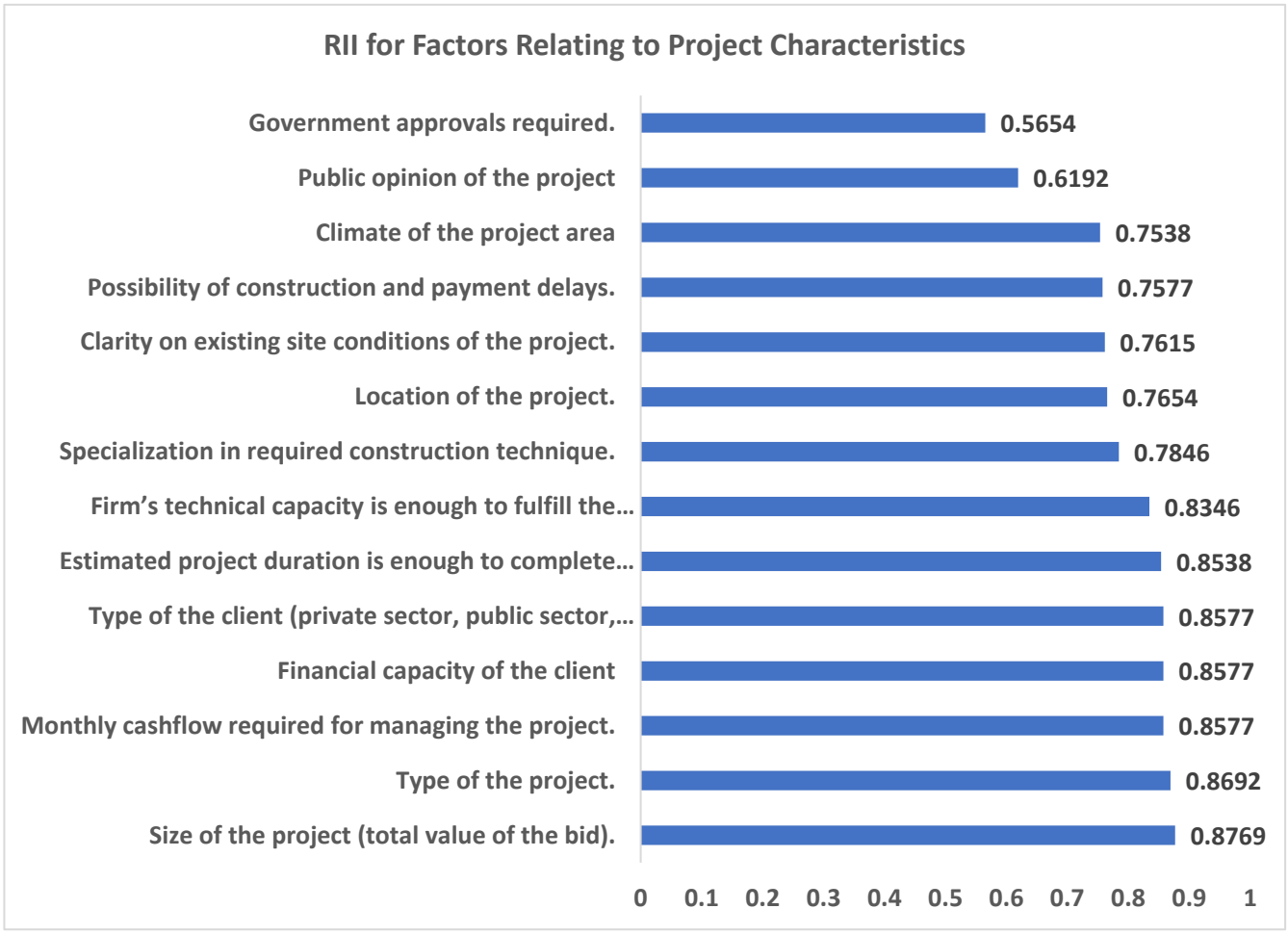


Figure 8. RII of factors affecting bidding decisions related to Project Characteristics with ascending ranking.

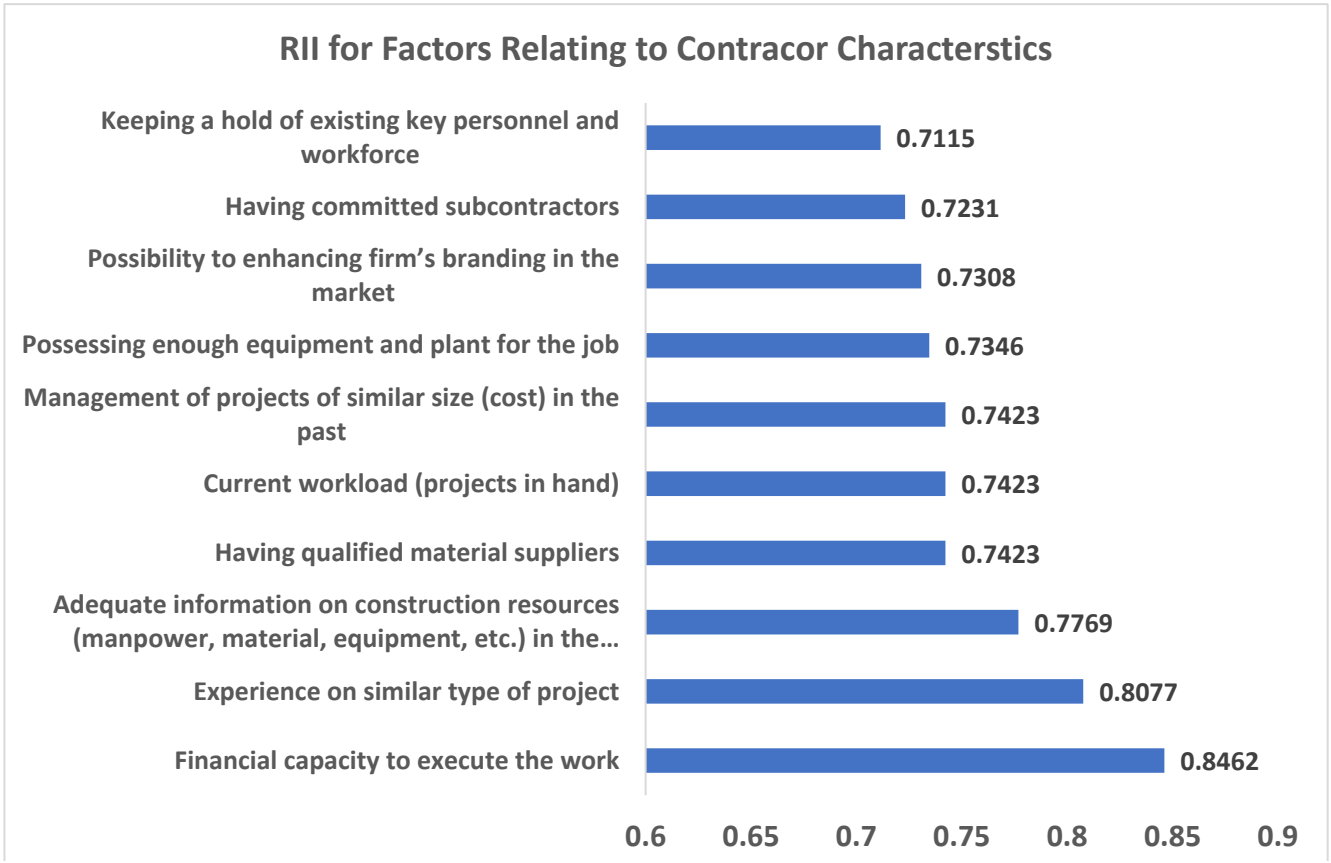


Figure 9. RII of factors affecting bidding decisions related to Contractor Characteristics with ascending ranking.

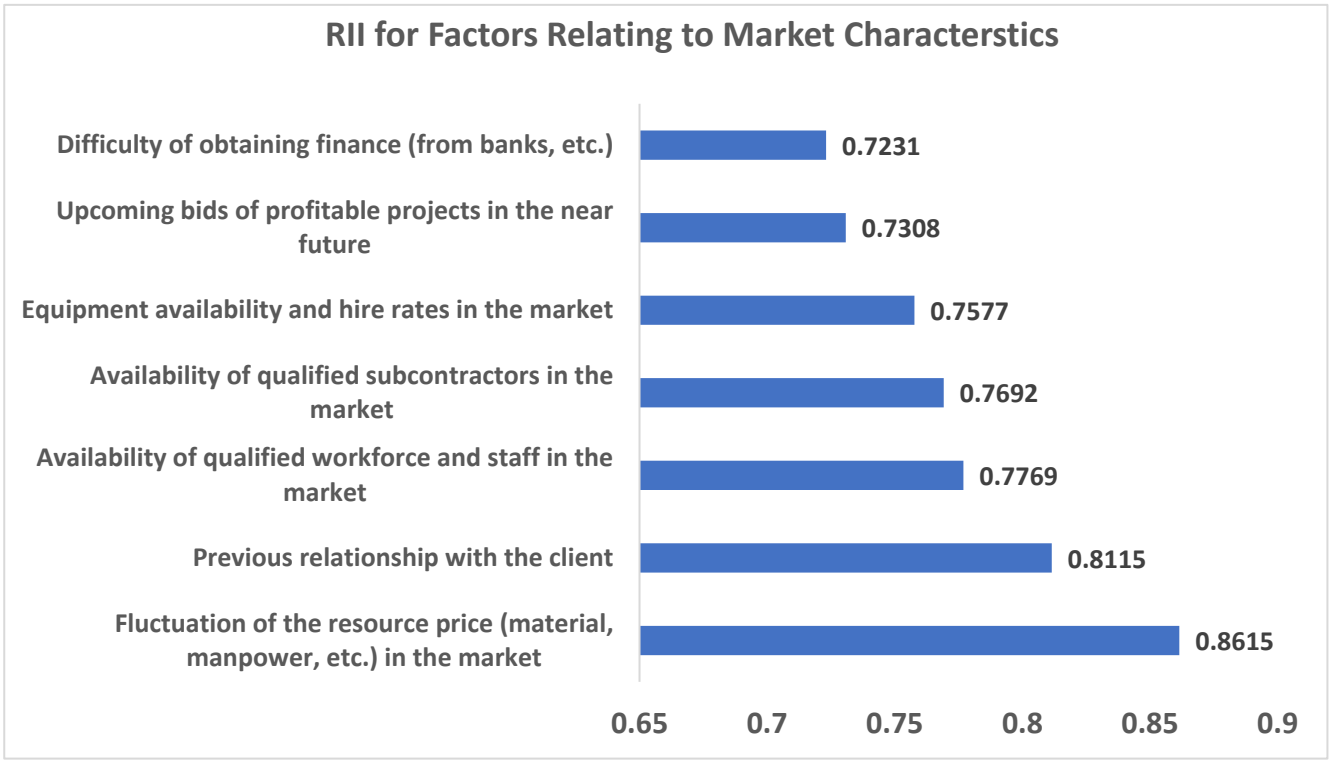


Figure 10. RII of factors affecting bidding decisions related to Market characteristics with ascending ranking.

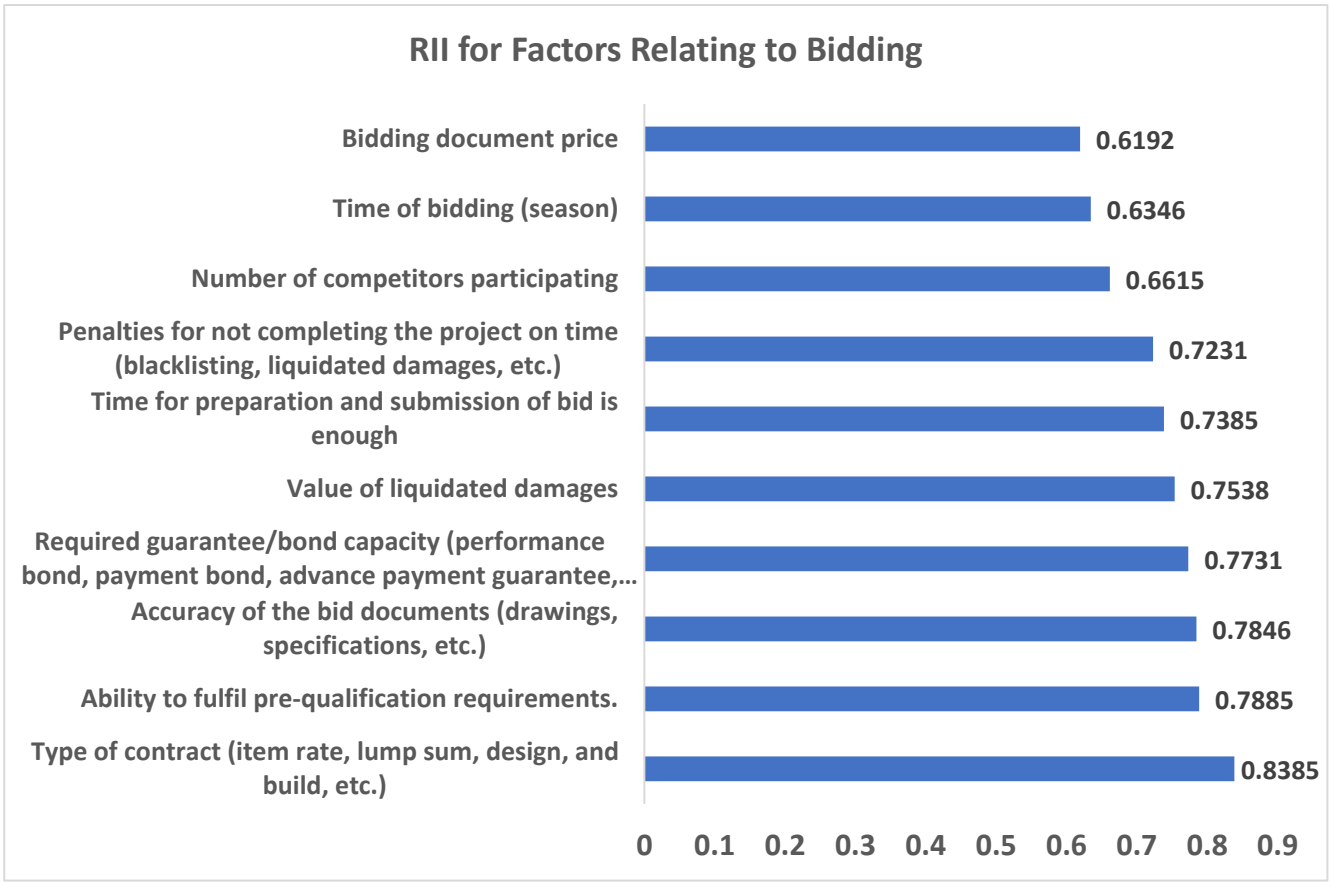


Figure 11. RII of factors affecting bidding decisions related to Bidding with ascending ranking

Figure12. RII of factors affecting bidding decisions with ascending ranking for all factors.

Figure 13. RII of factors affecting bidding decisions with ascending ranking for Top 21 factors.

Table 1.RII of factors affecting bidding decisions with ascending ranking for all factors.

Rank	Factor	Category	RII
1	Size of the project (total value of the bid).	Project Characterstics	0.8769
2	Type of the project.	Project Characterstics	0.8692
3	Fluctuation of the resource price (material, manpower, etc.) in the market	Market Characterstics	0.8615
4	Monthly cashflow required for managing the project.	Project Characterstics	0.8577
5	Financial capacity of the client	Project Characterstics	0.8577
6	Type of the client (private sector, public sector, international agencies, etc.).	Project Characterstics	0.8577
7	Estimated project duration is enough to complete the work.	Project Characterstics	0.8538
8	Financial capacity to execute the work	Contractor Characterstics	0.8457
9	Type of contract (item rate, lump sum, design, and build, etc.)	Bidding	0.8385
10	Firm's technical capacity is enough to fulfill the technical requirements of the project.	Project Characterstics	0.8346
11	Experience on similar type of project	Contractor Characterstics	0.8143
12	Previous relationship with the client	Market Characterstics	0.8115
13	Ability to fulfil pre-qualification requirements.	Bidding	0.7885
14	Specialization in required construction technique.	Project Characterstics	0.7846
15	Accuracy of the bid documents (drawings, specifications, etc.)	Bidding	0.7846
16	Adequate information on construction resources (manpower, material, equipment, etc.) in the market	Contractor Characterstics	0.7800
17	Availability of qualified workforce and staff in the market	Market Characterstics	0.7769
18	Required guarantee/bond capacity (performance bond, payment bond, advance payment guarantee, etc.)	Bidding	0.7731
19	Availability of qualified subcontractors in the market	Market Characterstics	0.7692
20	Location of the project.	Project Characterstics	0.7654
21	Clarity on existing site conditions of the project.	Project Characterstics	0.7615
22	Equipment availability and hire rates in the market	Market Characterstics	0.7577
23	Possibility of construction and payment delays.	Project Characterstics	0.7577
24	Climate of the project area	Project Characterstics	0.7538
25	Value of liquidated damages	Bidding	0.7538
26	Management of projects of similar size (cost) in the past	Contractor Characterstics	0.7423
27	Current workload (projects in hand)	Contractor Characterstics	0.7423
28	Having qualified material suppliers	Contractor Characterstics	0.7423
29	Time for preparation and submission of bid is enough	Bidding	0.7385
30	Possessing enough equipment and plant for the job	Contractor Characterstics	0.7346
31	Upcoming bids of profitable projects in the near future	Market Characterstics	0.7308
32	Possibility to enhancing firm's branding in the market	Contractor Characterstics	0.7308
33	Having committed subcontractors	Contractor Characterstics	0.7231
34	Difficulty of obtaining finance (from banks, etc.)	Market Characterstics	0.7231
35	Penalties for not completing the project on time (blacklisting, liquidated damages, etc.)	Bidding	0.7231
36	Keeping a hold of existing key personnel and workforce	Contractor Characterstics	0.7115
37	Number of competitors participating	Bidding	0.6615
38	Time of bidding (season)	Bidding	0.6346
39	Public opinion of the project	Project Characterstics	0.6192
40	Bidding document price	Bidding	0.6192
41	Government approvals required.	Project Characterstics	0.5654

From the above charts and table, with total number of respondents = 70, it is concluded that at the level of categories, it is clear that factors related to project characteristics have the greatest influence on the decision to bid or not. This is followed by factors related to contractor characteristics and market characteristics to a lesser extent, and finally, the least important are factors related to bidding.

At the level of factors “Size of the project (total value of the bid)” and “Type of the project” from were ranked the highest among 41 factors with RII of 0.8769, 0.8692 respectively. “Fluctuation of the resource price (material, manpower, etc.) in the market” was ranked the third with RII of 0.8615. “Public opinion of the project”, “Bidding document price”, and “Government approvals required” were ranked the least with RII of 0.6192, 0.6192 and .5654 respectively.

8. Data Validation

8.1 Statistical analysis

To verify and validate the collected data, the questionnaire responses were analyzed using the reliability test and the analysis of variance (ANOVA) test [21,22]. The reliability test was performed using the statistical computing package, statistical package for social science (SPSS), while the ANOVA test was performed using Microsoft Excel.

8.2 Factors reliability test

Reliability is the degree to which an experiment or evaluation procedure provides consistent results each time it is used. The generic name for consistency is reliability, reflective of the importance of consistency as a characteristic of a good test [21,22]. Reliability is commonly used as a measure of the internal consistency of a test. The coefficients of reliability for all factors is Cronbach’s alpha (equals 0.823) and Cronbach’s alpha based on standardized items (equals 0.818). As all the values of the coefficient of reliability exceed 0.8, the responses are determined to be reliable and to have good internal consistency.

8.3 Analysis of variance test

The data were approximately normally distributed, and the samples were independent, so that two ANOVA tests were applied. The first ANOVA test was conducted by dividing the 70 respondents into three groups according to average job size in millions of Egyptian pounds (10-100, 100-200 and over 200). The findings of the first ANOVA test demonstrate that the null hypothesis (Ho) was valid for all factors except for “Accuracy of the bid documents (drawings, specifications, etc.)”. The second ANOVA test was conducted by dividing the respondents into three groups according to the annual size of projects in millions of Egyptian pounds (20-100, 100-500 and over 500). The findings of second ANOVA test demonstrate that the null hypothesis (Ho) was valid for all factors except for “Availability of qualified workforce and staff in the market”. As indicated by the results, there was no significant difference among respondents.

9. Developing decision making tool

Based on the results and the ranking achieved, a decision-making tool has been developed using VBA. This tool is designed to assist in evaluating projects by incorporating a comprehensive database and a relative weighting system based on the Relative Importance Index (RII). Here’s a detailed explanation of the development process:

9.1 Database Creation:

- A comprehensive database will be established to include all relevant factors identified in the analysis.
- Each factor will be assigned a relative weight based on its RII, which reflects its importance in the decision-making process.

Table 2.RII & calculated weight for each factor.

Factor	RII	Weight
Size of the project (total value of the bid).	0.8769	2.799%
Type of the project.	0.8692	2.775%
Fluctuation of the resource price (material, manpower, etc.) in the market	0.8615	2.750%
Monthly cashflow required for managing the project.	0.8577	2.738%
Financial capacity of the client	0.8577	2.738%
Type of the client (private sector, public sector, international agencies, etc.).	0.8577	2.738%
Estimated project duration is enough to complete the work.	0.8538	2.725%
Financial capacity to execute the work	0.8457	2.700%
Type of contract (item rate, lump sum, design, and build, etc.)	0.8385	2.676%
Firm's technical capacity is enough to fulfill the technical requirements of the project.	0.8346	2.664%
Experience on similar type of project	0.8143	2.599%
Previous relationship with the client	0.8115	2.590%
Ability to fulfil pre-qualification requirements.	0.7885	2.517%
Specialization in required construction technique.	0.7846	2.504%
Accuracy of the bid documents (drawings, specifications, etc.)	0.7846	2.504%
Adequate information on construction resources (manpower, material, equipment, etc.) in the market	0.7800	2.490%
Availability of qualified workforce and staff in the market	0.7769	2.480%
Required guarantee/bond capacity (performance bond, payment bond, advance payment guarantee, etc.)	0.7731	2.468%
Availability of qualified subcontractors in the market	0.7692	2.455%
Factor	**RII**	**Weight**
Location of the project.	0.7654	2.443%
Clarity on existing site conditions of the project.	0.7615	2.431%
Equipment availability and hire rates in the market	0.7577	2.419%
Possibility of construction and payment delays.	0.7577	2.419%
Climate of the project area	0.7538	2.406%
Value of liquidated damages	0.7538	2.406%

Management of projects of similar size (cost) in the past	0.7423	2.369%
Current workload (projects in hand)	0.7423	2.369%
Having qualified material suppliers	0.7423	2.369%
Time for preparation and submission of bid is enough	0.7385	2.357%
Possessing enough equipment and plant for the job	0.7346	2.345%
Upcoming bids of profitable projects in the near future	0.7308	2.333%
Possibility to enhancing firm's branding in the market	0.7308	2.333%
Having committed subcontractors	0.7231	2.308%
Difficulty of obtaining finance (from banks, etc.)	0.7231	2.308%
Penalties for not completing the project on time (blacklisting, liquidated damages, etc.)	0.7231	2.308%
Keeping a hold of existing key personnel and workforce	0.7115	2.271%
Number of competitors participating	0.6615	2.112%
Time of bidding (season)	0.6346	2.026%
Public opinion of the project	0.6192	1.977%
Bidding document price	0.6192	1.977%
Government approvals required.	0.5654	1.805%

9.2 Model Input and Evaluation:

- Each company can input data for all projects under consideration into the model. This data includes score of each factor for every project, rated on a scale of 1 to 5.

Table 3. Model Inputs

	Evaluation		
Factor	Project 01	Project 02	Project 03
Size of the project (total value of the bid).	1	2	3
Type of the project.	4	5	3
Fluctuation of the resource price (material, manpower, etc.) in the market	1	2	3
Monthly cashflow required for managing the project.	3	2	4
Financial capacity of the client	3	5	2

- These evaluations can be based on numerical calculations, expert opinions, or the company's current market outlook and strategic direction.

9.3 Running the Model:

- Once the evaluations are inputted, the model will process the data based on the relative weights stored in the company's database.

- The VBA macro will then generate a message indicating the project with the highest score and provide a chart illustrating the final scores of each project.

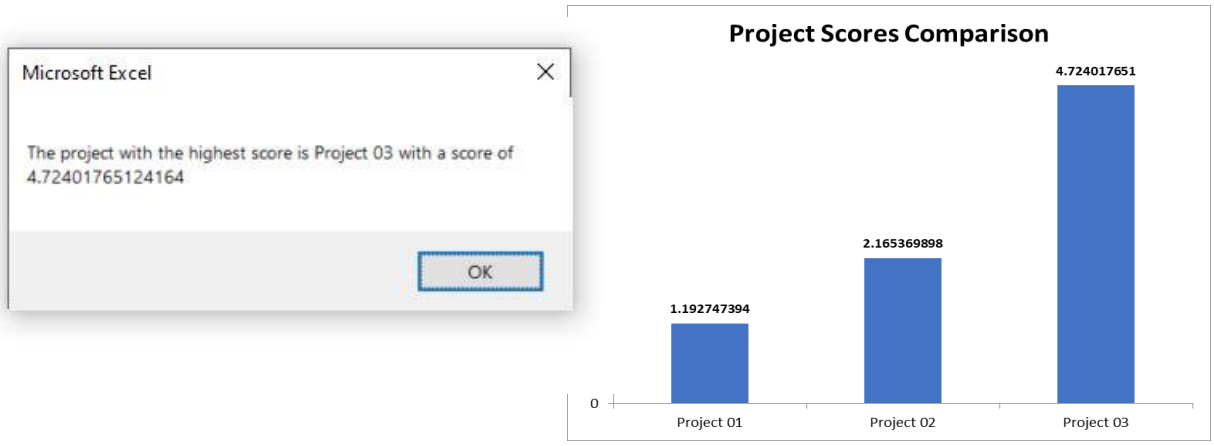


Figure 14. Model outputs

10.Case Study

To evaluate and decide whether to proceed with bids for three construction projects using a decision-making tool. A workshop was conducted with key stakeholders to assess all three projects based on the factors discussed.

10.1 Projects Under Evaluation:

Project A: New Office Building

- **Description**: Construction of a new office building.
- **Cost**: EGP 360,000,000.
- **Expected Return**: EGP 432,000,000 (20% return on investment).
- **Time**: 24 months.

Project B: Renovation and Upgrade of Existing Building

- **Description**: Renovation and upgrading of an existing building.
- **Cost**: EGP 300,000,000.
- **Expected Return**: EGP 360,000,000 (20% return on investment).
- **Time**: 12 months.

Project C: New Warehouse Facility

- **Description**: Construction of a new warehouse facility.
- **Cost**: EGP 450,000,000.
- **Expected Return**: EGP 540,000,000 (20% return on investment).
- **Time**: 18 months.

10.2 Initial analysis by the responsible stakeholders

Analysis of Project A

- Highest projected return of EGP 72,000,000.
- Highest cost at EGP 360,000,000.
- Longest project duration of 24 months.

Analysis of Project B

- Lower return of EGP 60,000,000 compared to other projects.
- Lower cost compared to Projects A and C at EGP 300,000,000.
- Shortest project duration of 12 months.

Analysis of Project C

- Substantial return of EGP 90,000,000.
- Highest cost at EGP 450,000,000.
- Project duration of 15 months.

10.3 Discussion

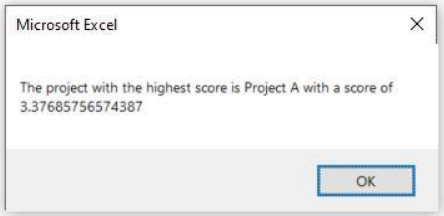
Despite the analysis conducted for the three projects, which focused on key aspects such as cost, return on investment, and project duration, and which served as the basis for comparison, the 41 factors presented and discussed. These factors included other elements that had been overlooked and their impact on decision-makers, such as the type of project, project location, resource availability, client type, contract type, and other varying factors. Subsequently, all factors were re-evaluated, and a rating was assigned to each factor based on the status of each project and the company's strategic goals.

Table 4. Case Study Inputs

Factor	Evaluation		
	Project A	Project B	Project C
Size of the project (total value of the bid).	4	3	5
Type of the project.	5	4	3
Fluctuation of the resource price (material, manpower, etc.) in the market	4	1	1
Monthly cashflow required for managing the project.	5	1	1
Financial capacity of the client	5	2	2
Type of the client (private sector, public sector, international agencies, etc.).	4	2	2
Estimated project duration is enough to complete the work.	4	2	3
Financial capacity to execute the work	1	2	5
Type of contract (item rate, lump sum, design, and build, etc.)	1	2	5
Firm's technical capacity is enough to fulfill the technical requirements of the project.	4	2	5
Experience on similar type of project	3	2	3
Previous relationship with the client	4	2	5
Ability to fulfil pre-qualification requirements.	2	3	2
Specialization in required construction technique.	4	2	3
Accuracy of the bid documents (drawings, specifications, etc.)	3	2	5
Adequate information on construction resources (manpower, material, equipment, etc.) in the market	1	2	5
Availability of qualified workforce and staff in the market	1	2	5
Required guarantee/bond capacity (performance bond, payment bond, advance payment guarantee, etc.)	1	4	5
Availability of qualified subcontractors in the market	1	4	5
Location of the project.	1	2	5
Clarity on existing site conditions of the project.	1	4	5
Equipment availability and hire rates in the market	4	2	1
Possibility of construction and payment delays.	4	2	1
Climate of the project area	4	4	1
Value of liquidated damages	4	2	1
Management of projects of similar size (cost) in the past	4	4	1
Current workload (projects in hand)	4	2	1
Having qualified material suppliers	4	4	1
Time for preparation and submission of bid is enough	4	4	1
Possessing enough equipment and plant for the job	4	2	1
Upcoming bids of profitable projects in the near future	4	2	1
Possibility to enhancing firm's branding in the market	4	2	1
Having committed subcontractors	4	2	1
Difficulty of obtaining finance (from banks, etc.)	4	2	1
Penalties for not completing the project on time (blacklisting, liquidated damages, etc.)	4	2	1
Keeping a hold of existing key personnel and workforce	4	3	1
Number of competitors participating	4	2	1
Time of bidding (season)	4	2	1
Public opinion of the project	4	3	1
Bidding document price	4	2	1
Government approvals required.	4	2	1

The results showed that Project A was preferred, despite its extended duration, due to its overall score across the 41 evaluated factors.

	Evaluation		
Factor	Project A	Project B	Project C
Size of the project (total value of the bid).	4	3	5
Type of the project.	5	4	3
Fluctuation of the resource price (material, manpower, etc.) in the market	4	1	1
Monthly cashflow required for managing the project.	5	1	1
Financial capacity of the client	5	2	2
Type of the client (private sector, public sector, international agencies, etc.).	4	2	2
Estimated project duration is enough to complete the work.	4	2	3
Financial capacity to execute the work	1	2	5
Type of contract (item rate, lump sum, design, and build, etc.)	1	2	5
Firm's technical capacity is enough to fulfill the technical requirements of the project.	4	2	5
Experience on similar type of project	3	2	3
Previous relationship with the client	4	2	5
Ability to fulfil pre-qualification requirements.	2	3	2
Specialization in required construction technique.	4	2	3
Accuracy of the bid documents (drawings, specifications, etc.)	3	2	5
Adequate information on construction resources (manpower,			



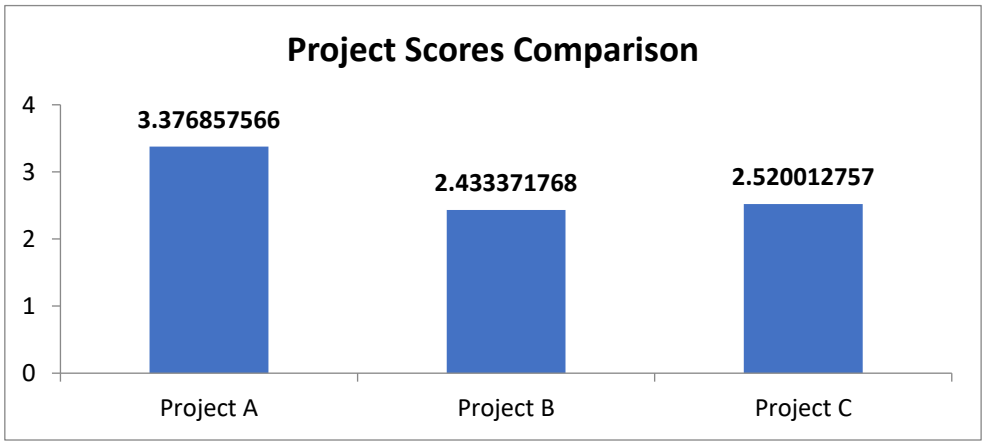


Figure 15. Case Study outputs

This approach Utilizes both quantitative data and expert insights to provide a reliable decision-making framework, facilitating better project selection and strategic planning in the construction industry.

11. Conclusions

This research explored the factors influencing bidding decisions in the construction industry in Egypt, providing a comprehensive analysis based on a literature review and empirical investigation. By reviewing existing studies, we identified critical factors impacting the decision-making process. These factors formed the basis for designing a detailed questionnaire, which was distributed to key decision-makers within Egyptian construction companies'1 st,2nd & 3rd class. The analysis of the collected data enabled us to rank the importance of these factors, with results presented through various charts for clarity. To ensure the validity of the findings, statistical verification was performed using an ANOVA test, confirming the reliability of the results. Building on these insights, a decision-making tool was developed employing matrix analysis with VBA. By providing a visual comparison of the final scores and a recommendation for the best project, the tool helps companies make informed decisions with minimal risk. The tool was applied in a case study conducted during a workshop, where it was used to evaluate and select between three major construction projects. The application of the tool demonstrated its effectiveness in providing structured and data-driven decision support, resulting in satisfactory outcomes.

In summary, this research contributes to a deeper understanding of the factors affecting bidding decisions in the Egyptian construction sector in the decade of (2013-2022). The developed tool offers a valuable resource for enhancing decision-making processes, making them more systematic and objective. The successful application of the tool in the case study underscores its potential for improving bidding decisions and supporting strategic project selection in the construction industry. Future research could investigate factors that are likely to impact the Egyptian job market based on latest recent changes, such as exchange rates, high inflation rates, and consequently, interest rates. These factors could, in one way or another, influence decision-making processes and should be considered and analyzed deeply in the upcoming researches.

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