

The Role of Contractor's Experience Factors In The Process of Prequalification for Green Buildings Projects.

Ali Abdullah Najm Najm, Ashi Pelin Grgn

Abstract: Few numbers of articles dealt with the factors that affecting the selection of contractors in green buildings.

This study has conducted to identify the Role Of Contractor's Experience Factors In The Process Of Prequalification For Green Buildings Projects. A total of four sub-factors which are (Experience In Delivering Green Building, The Contractor's & Sub-Contractors Experience In Construction Of Intended Product/Project Type, Recommendation Letters From Past Client, Past Health And Safety Performance); Classified as being used widely in the process of contractors' prequalification in Turkey, and falls according to the opinion of the experts under the factor of Contractor's Experience. These sub-factors have extracted from a rigorous literature review of a gross 120 articles published in the past 18 years. Then nine extensive interviews have established with engineers and architects who enrolled in Green Building projects, to score the above-mentioned sub-factors relatively on a scale from (1 to 9) to facilitate the utilization of the Analytical Hierarchy Process method (AHP). To avoid any variations in the expert's opinion regarding the priorities Geometric Mean was adopted, and finally, the weight of the sub-factors that used during the process of selection has determined. The results showed that the factors are ranked as the following: (Experience In Delivering Green Building), (The Contractor's & Sub-Contractors Experience In Construction Of Intended Product/Project Type), (Past Health And Safety Performance), (Recommendation Letters From Past Client) Respectively. Furthermore, both of (Experience In Delivering Green Building), and (The Contractor's & Sub-Contractors Experience In Construction Of Intended Product/Project Type) have recognized as dominant factors with a total weight of 58.5%. according to the calculations that based on the evaluations of interviewees. This study aids to minimize the potential risks associated with the decision-making process, which related to the selection of the best contractor. In other words, it helps to award the project to a contractor who can achieve the successful completion of the project, with a preliminary guarantee of attainment for Green Certificate for it through the accumulated experience in this area

Index Terms: Contractors Prequalification, Green Buildings, Contractor's Experience, Green Certificate.

I. INTRODUCTION

According to the dictionary of Cambridge the definition of Experience is known as an event or occurrence which leaves an impression on someone.

It is vital to check Contractor's Experience before awarding any project in order to get the job done correctly; That plus, the inclusion of Contractor's Experience is to ensure that the contractor has experience in a similar sort of projects, particularly as this project is to be of a high-quality standard. Many contributions throughout the literature indicated that there is a large degree of relation connecting the projects delay and the past contractor's experience. However, the Green Building Projects has no exception from the fact mentioned above. Green building projects include some activities that are atypical compared to conventional buildings projects. Such new activities have characterized by risky uncertainty, and they incur hidden costs that have not anticipated, nor are they easily identified by the owners. Therefore, many researchers tried to pave the way for the owners to overcome this issue, for instance (Dong, Zhang, & Yu, 2011) conducted qualitative and quantitative research and came up with an approach in which owners can choose contractors for future projects. The method revolves around contractors with experience in attaining Green certification for Green Building Projects, was overall more desirable and had a better competitive advantage over others through the experience.

(Pelin Gurgun & Ozbek, 2017) identified essential factors in the selection process of contractors in Green Building projects, which are considered as important for the successful completion of the projects, by intensive review of the literature; it is found that Price, Managerial Approach, Experience In Green Building Projects, Technical Approach, Certification System Procedures, Qualifications, and Past Performance, were defined as important in the selection of contractors in Green Buildings. Moreover, the owner is required to award the project to a contractor that can manage requirements of the certification systems and application processes and has experience in utilizing green products, in order to ensure the delivery of a Green Certified Building; Such a goal couldn't be achieved without an experienced contractor who has familiarity with the aforementioned.

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II. RESEARCH OBJECTIVES

The main objective of this study is to characterize the effect of the Contractor's Experience on the decision of the prequalification process in Green Building projects, in particular, thus contributing to understanding the role of this factor and its components in the success of completion of the green building projects by ensuring all the preliminary means to attain the Green certification for the project.

III. RESEARCH METHODOLOGY

This study cares about the creation of the perception about the role of Contactor's Experience components, in order to focus on, during the process of prequalification so that awarding the project to a contractor who can fulfill owner's goals regarding Green Building project.

To achieve this, a strategy of four phases have adopted, as follows:

1. The first phase considered a summary of the literature review regarding the factors used in the prequalification process.
2. In the second phase, the factors that were found in the first phase been filtered by experts to be homogenized with the set of factors used in Turkey by removing the uncommon ones.
3. In the third phase, the Microsoft Excel Program was employed to apply AHP method based on experts' evaluation of pairwise comparisons of the factors to calculate the components weights of Contractor's Experience.
4. Finally, writing up the conclusions and recommendations.

IV. POPULATION AND SAMPLE SIZE

The targeted experts' group comprises of Engineers, Architects, and Managers; From different companies with various years of experience and have direct contacts in their jobs to the contractors' evaluation, projects award juries, and supervision and management of construction projects in Turkey. The experts' got their experiences through their extensive career in private sector companies which implemented hundreds of projects both locally and globally. A total of nine comprehensive interviews were conducted to evaluate the Components of Contractor's Experience based on pairwise comparisons; with a detailed explanation regarding their perspectives. Figures (1), (2) & (3) shows the distributions Years of expert's personal experience in green building, Years of personal experience in the construction sector, and Number of green building projects that expert participated in, Respectively.

V. CONTRACTOR'S EXPERIENCE ROLE IN THE PROCESS OF PREQUALIFICATION

Contractor prequalification enables owners to shortlist contractor's Experience, and Capability to boost the chances of project success (Iyer & Banerjee, 2016). It is known that an inexperienced contractor creates a significant risk to the success of the project so that it could lead to delays, difficulties achieving Green Certification, and utilization of

unsuitable material. The accumulated experience aids in tackling unanticipated problems that could be encountered during construction. Many researchers have focused on the

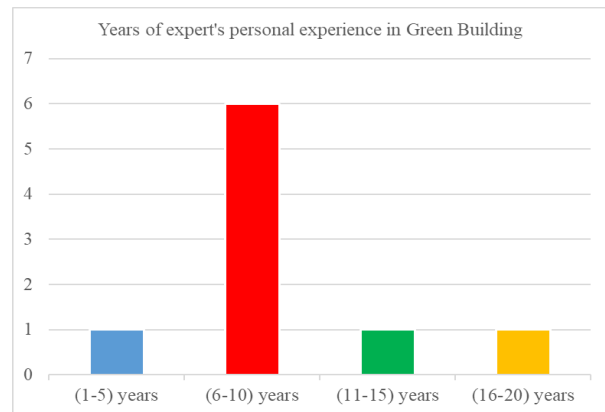


Figure (1) Years of expert's personal experience in Green Building

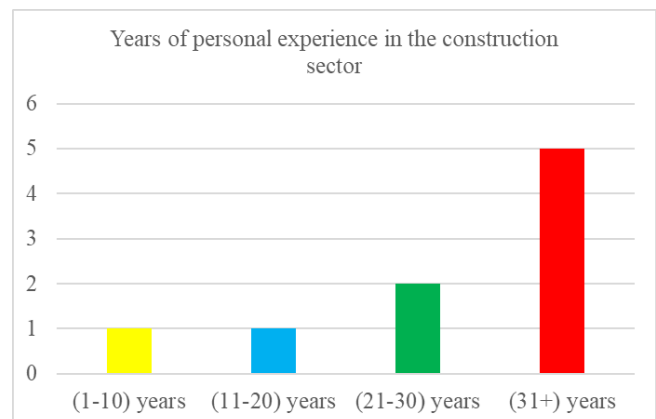


Figure (2) Years of personal experience in the construction sector

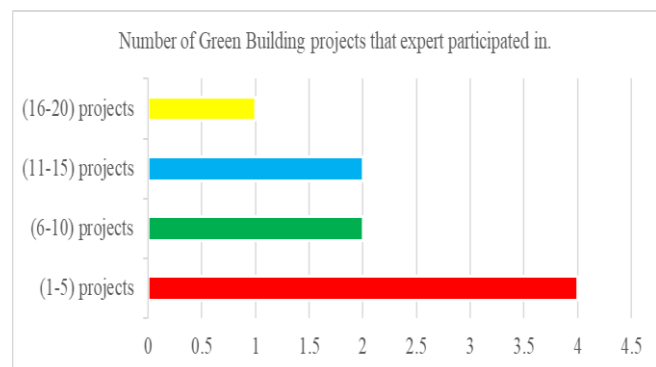


Figure (3) Number of Green Building projects that expert participated in.

Contractor's Experience, subsequent to that, it has assessed under many various titles such as Past Performance, Experience, The Past Project Performed, etc. This process requires evaluating project history records of the potential contractor in order to decide whether or not he has dealt with projects of similar scope and complexity in the past or currently.



Contractor's Experience normally depends on Experience, Capability Of Technical Personnel, The Complexity Of Work Performed, Current And Performed Work, and Level Of Technology (Elsayah, Gupta, & Zhang, 2013). According to the opinion of the experts in our research, the components of Contractor's Experience that being used in the Prequalification process for the contractors in Green Building projects in Turkey are as the following: According to the opinion of the experts in our research, the components of Contractor's Experience that being used in the Prequalification process for the contractors in Green Building projects in Turkey are: Experience In Delivering Green Building, The Contractor's & Sub-Contractors Experience In Construction Of Intended Product/Project Type, Recommendation Letters From Past Client, and Past Health And Safety Performance.

A. Experience In Delivering Green Building

Experience In Delivering Green Building is considered an important factor and should be prioritized when considering a Green Building Project; Moreover, Experience in Delivering a Green Building project is a sensitive factor, especially for the owners who are planning to attain a Green Certification, and it means that a contractor and staff should be familiar with and knowledgeable about the procedures, regulations, and process.

B. The Contractor's & Sub-Contractors Experience In Construction Of Intended Product/Project Type

The contractor has to show the participation in other previous projects, especially if they are similar to the intended project (Nieto-Morote & Ruz-Vila, 2012). Owners tend to award their projects to a contractor that has the desired qualification, which makes him satisfy with contractor's capacity by means of working staff experiences and skills, and sub-contractors, and experience with same project type and size. It is advised to select a contractor who has experience with comparable projects in the past; this can be attributed to the finding of a research conducted by (Alzahrani & Emsley, 2013) in which stated that the type of project completed has an impact on project success.

C. Recommendation Letters From Past Client

The recommendation letter is written usually by the past owner; In which he could recommend the contractor to the potential owner. This document also includes the evaluation of quality for the performed work, the capabilities, and characteristics of the contractor being recommended in terms of individual's ability to deliver a particular task or function. What is known about this factor is that owners who have never awarded a Green Building project, tend to ask for a reference letter from the prior owner to take a perception about the Contractor's Experience and capabilities.

D. Past Health And Safety Performance

The construction industry is well known that it has as the highest accident and related illness records over any industry sector. It has been classified as one of the most dangerous industries in the world (Aksorn & Hadikusumo, 2008).

Accidents occurrence on site leads to suspensions, cost increment, and wastes; In other words, more of waste polluting the environment, which results in difficulties in attaining the Green Certificate. The selection of contractor with a good safety record reduces the potential of cost overrun of construction and a helps to achieve the desired quality and within the planned time, thus contributing to achieving project success (Hatush & Skitmore, 1997).

VI. CALCULATIONS

The interviewees have asked to give their opinions and score the sub-factors of Contractor's Experience in case of being used in the prequalification factors for contractors in Green Building projects in Turkey, from {1 to 9}, where {1} represents equal importance and {9} represents very high importance. Based on the above, the experts quantified the relative importance for each factor. Accordingly, the four sub-factors have pairwise compared; Then, the Geometric Mean was adopted to avoid any variations in the expert's opinion regarding the priorities. Thus the Analytical Hierarchy Process (AHP) method has used to calculate the relative weight of the components. The Consistency Ratio (CR) has also calculated at each stage to be sure that (CR) was not exceeding 10% according to AHP for sound decisions. However, in case that (CR) exceeds 10%, the entries reviewed with the experts. Table (1), (2), (3), & (4) shows The Geometric Mean Of Contractor's Experience Sub-Factors, The Relative Weight Of The Selection Factors, The λ Matrix, The Consistency Ratio Check Table; Respectively.

VII. RESULTS & DISCUSSION

Based on the values that have obtained from the calculations and which shown in the Table (2), the factors were ranked according to their overall priority based on AHP method, as follows: : EP_1_(Experience In Delivering Green Building), EP_2_(The Contractor's & Sub-Contractors Experience In Construction Of Intended Product/Project Type), EP_4_(Past Health And Safety Performance), EP_3_(Recommendation Letters From Past Client) Respectively. Furthermore, The results have indicated that both of ((Experience In Delivering Green Building), and (The Contractor's & Sub-Contractors Experience In Construction Of Intended Product/Project Type) have recognized as dominant factors with a total weight of 58.5%. By reviewing factor's weight, comes into minds, many reasons regarding the scores which led to these results. The Geometric Mean, showed that the factor of (Experience In Delivering Green Building) versus factor of (The Contractor's & Sub-Contractors Experience In Construction Of Intended Product/Project Type), and (Past Health And Safety Performance) have scored with a relatively same score; which means that the decision makers put the same degree of importance on each of these factors during the process of selection. This convincing really emphasizes that decision makers are obliged to pay equal attention to both factors.



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On the hand, it is quite critical to check the past experience of the contractor is such risky project which needs a contractor whom enough knowledge about the procedures and green materials to ease the potential difficulties during the process of rating to gain Green Certification.

On the other hand, checking (Contractor's & Sub-Contractors Experience In Construction Of Intended Project Type) has to be paid the equal amount of attention with the factor of (Experience In Delivering Green Building); Because owners tend to mitigate such risks associated with contractors/and or sub-contractors who have no experience with the construction on the intended projects; Also the lack of experience lead to delays and problems related to quality (Aditi, 2014). At the same time, during awarding a project with the intention of attaining green certificate drives the decision maker to avoid the contractors with a negative performance record of health and safety.

Despite the importance of the factor of (Recommendation Letters From Past Client), but it is noted that it got minimum scores than each of (Experience In Delivering Green Building), (The Contractor's & Sub-Contractors Experience In Construction Of Intended Product/Project Type), and (Past Health And Safety Performance) factors. This can be traced to the opinion of experts, which provides that it is vulnerable

to the lack of reliability because of the potentiality of bias by the past owners.

VIII. CALCULATIONS & RECOMMENDATIONS

The results confirmed that AHP based on a scientific basis, and it is free from bias and intuition in the scores method. Also, the results reflect the extent of reliability of AHP where all factors were pairwise compared. Moreover, the comparison matrix has subjected to the Inconsistency check, which indicated the soundness of the judgments. The results have presented numerical values to be utilized by the decision maker during the process of Prequalification for Contractor's Experience in Green Buildings in Turkey. Moreover, it summarized approximately equal relative weight for each of (Experience In Delivering Green Building) versus factor of (The Contractor's & Sub-Contractors Experience In Construction Of Intended Product/Project Type), and (Past Health And Safety Performance) factors; Indicated the domination of both (Experience In Delivering Green Building), and (The Contractor's & Sub-Contractors Experience In Construction Of Intended Product/Project Type) factors over other factors which urges the Decision Maker to put relatively more attention for Green Buildings & Projects type and guarantee initially the success of the project.

This study expected to aid the decision makers in qualifying the best contractor to the final selection stage in Green Building Projects. That would lead to achieving owner's objectives, in particular, the successful completion of their projects and attaining a Green Certificate for it, through the utilization of contractor's accumulative experience in both of Green Buildings and construction field in general.

The findings from the study present an idea about the role played by each factor on the final decision during the process of prequalification.

The importance of Experience In Delivering Green Building is driven from the fact of aiming building a Green Certified building. Therefore, it is essential to award the project to a well-experienced contractor and providing ensures for this objective, by minimizing the risks associated with a contractor who lacks knowledge in procedures and Green materials along with the rating systems.

The results suggest focusing on contractor's as well as sub-contractor's experience in the construction of the intended project; cause owners tend to avoid the uncontrollable risks associated to the selection of contractors and those who have inexperienced subcontractors who lack the experience in constructing of the intended project type and size. Otherwise, the venture of getting into such a risk leads with high expectation, to quality problems or cost overrun. all factors during the process of prequalification to mitigate the risks associated to the lack of experience in

Owners who aim to gain a Green Certificate prefers to award their projects to contractors with excellent health and safety record. Otherwise, they cannot apply for the Green Certification. The consequences of selecting a contractor who pays no attention to this important element lead beyond doubt to suspensions, material, and moral damages.

It is obvious from the results that owners don't put much attention to the factor of the Recommendation Letter, cause it is prone to biases. Some experts claimed that the past owner could be contractor's relative or friend, such cases would bring a non-transparent image about the reality for the decision maker. However, the Recommendation Letter could give in some cases, perception of the Contractor's Experience and capabilities, especially the fact of the inability of gaining this kind of letter without earning the satisfaction of the past owner.

Despite the previous, the study has flaws due to the lower number of the interviewee and the confine the study to the local private sector only, which asks for the recommendation of increasing the sample size by conducting the interviews with more experts in both in the private and public sectors locally and/or globally.

No	The Sub-Factors	Code	EP_1	EP_2	EP_3	EP_4
1	Experience In Delivering Green Building	EP_1	1	1.08	2.09	1.08
2	The Contractor's & Sub-Contractors Experience In Construction Of Intended Product/Project Type	EP_2	0.93	1	2.26	1
3	Recommendation Letters From Past Client	EP_3	0.48	0.44	1	0.5
4	Past Health And Safety Performance	EP_4	0.93	1	2.01	1
n =	4	SUM	3.33	3.52	7.36	3.58

Table (1) The Geometric Mean Of Contractor's Experience Sub-Factors.

No	The Sub-Factors	Code	EP_1	EP_2	EP_3	EP_4	Weight of the factors
1	Experience In Delivering Green Building	EP_1	0.3	0.31	0.28	0.3	29.80%
2	The Contractor's & Sub-Contractors Experience In Construction Of Intended Product/Project Type	EP_2	0.28	0.28	0.31	0.28	28.70%
3	Recommendation Letters From Past Client	EP_3	0.14	0.13	0.14	0.14	13.60%
4	Past Health And Safety Performance	EP_4	0.28	0.28	0.27	0.28	27.90%
							100%

Table (2) The Relative Weight Of The Sub-Factors.

No	The Sub-Factors	Code	EP_1	EP_2	EP_3	EP_4	Σ Factors Weights	C.VALUE = Σ Factors Weights / Weight of the Factors
1	Experience In Delivering Green Building	EP_1	0.3	0.31	0.28	0.3	1.19	4.003
2	The Contractor's & Sub-Contractors Experience In Construction Of Intended Product/Project Type	EP_2	0.28	0.29	0.31	0.28	1.15	4.003
3	Recommendation Letters From Past Client	EP_3	0.14	0.13	0.14	0.14	0.54	4.001
4	Past Health And Safety Performance	EP_4	0.28	0.29	0.27	0.28	1.12	4.003
							Sum	16.01

Table (3) The λ Matrix.

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λ max	C.Value/n
λ max	4.00
Consistency Index (CI)	$(\lambda \text{ max} - n)/(n-1)$
Consistency Index (CI)	0.00
Random Index for (n=4)	0.9
Consistency Ratio (CR)	CI/RI
Consistency Ratio (CR)	0%

Table (4) The Consistency Ratio Check Table.

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sectors such as construction, logistics, education and finance about risk management, project management. Before this, she worked as a teaching and research assistant at Bogaziçi University, Istanbul, where she received her PhD by completing her dissertation on risk analysis in construction sector. She coordinated several construction projects in Russia during her master studies. She visited Northeastern University, Boston as a visiting research scholar. Her areas of interest include risk management, sustainable structures, decision-making models in construction projects and public-private partnerships. She authored and co-authored more than fifty journal and conference papers in collaboration with colleagues from various academic and professional institutes in Turkey, USA, Italy and Poland.

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