Resilient Structures and Sustainable Construction
Edited by Pellicer, E., Adam, J. M., Yepes, V., Singh, A., and Yazdani, S.

ISBN: 978-0-9960437-4-8

FACTORS AFFECTING THE SELECTION OF CONTRACTORS IN GREEN BUILDING PROJECTS

ASLI PELIN GURGUN[1] and MEHMET EGEMEN OZBEK[2]

[1]*Dept of Civil Engineering, Yildiz Technical University, Istanbul, Turkey*
[2]*Dept of Construction Management, Colorado State University, Fort Collins, USA*

The growing interest in sustainable design and construction introduces new set of risks specific to green building projects. One of the challenges in green building projects that require special consideration is the selection of the appropriate contractors to ensure that the targeted sustainability goals of the projects will be achieved. Rapid growth of green building movement requires that contractors that are willing to be active in sustainable construction learn green building rating systems, application processes, green products, and related laws and regulations. This study investigates major factors affecting the selection of contractors that will be responsible for the construction of projects aiming certification through green building certification systems. An extensive literature survey was completed to identify the significant factors in the selection process, which are important for the successful completion of the projects. It is found that experience in green building projects and certification system procedures, managerial approach, technical approach, price, past performance, and qualifications are important in the selection of contractors in green buildings.

Keywords: Certification systems, Sustainability, Contractor selection.

1 INTRODUCTION AND PURPOSE

Construction activities result in adverse environmental impacts globally. According to the United States Department of Energy (2013), buildings produced 40% of the carbon emissions in 2009. In OECD (Organization for Economic Cooperation and Development) countries and Europe, buildings use 25-40% and 40-45% of the total energy, respectively (United Nations Environment Program 2007). Since use of resources such as energy, water, materials, and land impacts the environment, processes of construction and constructed facilities are considered critical for sustainability efforts (Kubba 2010). Construction activities can be the source of several adverse impacts on the environment because manufacturing and transporting building materials consume energy and generate emissions linked to global warming (Lippiatt 1999). Given this, using resources efficiently and minimizing negative impacts on the environment have become an important goal in the construction industry. As a result, the interest in green building is growing, which creates new business opportunities across the world.

According to World Green Building Trends 2016 report, which is based on survey responses from 70 countries, respondents expect 60 percent of their projects will be green by 2018 (Dodge Data and Analytics 2016). The interest is not a trend localized to one country or region; and green building is a growing business around the world (World Green Building Council 2017). Influences of sustainable practices can be observed in construction sectors of both developing and developed countries.

Several green building rating systems are used to certify buildings, providing "green building" recognition. While some countries develop their own systems, such as Leadership in Energy and Environmental Design (LEED) in the U.S., BRE Environmental Assessment Method (BREEAM) in the United Kingdom, Green Building Council of Australia Green Star (GBCA) in Australia, DGNB in Germany, Comprehensive Assessment System for Built Environment Efficiency (CASBEE) in Japan, Estidama in U.A.E., and Hong Kong Building Environmental Assessment Method (HK BEAM), some others prefer to adopt one of these already-developed tools. These tools involve several procedures to rate the sustainable practices; and buildings earn points to get certified.

There are different factors encouraging sustainable construction and applying for a certification system other than just building environmental-friendly structures. These include incentives related to tax/loan discounts, low financing rates, reputation, marketing advantages and competitiveness etc. that attract developers, owners and investors. In some countries or provinces, public authorities even mandate sustainable buildings and require certification by a recognized green building certification system. In order to make use of such benefits, it is important to complete the projects according to the requirements of the certification systems.

The growth in the global green building sector introduces new challenges to consider for successful completion of sustainable projects. One of the prevailing challenges is the selection of contractors; as success of the projects depends largely on this process (Xia *et al*. 2009). A contractor can provide suggestions in material selection, system performance, decreasing construction waste etc. (Syal *et al*. 2007). Most of the time, contractors are widely viewed as brokers of construction labor, however the role of them needs to be recognized to be more involved as sustainable buildings gather momentum in the construction industry (Riley *et al*. 2003). This is mostly because contractors take full responsibility for coordination and project control (Xia and Chan 2012). This makes it critical for the owner to select the appropriate contractor to achieve the desired sustainability measures.

The selection of contractors includes evaluation of several attributes that owners seek based on the characteristics of the projects. In case of green building projects, these attributes seem to stand, but additional factors are also observed specific to sustainable projects. The objective of this study is to investigate major factors affecting the selection of contractors that will be responsible for the construction of projects aiming certification through green building certification systems. An extensive literature survey revealed that several factors such as experience in green building projects and certification system procedures, managerial approach, technical approach, price, past performance, and qualification are identified as prominent factors in green building projects. The following section explains these factors and their roles in the selection of the appropriate contractors that contributes to achievement of projects' sustainability goals.

2 GREEN BUILDINGS AND FACTORS AFFECTING CONTRACTOR SELECTION

Owner's expectations from the project and objectives define the evaluation factors affecting contractor selection process. However, it is not an easy task and utmost attention should be paid in this process (Xia *et al*. 2013). In the literature, there are several studies that investigate major aspects that owners should consider while deciding on the party that will take over the construction process. Gransberg and Barton (2007) place the factors in five categories; price, technical approach, qualification, schedule and project management. Xia *et al*. (2013) adds five more factors to Gransberg and Barton's (2007) findings, which are past performance, financial capacity, responsiveness, and legal status. Sarkis *et al*. (2012) use economic/business,

environmental and social indicators to establish a selection model based on studies conducted by RICS (2004), Labuschagne *et al.* (2005), and Presley *et al*. (2007).

Since designing and constructing using sustainable practices and certification process with a rating system are required in a green building project, additional aspects need to be considered in the selection of the contractor. Lam *et al*. (2010) found that stakeholder involvement is the most important factor in the implementation of green specifications in projects. According to a survey administered by Xia *et al.* (2015), 40% of owners of design-build sustainable projects that seek LEED certification believe that sustainability requirements should be evaluated as a separate factor category in addition to the regular aspects of contractor evaluation process. Experience in green building projects and certification system procedures, managerial approach, technical approach, price, past performance, and qualification are identified as the important factors used in contractor selection in green buildings. These factors are briefly discussed in the following sections.

2.1 Experience

Experience of the contractor in construction projects has been identified as a critical factor by different researchers (Gransberg and Barton 2007, Xia *et al*. 2013). The contractor can be a key stakeholder starting from early stages until project closeout phase. Delivery of a certified building brings out the necessity of experience of the contractor with the procedures of the rating system. Early involvement of constructors is important related to cost and schedule implications and can be helpful in educating subcontractors about LEED requirements and additional responsibilities (Syal *et al*. 2007).

Assignment of specialized personnel experience can be crucial for successful project completion. Green building projects can incur extra cost, time and effort to learn new technologies and practices (United States Green Building Council 2011). New products, materials and techniques may require expertise. Therefore, including experienced personnel that worked in a green building certified project before can be of help to achieve the aimed level of certification.

2.2 Managerial Approach

Achievement of green building certification is important for project owners; and mostly it is related to receiving benefits of financial aspects provided by authorities and financial institutes, such as incentives, tax/loan discounts, and lower financing rates (Li *et al*. 2011, Ozog, 2010). These opportunities can be major drivers for owners to seek green building certification targeting a specific certification level. In order to achieve sustainability targets and benefit from financial advantages, owners need to ensure that contractors employ a professional managerial approach. Project schedule planning for timely completion is important and management plan for cost, quality, safety and risks are critical. In general, owners should consider and evaluate the contractors' managerial capabilities for project success; and this is not different for green building projects.

2.3 Technical Approach

Higher construction standards introduce challenges in green buildings for all project parties. Credits included in green building rating systems usually require capability of suggesting possible sustainable strategies and creativity to earn points. Application and use of special techniques, technologies and materials to achieve certification demand technical proficiency and efficiency.

An inexperienced team can cause delays, creating additional cost and generating less than ideal solutions (Gurgun *et al*. 2016). Therefore, technical aspects of the contractor are regarded as one of the factors influencing the selection process.

2.4 Price

Cost of green buildings and risks impacting cost of green projects are discussed by several researchers (Katz 2003, Langdon 2007, Gurgun *et al.* 2016). Perception of higher cost of green buildings compared to non-green buildings is one of the concerns for owners in making the decision as to whether seek green building certification or not. From this point of view, price proposal of contractors is one of the factors assessed among other factors affecting the contractor selection.

2.5 Past Performances

Past performance of contractors in non-certified similar projects is as important as having experience in certified projects. Since sustainable construction is rather and relatively a new trend, contractors need to be evaluated based on their performance from previous similar projects related to budget, schedule, quality, and safety requirements (Gransberg and Barton 2007). Reputation of the contractor in the sector and the region needs to be considered.

2.6 Qualification

Xia *et al*. (2013) found that qualification is one of the most significant categories that affect the selection of the most competent contractor in their study. The also reported that 62% of the request for proposals they analyzed included qualification as an evaluation criterion. Indeed, the study, in which Gransberg and Barton (2007) analyzed 110 requests for proposals, found that qualifications of the firm and individuals were significantly more important than other evaluation aspects. Having proper licenses/resumes of key personnel in the project, business reference and certificates, and availability of sufficient staff resources constitute the underlying concept in this category.

3 SUMMARY AND CONCLUSION

Sustainable construction practices and green buildings are increasing across the world, bringing additional concerns in successful completion of the projects. Selection of the appropriate contractor is one of the most critical decisions that can affect the success and achievement of sustainability targets in sustainable projects. These projects not only involve rather common factors that affect contractor selection in conventional projects, but also include aspects specific to green buildings. Implementation of advanced techniques, technologies, systems and materials, and procedures related to green building certification systems introduce new set of circumstances that need attention of owners. The owner is required to identify a contractor that can lead requirements of the certification systems and application processes, has experience in using green products, and keep up with existing regulations and financial incentives that the project can benefit from.

This study represents an initial step in identifying the factors that might influence the green building owner's perspective in selecting the most appropriate contractor. For this purpose, a literature survey is conducted and the highlights from this effort are summarized in the paper. It is found that experience in green building projects and certification system procedures, managerial approach, technical approach, price, past performance, and qualifications are

important in the selection of contractors in green buildings. Future research is needed to verify/validate the initial list of factors presented herein (which was solely derived from the literature) by getting the input from owners of a variety of green building projects. Once that is done, further studies can be conducted to develop a multi criteria decision-making tool that the owners can use to select their contractors for green building projects.

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