

A Proposed System for Prequalification of Construction Companies & Subcontractors for Projects in Egypt

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Abstract: For several years, Egypt has witnessed great progress in terms of construction and great interest in it. It is also witnessing a great diversity in these projects, whether infrastructure, airports, housing complexes, roads and bridges.

Contracting companies are keen to use all modern methods of construction and implementation, in line with the requirements of progress and implementation of global projects, and most of the major contracting companies are working to grow externally in many countries, especially in Africa, and therefore development is required in the various tools used to implement These projects, especially the most important tool, are subcontractors.

In view of the multiplicity and different methods of selecting subcontractors that are followed by the owners of engineering projects in Egypt, and the weights of criteria differ from one institution to another, these methods are deduced from the instructions of the donors and not in accordance with the local environment, therefore; The research will study the extent of the need to find a unified and comprehensive model that meets the needs of these entities in the selection process of subcontractors, adapts to local conditions and raises the efficiency of projects in terms of quality, cost, safety factors, in addition to time.

Keywords: Construction Companies, airports, housing complexes, roads and bridges, engineering projects.

I. INTRODUCTION

There are many factors that affect the success of construction projects, and choosing the right subcontractor is a very important factor for the success of any project.

Based on the FIDIC guidelines (in selecting the general contractor for mega projects), it is recommended to apply pre-qualification, in order to ensure that the bids that will be compared between them are submitted by contractors who have the resources and experience that enable them to carry out the required work satisfactorily.

But; Pre-qualification procedures contain many areas of weakness, as it is based on personal judgment issued by the decision-makers, and it also often contains an uncertain history provided by different contractors.

Several pre-qualification models have been identified for selecting a contractor; However, there are two significant shortcomings of these models regarding the evaluation of the self-management ability variables, the models are not comprehensive because they do not include a sufficient set of subjective variables related to administrative capacity that have a significant impact on time and cost management, and not enough attention has been paid to pre-qualification models on the impact of the field visit to companies or factories that will be dealt with either for implementation or Supply, which is very important because it has a great impact on ensuring the validity of the submitted documents and also directly seeing the capabilities of the bidders.

A. OVERVIEW:

Many contracting companies seek to develop models to pre-qualify contractors, and they are developed from time to time according to requirements and changes in projects and contracts, the goal is always to contract with experienced and competent contractors and also at the lowest prices as possible, and companies always work on Updating contractors' data, but: the paperwork system always lacks accuracy, and the human factor always interferes with it, and this is what we try to avoid and work to find a new system that works with the slightest human intervention to calculate the level of contractors before contracting with them, and it is based on many the data that is entered and then the calculations are made automatically, which guarantees equal opportunities and obtaining results closer to the accuracy and complete distance from individual personal opinions and trends. Distance from individual personal opinions and trends.

B. PROBLEM STATEMENT:

Despite the proliferation of contracting companies in Egypt and the implementation of many projects; we face many times reasons for stopping the implementation of projects in the implementation stage and delay in delivery on time, as well as increasing costs at the expense of profits, and this results are according to lack of real understanding of project management and lack of communication between the implementation elements (owner / contractor / consultant) and negative cultural and social heritage, as well as many methods of management, especially in projects that are not suitable with modern and scientific development in engineering project management that also include the most appropriate Evaluation methods that are not applied, and in this research we will work to find a system to implement the pre-qualification stage for contractors, which limits many of the risks.

C. THESIS OBJECTIVE:

The importance of this study lies in guiding decision-makers to the most appropriate competitors financially, technically and efficiently in line with the nature of the project and the need of the business owner and in a way that does not delay the agreed implementation period and the total cost, as it helps to avoid many problems resulting from a lack of appropriate selection. For several reasons, the most important of which are:

1. General weakness in evaluation, whether technical or financial, due to reliance on human effort and different selection mechanisms.
2. The lack of a real financial evaluation of the project, which causes a large percentage of the total costs of the project to go out of the maximum cost expected by the owner.
3. The emergence of many contractual problems and disputes between the owner or the general contractor and the subcontractors.

D. RESEARCH CONTRIBUTION

This study includes designing a model through the use of a computer and works to contribute to the study and analysis of contractors' data in order to be able to work pre-qualified for them without the interference of human opinions or any manual errors. Construction and engineering companies can use the results of this thesis as a basis for pre-qualification work for contractors. Moreover, the use of this system is expected to achieve savings in cost and time for construction projects, as well as reduce and avoid risks from contractors.

E. RESEARCH METHODOLOGY

1. Study the construction environment in the Arab Republic of Egypt.
2. Mechanisms for evaluating contractors in international construction contracts, FIDIC.
3. Study previous research related to the research topic.
4. Creating a questionnaire explaining the methods currently used to evaluate contractors in contracting companies in Egypt.
5. Conducting a questionnaire for the major contracting companies in Egypt about the most appropriate methods for evaluating subcontractors.
6. Study the mechanisms of working with a proposed system and its applications in the field of project management, selection and evaluation of subcontractors.

7. Application of the proposed systems on the principles studied and evaluations (technical, financial and efficiency) of the contractors of major projects in Egypt.

8. Analysis and results.

II. LITERATURE REVIEW

Shobaki, (2008) conducted a study which aimed to identify local strategies for selecting contractors to determine problems in the Gaza Strip, depending on decision-makers working with customers. Moreover, it tries to assess whether local selection approaches need to be improved and developed or not.

80 questionnaires were distributed to the study population, which included customers, sponsors, and consulting boards with 7 specializations according to the engineering syndicate classification. 73 questionnaires were gathered and the answer rate was 91.3%.

Another (AHP) questionnaire was designed and distributed to A specialist commission of decision-makers working with the clients, made up of six specialists in the choice of advisory bodies for weight determinations of the significant parameters found in the study findings of the previous questionnaire as well as the relative significance of those criteria.

The results of this thesis show that in the selection process of the evaluation of consultancies offices, there are three key criteria: The Office's general expertise, its contractor, and the consultant office's approach as well as its suitability to the parameters defined by the customers. The analysis also highlighted that exist 6 sub-criteria for each key criterion. In this analysis, weight and relative value were also defined for any principal and sub-criteria, and exposure to the general selection model.

This study differs from the present study in the purpose as the goal of the selection process of the evaluation of consultancies offices.

The researcher of the present study gained valuable information from the related literature section of the preceding study to know more

about the nature of information of the construction company and its importance. That was helpful in designing the study framework. Reviewing the findings, procedures, and recommendations intensively the researcher arrived at important details about factors that may influence various criteria used for contractor's pre-qualification. [21]

Nassar, (2013) suggested an investigation into Egyptian building contractors' prequalification using fuzzy-AHP engineering templates. The key goal of this paper is to establish a modern integrated model of judgment, consisting of an approach to theoretical fuselage and analysis hierarchy (AHP), using the theory and PHA in its entirety.

The study tools were two fuzzy methods which were the analysis of Chang's scope and the evaluation of the group judgement of Jaskowski's aggregates. Both techniques are applied in the Egyptian building industry to real contractors and evaluated. A software tool is improved to automate the calculations.

This research created a new integrated decision model consisting of a sophisticated AHP solution that leverages the fuzzy theory and the AHP to deal with insecurity and inaccuracy in the prequalification phase of a contractor, where decisions are expressed as smoothly triangular numbers. Utilizing literature review and expert advice on construction projects, the main standards used in this model were gathered.

The present study differs from the previous studies mentioned above as it created a new integrated decision model consisting of a sophisticated AHP solution that leverages the fuzzy theory and the AHP to deal with insecurity and inaccuracy in the prequalification phase of a contractor, where decisions are expressed as smoothly triangular numbers.

The researcher of the present study gained valuable information from the related literature section of the preceding study to know more about the insecurity and inaccuracy in the prequalification phase of a contractor and how to deal with it. That was helpful in designing the Prequalification of construction companies and subcontractors for projects criteria checklist. [17]

Mària, (2013) analysed research that aimed at integrating job security into recent models of contractors to direct general contractors in the procurement phase of subcontractors and assess different contractors during project execution.

The purpose of the study is to emphasize the influence of the general level of occupational health and safety culture on the workplaces of different contractors.

The investigator used the variables which affect the safety efficiency of contractors during construction and analysed methods to assess the safety efficiency of contractors.

The study provided the considerations that holders and general contractors should take into consideration during the procurement and assessment of contractors and subcontractors. The study results ensured that the safety appraisal findings will be an important tool for encouraging entrepreneurs to achieve better safety outcomes. It may also influence owners' or general contractors' decision-making as to whether the contractor is appropriate for a possible contracting operation. The study provided the present researcher with some criteria which are as follow [16]:

1. The criteria that holders and general contractors should take into consideration during the procurement and assessment of contractors and subcontractors.
2. The criteria of selections the contractor which helps owners' or general contractors' decision-making as to whether his appropriateness for a possible contracting operation.
3. It also provides her with the safety appraisal findings that encouraging entrepreneurs to achieve better safety outcomes.

Sergey & Marina, (2016) conducted a study that aims to take account of the fundamental problems in QMS implementation and select an accreditation body. The findings of the study demonstrate that there are many recommendations for how to achieve a consistent credential, however, there is no framework for actions in the construction sector for the execution of system design firms. Consequently, criteria need to be established for the application and determination of the key criteria of the selection of certification bodies of previously listed building enterprises QMS.

Reviewing the findings, procedures, and recommendations intensively in this study, the present researcher arrived at important details about factors that may influence QMS implementation and select an accreditation body of previously listed building enterprises QMS, how to achieve a consistent credential, and framework for actions in the construction sector for the execution of system design firms. [19]

III. DATA COLLECTION

In order to achieve the objectives of this research, a questionnaire was designed to consist of 23 questions, they were varied and selected based on the results of previous research, as well as years of experience in major contracting companies in Egypt, and this questionnaire was investigated in the most important factors that affect the previous Qualification of contractors in various projects and of different types and capabilities.

A. Sample selection:

The distribution was not limited to within the organization in which I work only, but the questionnaire was distributed to many engineers in different fields of contracting in which they work, as well as according to different years of experience. LinkedIn, which is the world-famous recruitment site, was used to distribute the questionnaire, as well as many groups WhatsApp, which brings together a large number of engineers in various disciplines.

B. Sample size:

The sample was distributed to a large number as mentioned before, and 83 responded and they answered all the questions.

The sample size was determined and distributed to engineers working in major contracting companies in Egypt with a large number of years of experience. Care was taken to collect the largest number of responses to be able to reach the highest degree of accuracy of conclusions to build a strong, valuable and consistent system that preceded the qualification of contractors with business need and actual market.

C. Questionnaire Structure:

The main objective of this questionnaire is to identify the most and most important factors that affect the process of pre-qualifying contractors, as well as drawing attention to factors that may be needed, and the questionnaire is classified into 3 main sections:

- Section A: Organized to investigate general and background information on respondents' experience.
- Section (B): structured to identify the most important factors that affect the process of pre-qualifying contractors, and it is divided as follows according to the instructions of the FIDIC

1. General
2. Subcontractor Organization
3. Subcontractor Financial Statement
4. Subcontractor Resources
5. Subcontractor Systems & Applications

- Section (C): It was organized to know the impact of the Corona pandemic on the prequalification of contractors.

IV. ANALYSIS OF SURVEY RESULTS

The qualification of contractors depends on the analysis of many factors related to contractors in terms of age, experience, capabilities and competencies, and other factors that affect the evaluation of contractors,

in addition to a group of factors related to projects in terms of duration, resources needed for projects, project work team and other factors. Therefore, the pre-qualification of contractors, especially Subcontractors, is an important and essential step in their success and the success of the projects they implement.

This chapter aims to analyze the results of the questionnaire obtained; In order to study and analyze the prequalification process for subcontractors and study the basic determinants of the prequalification process, the factors affecting the success of construction projects, and to show the importance of all the factors that affect the organization of the subcontractor. - Contractors and their performance of their diverse and varied work.

In the questionnaire, there was a large and useful diversity in the sample, in terms of the number of years of experience, the nature of the projects that have been worked on, as well as the duration of the projects, which also has a significant impact on showing the efficiency of contractors and gaining experience in selecting the right contractor. The results of the selected sample data are as follows:

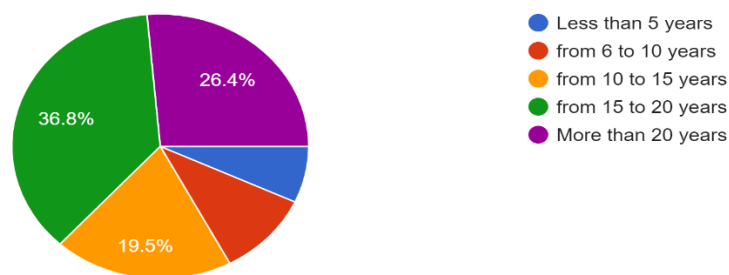


Figure 1: No. of Years of Experience

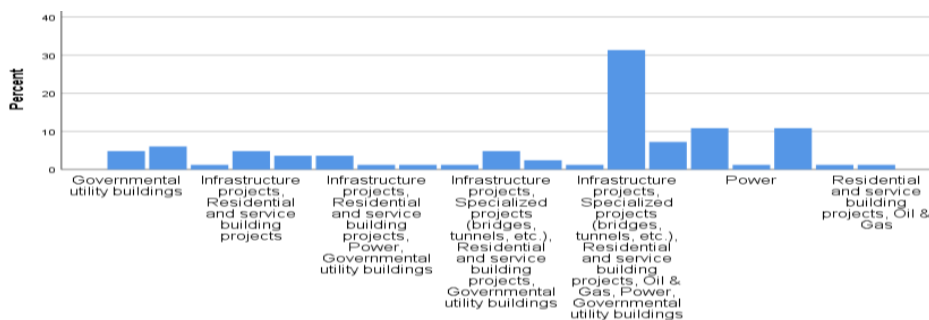


Figure 2: Company majority type of projects

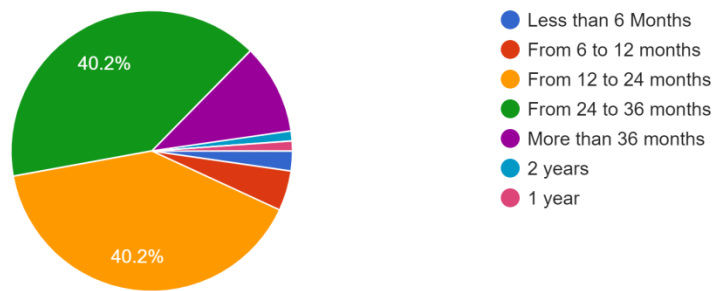


Figure 3: The Average Project Duration

This part was intended to discuss with the respondents about the prequalification of contractors, where it was known to what extent the importance of prequalification is reached and differing views were obtained, but the vast majority recognized its importance.

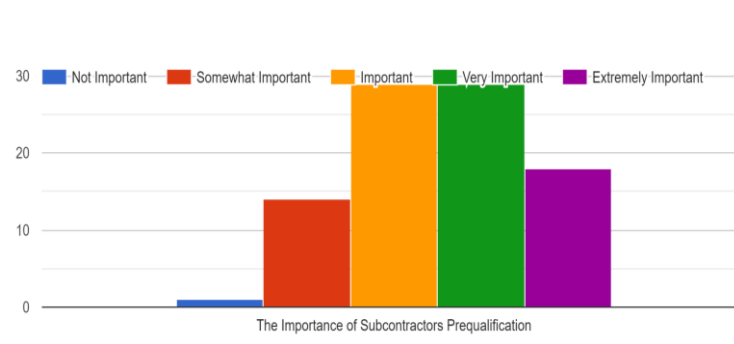


Figure 4: Importance of Subcontractors Prequalification

Most Important Considerations in Prequalification:

It is concluded that the most important considerations that must be taken into account in the pre-qualification process are:

- Work Volume.
- Work type.
- Work criticality.

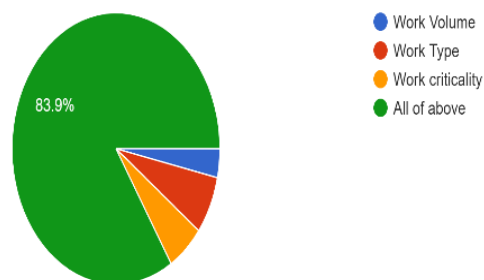


Figure 5: Most Important Considerations in Prequalification

The Stage Should We Conduct Prequalification:

Another important question is knowing at what stage from the respondents' point of view the pre-qualification procedures should be carried out, and the vast majority were in favor of 44.8% being in the pre-tender stage, while 35.6% were concern prequalification procedure to be in the same tender stage.

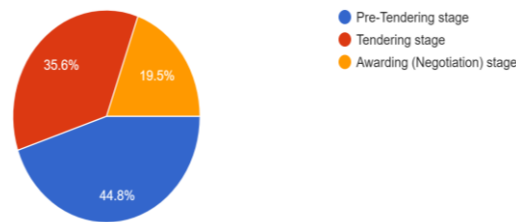


Figure 6: The Stage Should We Conduct Prequalification

Most Important Factors Affecting Pre-qualification:

Finally, the most important questions were reached, and on the basis of which the most important factors affecting the qualification of subcontractors are determined.

As we have seen in previous researches, some important factors that were addressed in various researches were identified, in addition to practical experience in contracting companies, as well as looking at the recommendations of the FIDIC, some factors were identified and a questionnaire was collected about them, and they are as follows:

1. Quality
2. Safety
3. Financial Capacity
4. Resources
5. Complete required data
6. Past experience in similar projects
7. Subcontractors organization

The results show that the highest factors are quality and work on projects similar to the project that is being tendered.

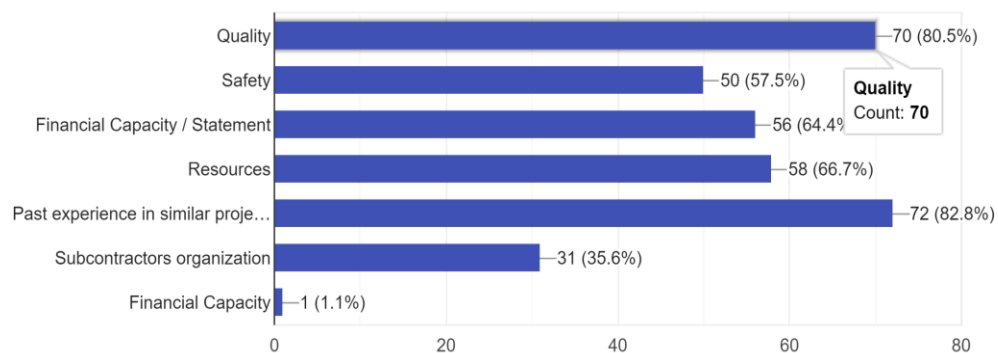


Figure 7: Most Important Factors Affecting Pre-qualification

The department should be owner of doing prequalification:

There is a lot of debate in some contracting companies about the administration responsible for the pre-qualification procedures, as it is one of the new things in contracting companies in Egypt, and it was necessary to know the different views in this regard, so the following question was asked, which is from the point of view of the respondents Who is the department responsible in the contracting companies for the procedures that pre-qualified the contractors, and the highest percentage was for the procurement department, followed by the tender department.

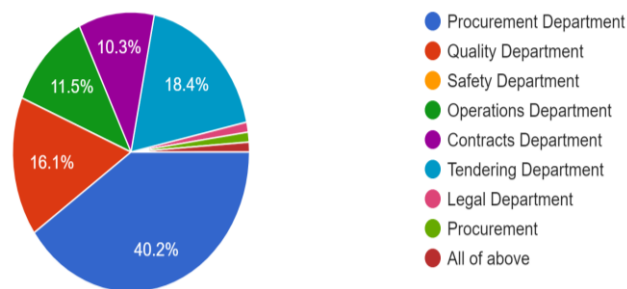


Figure 8: Department Should Be Owner of Doing Prequalification

The following question (and it is an optional question) came to know the reasons for selecting any of the respondents for the department responsible for the pre-qualification procedures from their point of view, and despite it being an optional question, the response came from 37 respondents, and the following are some of the answers in particular that are related choosing the procurement department to be responsible for the pre-qualification procedures:

- Procurement department is the responsible to issue the sub-contract. They need to verify the data.
- In fact, a specialized supporting division shall be responsible for sourcing, assessment and segregation of all subcontractors, some of the major companies in Egypt indeed have this department under the name of "Sourcing Department".
- Because it will be the department responsible for contacting with the subcontractor and following up with him during the project execution.
- They are direct contact with subcontractors and to collect feedback from company department.
- If the company involves some traces of functional management, then Procurement Dept. must have the ability to asses SCs, otherwise if the company is projected then the Operation must do.
- Because it is the first department deal the subcontractors.
- This is according to my organization procedure, and may be delegated to tendering and operation departments, for small scale subcontractors, also the Quality and safety have their share for case of evaluation of Big scale subcontractors.
- Procurement department should act as database of qualified subcontractors for Tender and operation departments.
- Procurement Department is the first step of communication with subcontractor.
- Procurement department is the owner of job and make required analysis, but the all department must be share in this evaluation with suitable weight for each department.
- Their prime job, they have the resources and caliber to do this task effectively, or they should have.

Subcontractor Organization:

The Importance of Outline of the Applicant’s system for project control such as risk, cost control and time control:

According to the recommendations of the FIDIC in the prequalification procedures for contractors, knowing the applications applied in subcontractor’s company for different departments is important, such as the planning, cost and risks departments, from the points that should be included in the prequalification process, so I made sure to clarify about them and the opinions of the respondents on this point, and the result was that (Important), In Addition:

- The importance of past experience for relevant projects.
- The importance of numbers of years as main subcontractors.
- The importance of company organization chart.
- The importance of total amount of previous projects, and the total amount of current year projects.

- The importance of company record in cases or arbitration in contracts executed during the last six years, or the current projects.

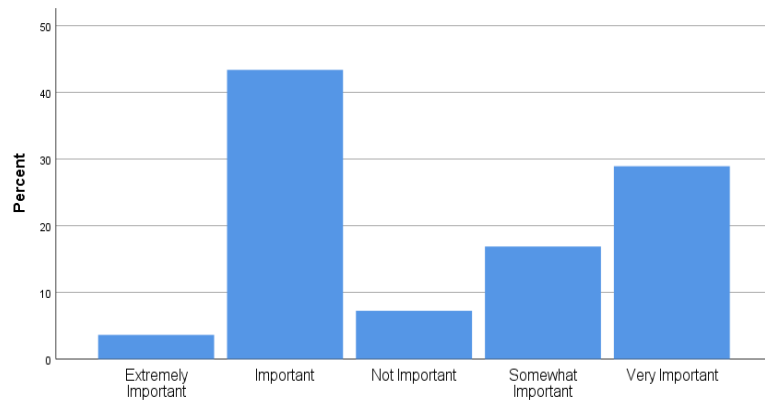


Figure 9: Importance of Outline of the Applicant's system

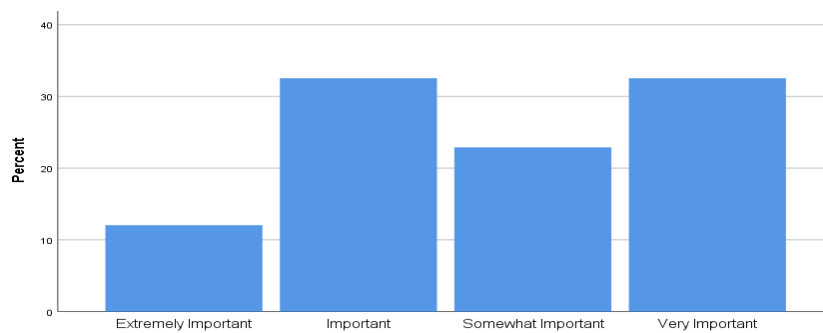


Figure 10: Importance of past experience for relevant projects

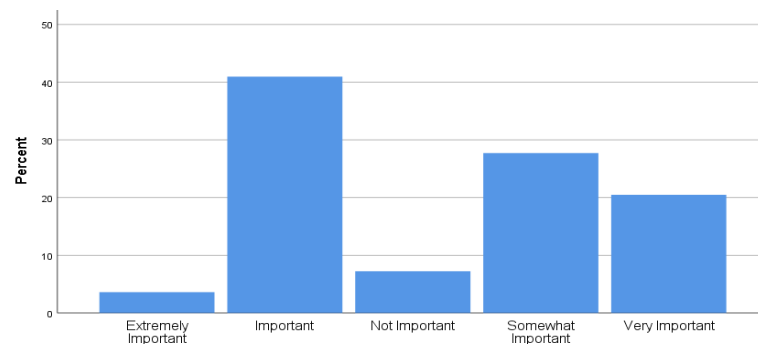


Figure 11: importance of numbers of years as main subcontractors

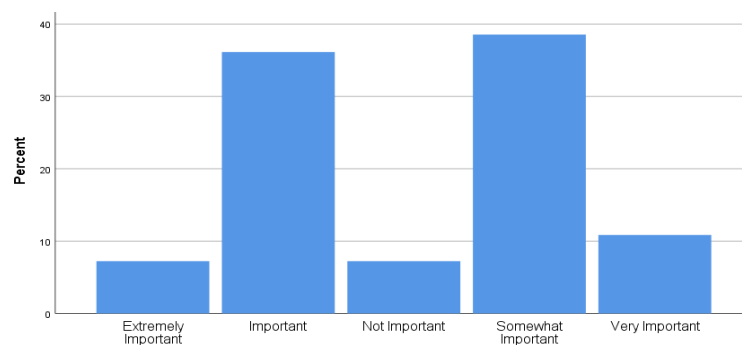


Figure 12: importance of company organization chart

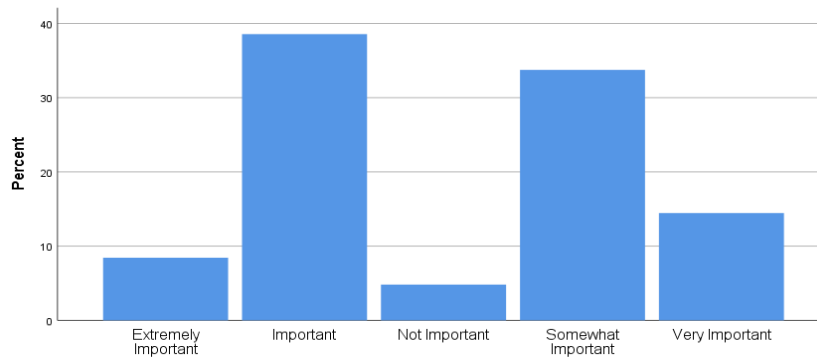


Figure 13: importance of total amount of previous projects, and the total amount of current year projects

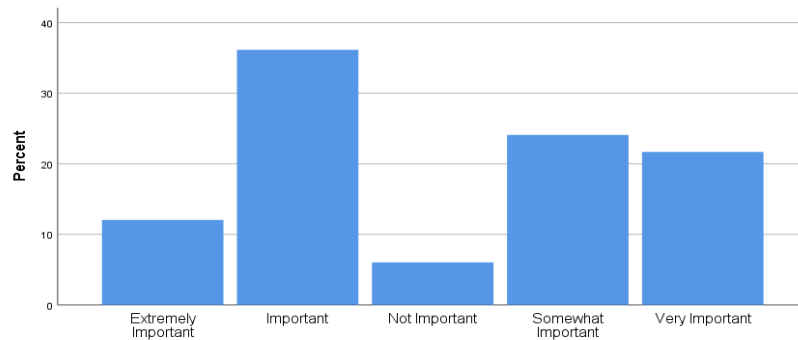


Figure 14: importance of company record in cases or arbitration in contracts executed during the last six years, or the current projects

Subcontractors Resources:

Another factor is the resources of the subcontractor for who advances the pre-qualification, and in my opinion it is one of the most important factors, as the subcontractor’s strength and capabilities to participate in the project’s work show, especially if it is one of the important projects or those of a special nature.

- Importance of managerial and presentation skills for key persons.
- Total number of onsite technicians –e.g. carpenter, electrician, mason, painter, etc.
- Number of engineers on project sites.
- Provide with list Include the main items of construction equipment, which are available to be used for project.
- In the industrial projects, or special works in some projects, the importance of possibility of self-manufacturing and preparations.

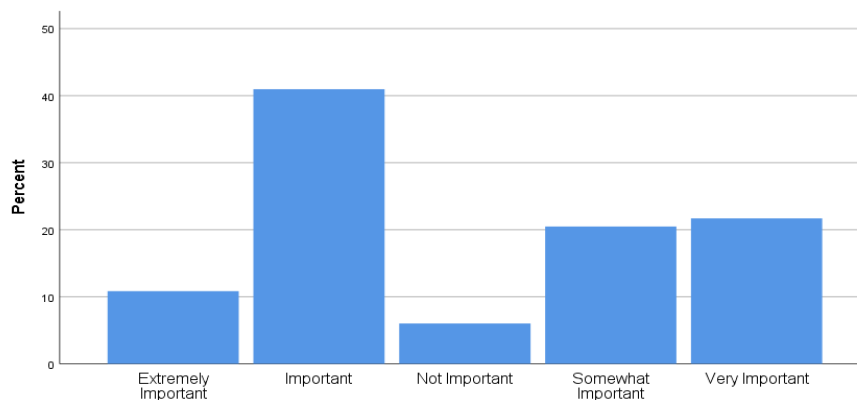


Figure 15: Importance of managerial and presentation skills for key persons

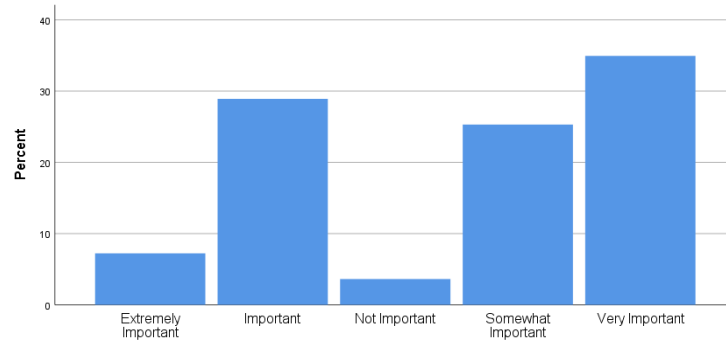


Figure 16: Total number of onsite technicians –e.g. carpenter, electrician, mason, painter, etc.

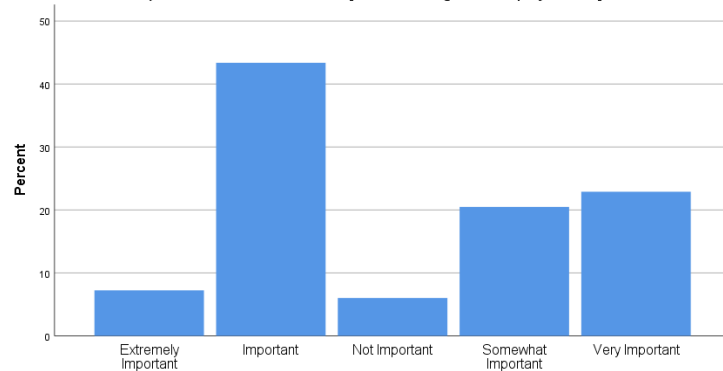


Figure 17: Number of engineers on project sites.

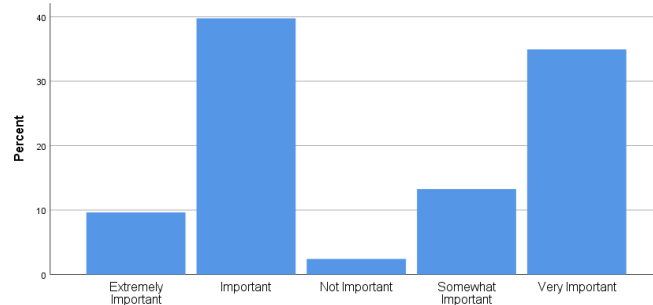


Figure 18: Provide with list Include the main items of construction equipment, which are available to be used for project.

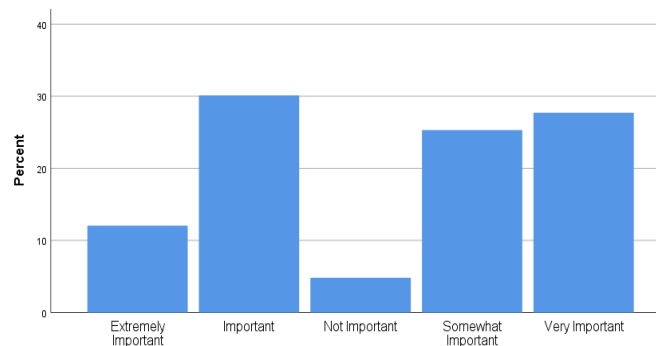


Figure 19: In the industrial projects, or special works in some projects, the importance of possibility of self-manufacturing and preparations.

Systems & Applications:

The last factor chosen based on FIDIC recommendations is the importance of describing the operations management system in the contractor entity, such as risk management, cost and time control, and the questionnaire was conducted as follows:

- The importance of describing the subcontractor operation management system for project control such as risk, cost control and time control.
- The importance of describing the subcontractor Quality System.
- The importance of describing the subcontractor Health and Safety System.
- The importance of the list of the projects undertaken in the last five years under the above systems.

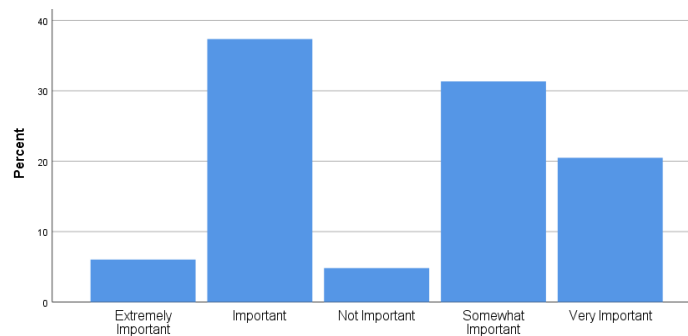


Figure 20: The importance of describing the subcontractor operation management system for project control such as risk, cost control and time control.

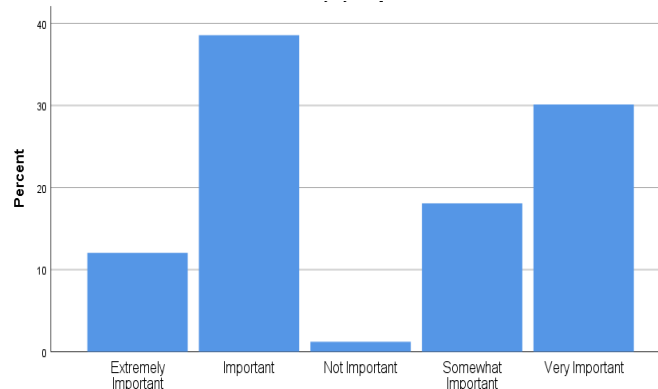


Figure 21: The importance of describing the subcontractor Quality System.

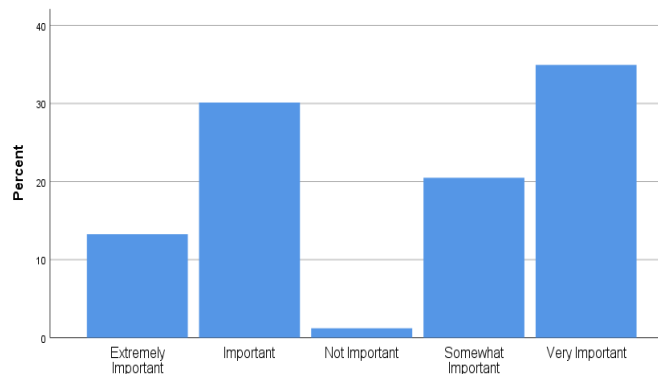


Figure 22: The importance of describing the subcontractor Health and Safety System.

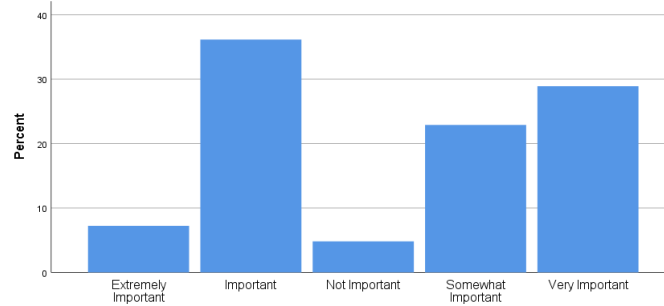


Figure 23: The importance of the list of the projects undertaken in the last five years under the above systems.

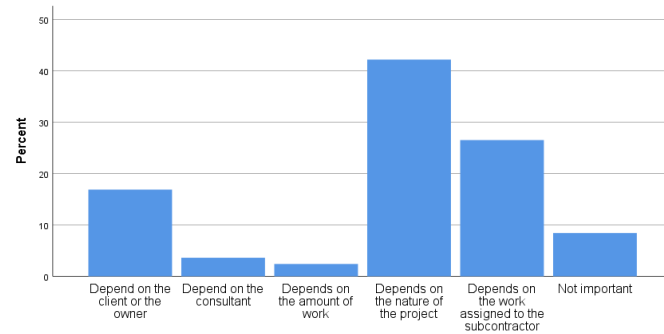


Figure 24: The importance of certificate with ISO 9000 - Quality Management.

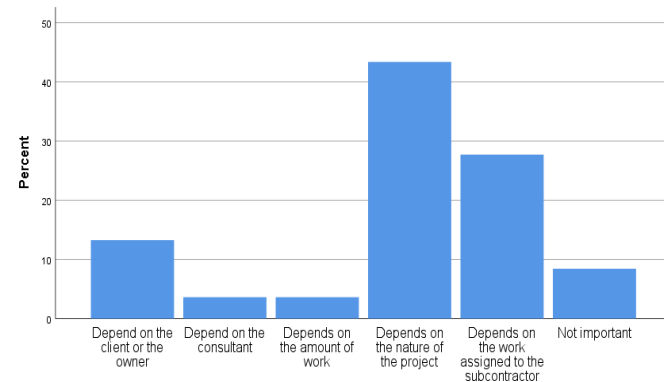


Figure 25: The importance of certificate with ISO 31000: 2018 - Risk Management

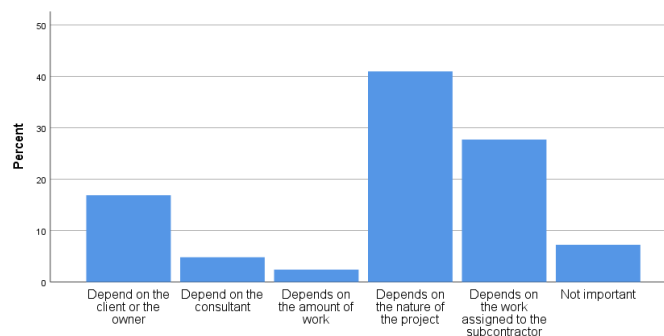


Figure 26: The importance of certificate with 9. ISO 45001 – Occupational Health and Safety

The impact of the Corona pandemic on the prequalification of contractors.

After the Corona pandemic invaded the world this year, and after it greatly affected all stages of life, it became very necessary to take it into account, especially as it directly affected businesses, and also because there is no specific date for its end, and it is also useful to take it into account In order to avoid any other damages that may result from a similar pandemic in the future, we take the lessons learned from them as much as possible, so this section of the questionnaire, and the following shows the results that have been reached:

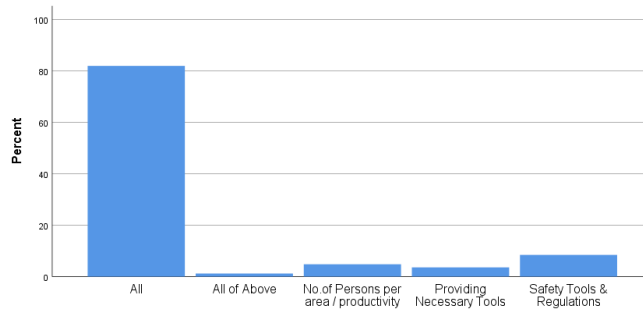


Figure 27: After the Covid-19 pandemic, what are the factors that should be taken into consideration from your point of view

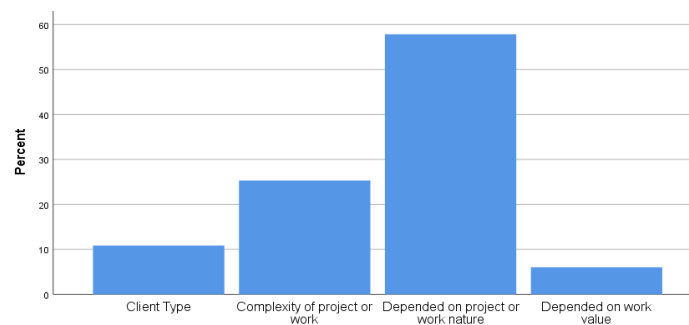


Figure 28: When is it necessary, to check an accredited certificate such as ISO with the contractor for approval

V. CONCLUSION

The paper reached a set of important results, especially the impact of factors related to sub-contractors such as years of experience, the nature of the jobs in which they work, the nature of the roles they perform, years of experience, the reputation of the contractor, the number of projects that the sub-contractor is managing at one time, and other factors related to the sub-contractor. The results of the chapter also indicated a group of related factors such as quality management, quality systems, risk management and other factors that affect the nature of prequalification of subcontractors and the success of construction projects.

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