

BARRIERS TO ADOPTION OF SUSTAINABLE CONSTRUCTION PRACTICES IN KHULNA CITY

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ABSTRACT

Project Management is very vital in the construction industry and sustainability is concerned with minimization of negative environmental impacts and overwhelming unease over climate change. Nowadays, sustainable construction has become a key demand in the construction industry globally. However, sustainable construction in Bangladesh still facing obstructions, as there is a deficiency of efficient project management framework. This study aims to identify the most influencing barriers to implement the sustainable practices in the construction industry of Khulna city of Bangladesh. Questionnaire survey and interviews have been conducted among various stakeholders and industry experts in the Khulna city area. This study has revealed that lack of knowledge on sustainable construction, lack of qualification of project manager, unfamiliarity with sustainable technologies are the main barriers for implementation of sustainable construction in Khulna city. So, this study will help the stakeholders for the implementation of sustainable construction practices.

Keywords: Sustainable Construction, Sustainability, Barriers, Stakeholders, Khulna City.

INTRODUCTION

Sustainable improvement refers to take care and minimize the potential negative environmental impacts. Sustainable construction aims to meet present day needs without compromising the ability of future generations to meet their own needs in times to come. It incorporates the best use of resources. Sustainable construction is concerned with the issues of building's design and management, material and construction technology concerning over energy efficiency.

A review of the relevant literature reveals that the condition of the sustainable construction in developing countries is not up to the mark. "Inadequate level of awareness" and "the lack of knowledge of stakeholders" are the main barriers (Serpell, Kort, & Vera, 2013). The review has also found that the main factors hindering the implementation of sustainability in the construction industry are "lack of education and training on sustainable construction (SC), technologies, capacities and, more importantly, policies for the development and successful implementation of sustainability practices."

Yang and Yang (2015) have conducted a quantitative questionnaire study. It is a qualitative interview study to establish a hierarchical model that encompasses critical factors affecting the execution of sustainable housing in Australia.

Chan, Darko, Ameyaw, and Owusu-Manu (2016) have researched with a aim to examine the criticality of various barriers preventing the wider adoption of Green Building technologies. "Resistance of stakeholders to change" and "higher cost" are identified as the most critical barriers to implementing Green Building technologies.

Darko and Chan (2017) have presented a systematic review of literature on barriers to GB adoption. It has been found that “lack of information, cost, lack of incentives, lack of interest and demand, and lack of GB codes and regulations” are the most reported barriers in the literature.

Du Plessis (2007) has addressed sustainable problems in a way that is socially and ecologically responsible. The paper has described the meanings of the implementation the suggestions of “Agenda 21 for Sustainable Construction in Developing Countries” at a local level by developing regional and national action plans.

Warnock (2007) has conducted a literature review to find out the integrating instruments to achieve sustainable construction and buildings. Finally, that article has advised a straightforward, realistic structure and instruments, aiming at facilitating sustainable construction and buildings.

Singh, Murty, Gupta, and Dikshit (2009) has stated that there had been number of initiatives subsist on indicators and frameworks for sustainable development. This article is focused on general idea of various sustainability indices to measure sustainable development.

Waris, Liew, Khamidi, and Idrus (2014) have conducted a research on on-site sustainable construction equipment selection, using both the qualitative and quantitative research methods. The authors has stated that “during the construction phase, selection of right equipment are always a key factor in the success of any sustainable construction project.”

Ali and Al Nsairat (2009) have studied on international green building assessment tools such as such as LEED, CASBEE, BREEAM, GBTool, for a better understanding of the concept of green building assessment tool and its role for achieving sustainable development through developing an effective green building rating system for residential units in Jordan.

Robichaud and Anantatmula (2010) have conducted a comprehensive analysis using matrix present specific adjustments to traditional project management practices. The aim of this paper is to propose specific modifications to conventional building practices to optimize the delivery of cost-efficient green building projects.

Van Bueren and Priemus (2002) have conducted a paper on “Institutional barriers to sustainable construction”. In this paper, they have added that it is not technical factors but institutional factors that underlie to implement sustainable construction.

Shelbourn et al. (2006) have made a research on “managing knowledge in the context of sustainable construction”. This paper shows that “although indicators, checklists and assessment tools for sustainability in construction is readily available, there is still a need for a structured approach for the implementation of sustainability practices and methods within construction projects”.

Shen, Tam, Tam, and Ji (2010) has introduced a new approach for conducting project viability study by implementation the principles of sustainable development practice with reference to the Chinese construction industry. The study explained and suggested that “there is a need for shifting the traditional approach of project feasibility study to a new approach that embraces the principles of sustainable development.”

Powmya and Abidin (2014) has conducted a survey among construction practitioners in Oman focusing on the current progress and barriers of implementation of green construction. “The lack of demand for green construction” and “lack of pressure by government” were the top two.

Hwang, Zhu, and Tan (2017) made a study and questionnaire survey in Singapore. The study revealed that the top three barriers were “perceived higher initial capital costs”, “uncertain tradeoff between environmental and financial benefits” and “lack of government support”.

Durdyev, Zavadskas, Thurnell, Banaitis, and Ihtiyar (2018) has been used a questionnaire survey targeting local construction professionals. The study has shown that “the industry-wide adoption of SC practices is poor, which is believed to be due to a lack of awareness and knowledge and reluctance to adopt new sustainable technologies”.

Bourdeau (1999) has represented an international study to find the relationship and defined links between the principles of sustainable development and the construction sector. The study has

identified main issues, constraints and current policies, predicted changes and adaptations for the construction sectors in each country.

The building construction industry is considered as one of the fastest and biggest sector in Bangladesh. It has a significant role within the overall infra-structural improvement of the Bangladesh and its economic system. Many research has been conducted around Bangladesh about the safety issue, cause of delay, risk analysis, accident analysis. There is much more similarities of this research but it is different according to the socio-economic condition of Bangladesh. The intention of this survey-based research is to identify the barriers to sustainable construction practices in Khulna City. It is hoped that the outcomes of this study will enrich knowledge about the current state of barriers to sustainable construction in Khulna City and form a platform for future SC work within the country.

METHODOLOGY

The methodology applied in this research is a questionnaire survey and direct interviews. The flow diagram of this research has been stated in figure 1.

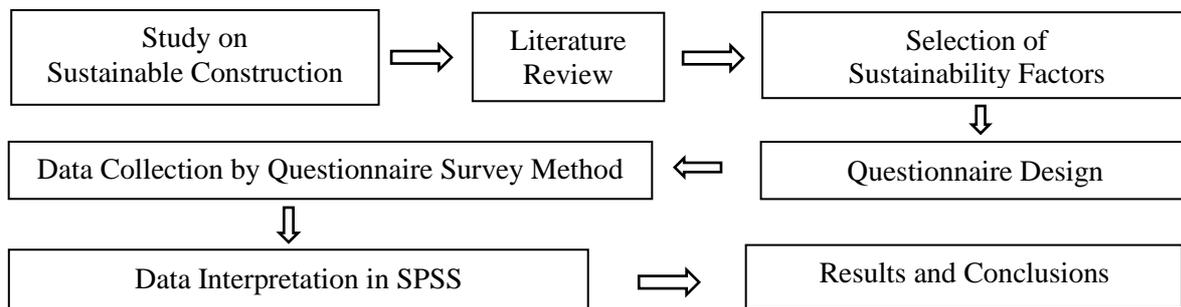


Fig. 1 Flow Diagram of Methodology

Firstly, Sustainability study has been performed. Then the literature review on sustainable construction has been accomplished and the sustainable factors has been selected. Then the questionnaire format was developed and the survey was executed. Finally, it has been analysed in SPSS. This study has adopted a Likert scale rating of influence level from 1 to 5 where 1 stands for “Very less” and 5 for “Very high” influence of the drivers and barriers.

This study is aimed to prioritize the identified drivers and barriers of Sustainable Construction in Khulna according to their importance, using the RII method. For each driver and barrier, the RII was calculated using eq. (1):

$$RII = \frac{\sum W}{N \times A} \dots\dots\dots (1)$$

Where,

- W= weighting of each driver or barrier given by respondents;
- A = highest weight, which is 5 for this study;
- N = total number of respondents.

The study has adopted questionnaire survey as a method to identify the fundamental factors affecting the implementation of sustainable construction in construction projects. Surveys through questionnaires were found appropriate for achieving the objectives of this study. Based on the literature cited various factors have been selected. The study was conducted by developing a questionnaire and collecting the responses from 100 individuals (40 workers, 30 Contractors, 30 Engineers) from construction sites around residential area in Khulna City.

DATA RELIABILITY

The required data for this study was collected from stakeholders of construction industry. So it is necessarily essential to analysis to check the reliability and validity of the independently collected data. The Cronbach’s Alpha test is conducted by the software of Statistical Package for the Social Science (SPSS). Table 1 represent the Cronbach’s Alpha test result of this research which is greater

than 0.7 and it satisfies the standard value.

Table 1: Reliability Statistics

| Cronbach's Alpha | Cronbach's Alpha Based on Standardized items | N of Items |
|------------------|--|------------|
| 0.825 | ≥ 0.7 | 100 |

RESULTS AND DISCUSSIONS

The data has been collected through questionnaire survey. The mean value of the survey result has been calculated in SPSS. Finally, the Relevant of Importance Index (RII) was determined according to eq. (1). From worker's, contractor's and engineer's perspective, the most influencing barrier in order to adopt sustainability is 'Lack of knowledge on sustainable construction', 'Unfamiliarity with sustainable technologies' and 'Lack of Qualification of project manager' respectively. Without having the knowledge of sustainability and sustainable technology, it is very difficult to implement sustainable construction framework. As an expert sailor is needed to reach its destination, similarly an expert and qualified project manager is also needed for the implementation sustainable goal. Table 2 represents the result of responses on respect to worker, contractor and engineer respectively. In table-2 top three obstacles according to the stakeholders has been highlighted. The reason behind these barriers are to be top, mostly because, the ineffective and insufficient cautiousness about sustainable construction.

Table 2: Survey Response Result According to Worker, Contractor and Engineer with RII

| Sustainability Factors | Worker's perspective | Contractor's perspective | Engineer's perspective |
|--|----------------------|--------------------------|------------------------|
| | RII | RII | RII |
| 1 High Cost of Projects | 0.0250 | 0.0333 | 0.0317 |
| 2 Lack of knowledge on sustainable construction | 0.0294 | 0.0361 | 0.0361 |
| 3 Is familiar with the word sustainability? | 0.0206 | 0.0222 | 0.0244 |
| 4 Lack of Government Support | 0.0250 | 0.0319 | 0.0297 |
| 5 Due to different contract forms of project delivery | 0.0228 | 0.0292 | 0.0286 |
| 6 Lengthy approval process for new sustainable technologies | 0.0253 | 0.0194 | 0.0336 |
| 7 Unfamiliarity with sustainable technologies | 0.0244 | 0.0377 | 0.0239 |
| 8 Lack of communication and interest required amongst project team members | 0.0241 | 0.0292 | 0.0256 |
| 9 More time required to implement sustainable construction practices on site | 0.0247 | 0.0292 | 0.0275 |
| 10 Client does not agree with the proposal | 0.0281 | 0.0306 | 0.0317 |
| 11 Lack of sustainable Planning | 0.0241 | 0.0376 | 0.0358 |
| 12 Labor related challenges | 0.0231 | 0.0236 | 0.0328 |
| 13 Lack of sustainable materials | 0.0225 | 0.0306 | 0.0250 |
| 14 Lack of Qualification of project manager | 0.0275 | 0.0361 | 0.0367 |
| 15 Lack of Qualification of construction engineer | 0.0278 | 0.0361 | 0.0311 |
| 16 Weather Condition | 0.0200 | 0.0222 | 0.0181 |
| 17 Lack of Qualified Consultants | 0.0266 | 0.0361 | 0.0244 |
| 18 Lack of Political Stability | 0.0200 | 0.0250 | 0.0214 |
| 19 Workers' unaware of the correct methods and procedures | 0.0266 | 0.0375 | 0.0328 |
| 20 Conflict with the architect over the type of material to be used | 0.0128 | 0.0167 | 0.0197 |

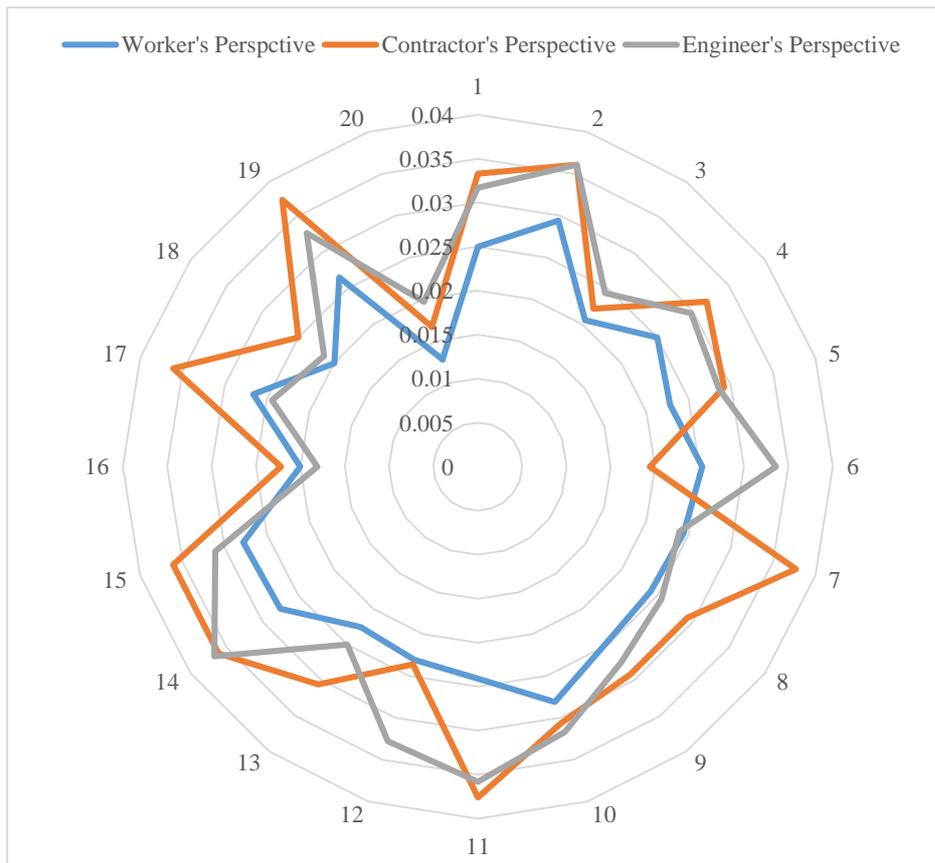


Fig. 2 Comparison of sustainability factor of three stakeholders

Figure 2 represents the position of sustainability factor with respect RII. The perimeter values is defined as the serial no of table-2 and y-axis is defined with the RII of respective factors. Mainly, from this radar chart the impact of the sustainability factor can be compared with respect to stakeholders. For example: sustainability factor 1 is most influencing for contractor's perspective where as it is less impacted on worker's perspective.

CONCLUSIONS AND RECOMMENDATIONS

This study has focused on the obstacles for sustainable construction in Khulna City, Bangladesh. Contractor, Worker, Engineer are the major and driving stakeholders in this research. The data has been collected through questionnaire survey and direct interviews. 20 factors have been selected as a barrier or obstacles to sustainable construction. The results has been interpreted on the basis of RII. From the perspective of major parties the results is described. Among the barriers, Lack of knowledge on sustainable construction is the most influencing barrier according to worker's perspective. Conflict with the architect over the type of material to be used have been counted as less persuading barrier according to the worker's outlook. Similarly with the help of the table-2 with the help of RII according to the contractor's perspective Unfamiliarity with sustainable technologies is the most influencing barrier. Conflict with the architect over the type of material to be used was counted as less effected barrier from contractor's perception. And, the last stakeholder's viewpoint, who is the major driver of this research, is Lack of Qualification of project manager- concluded as the main obstructions and Weather Condition has been identified as less influencing. Finally, the study limits only on Khulna city. The scenario may be similar in whole Khulna region but can not be encountered to whole country. It will be very praisedworthy if some one can integrate the overall condition of obstacles of Bangladesh.

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