Journal of Engineering and Applied Sciences 11 (4): 891-893, 2016
ISSN: 1816-949X

Performing Schedule with Focus on Time and Cost

Ali Amiri
University of Manchester, Manchester, England

Abstract: During the last 10 year willingness of sustainable building construction has increased. Human being is becoming more sensitive about the environment and concern about limited natural resources. People are now aware of benefits of green construction. In addition, continuous rise of energy price makes it vital to construct buildings with the lowest consumption of natural resources. Sustainable construction needs more time and cost in comparison with traditional construction, so this is a big problem to encourage clients to construct green. The aim of this literature study is to improve project management tools and techniques in order to reduce time and cost of green construction projects. This will motivate project owners to prefer sustainable instead of traditional construction. In addition, the objectives are as follows: giving a good understanding of sustainable construction and its importance; finding the important factors which result in taking more time and cost in green projects; giving practical recommendations in order to reduce time and cost of green projects

Key words: Project management, green construction, sustainable building construction, environmentally, sustainable or construction

INTRODUCTION

Research shows that sustainable construction plays a significant role in reducing material and energy consumption. A survey shows that green buildings use 30% less energy during operation phase. Furthermore, deduction on environmental concerns is possible by benefiting from green construction processes (The Economist, 2004). According to a research in China buildings use >30% of the whole energy consumption (Zhong and Chen, 2011). Therefore studying on the methods to green construction is vital and it is needed to find solutions to replace sustainable construction with traditional.

Hwang *et al.* (2013) said despite the importance of sustainable construction a little amount of research has been done in this area. They added, it is needed to pay attention to sustainable construction especially infrastructures which have an important effect on the world environment. This issue becomes more significant in developing countries consuming a large amount of resources for their construction activities (Shen *et al.*, 2010). For example in Singapore from the start of Green Mark Scheme in 2005 which is a kind of certification of sustainability the number of buildings obtaining this certification rose up from 17-440 in the same year (The Business Times 2010).

Literature review: Generally, green construction is a kind of construction which has the lowest impact on environment (Hwang and Leong, 2013). The negative impacts of traditional construction and limited natural resources make it vital to improve sustainable construction. Sustainable construction is applied throughout the whole lifecycle of projects from feasibility study to operation phase and also disposal of the building (Shen *et al.*, 2010). Premium cost of green buildings is higher than traditional one which is a big obstacle to construct sustainably according to clients opinion. In addition, the design and construction phases of green buildings take longer than traditional buildings. Design and construction of sustainable buildings can be more complicated because teams are usually unfamiliar with sustainability (Shen *et al.*, 2010).

MATERIALS AND METHODS

This study is a literature review so it has used other researcher's data (secondary data). In order to find the sources keywords like project management, green construction, sustainable building construction, environmentally sustainable or construction have been used.

Several search engines helped to find the resources. Google scholar was one of the engines being utilized from which makes it possible to search across many disciplines and sources like: articles, books, theses, abstracts and, etc.

The main search engine was University of Manchester Library Search. This search engine makes it possible to have an advanced search. In this search engine, it is possible to limit the search to any special author, any year

of publication, searching in just study or selecting peer reviewed researches. Other and has overlap. It has been tried to relate sustain ability to project management. The study have focused on cost and delay and have compared traditional and green construction. A combination of study with literature review and empirical research has been chosen to give an accurate and reliable understanding of the topic. Some study have been rejected because of their old publication date. Study with recent topics have been selected to make it possible to focus on a clear issue.

RESULTS AND DISCUSSION

Cost of green construction projects: Shen *et al.* (2010) have investigated their time on project feasibility study to make the green construction management techniques efficient in order to reduce the cost of green construction projects. The results showed that economic issues are more important than social or environmental parameters for clients so reducing cost can motivate clients to construct sustainably.

Robichaud and Anantatmula (2011) have done a research on sustainable construction which focuses on cost. They have paid attention to the point that more cost in sustainable construction projects is an obstacle to the improvement. Their aim was to find solutions to reduce the cost of these projects. They believe that green project management techniques can help these projects to complete with an acceptable cost.

Duration of green construction projects: Hwang and Leong (2013) have compared traditional and green construction schedule delay and the factors causing delay. They have used a combination of literature review and questionnaire in order to complete their research. According to literature review they found the reasons causing a project delay like factors related to project, client, consultant, design team, contractor, labor, equipment and material and also external factors. The analysis of questionnaires showed that 16% of traditional projects have delay while 32% of green construction projects completed behind the schedule.

Hwang *et al.* (2013) tried to evaluate schedule performance of green construction projects focusing on time. In order to achieve this goal they have done an empirical research. They have analysed 30 questionnaires answered by companies beside 6 interviews with PMs. They have searched to find the answers for the amount of delay for green projects and recommendation to reduce them. They found that green construction projects took 8% longer in comparison with traditional ones. In addition these projects completed 4.8% later than their planned schedule. Factors like complex technological characteristics of green construction projects and also a more integrated approach needed in delivery of these projects caused the delay.

CONCLUSION

It is needed to be mentioned that natural resources are limited and a serious attention is needed to be paid in order to control and manage the consumption of these resources. The construction industry has the most effect on environment and if sustainable construction does not improve future generation will be damaged from lack of natural resources (Robichaud and Anantatmula, 2011). Green construction will cost more and also take longer. A project is acceptable when three main factors of time, cost and quality are fulfilled so methods and techniques should be found in order to increase the performance of projects.

Green construction will definitely increase quality so time and costs are the obstacles to encourage people to sustainable construction. It is needed to find solutions to minimise time and cost difference between traditional and sustainable construction to motivate clients to construct sustainably.

Some recommendations from this study are given to reduce the cost of green construction. Project team integration, having full requirements of the project in mind, designing with the whole team and using rewards during the project construction are some important solutions (Robichaud and Anantatmula, 2011). Factors that can resolve delay in sustainable construction are: fast decision making by client or project team, efficient communication, use of contractors with reliable financial power and benefiting from experienced consultants (Hwang and Leong, 2013).

Further research is needed in order to find solutions on how to reduce cost and time in sustainable construction projects and give practical and reasonable recommendations toachieve this goal. Clients will be willing to construct sustainably instead of traditionally if they realize that the cost and time is the same or very near.

RECOMMENDATIONS

It is understood that in the world with growing population and limited natural resources the implementation of high-performance sustainable construction is serious for the future (Kibert, 2009). Efficient project management processes can help to improve sustainability. A PM who can benefit from tools, techniques and skills in order to complete a project within an acceptable quality, time and cost is needed (PMI, 2013).

In order to achieve the goal of sustainable construction increase a couple of solutions have been found. Hong *et al.* (2011) mentioned that to reduce energy and natural resources consumption a sustainable management during the whole life cycle of a project is needed which will result in a green building. Earliest involvement of all stakeholders during the first step (i.e., defining) through the completion of a green project is necessary to guarantee the efficiency (Matar *et al.*, 2008). Governments can force clients to obtain green construction certification or encourage them by giving help about sustainable construction (Shen *et al.*, 2010).

Reducing cost of green construction projects: Cost is one of the most important factors of projects. She *et al.* (2012) argued that although decline in the operation or maintenance of projects is an acceptable reason for higher cost of initial construction it should be tried to reduce the cost of green construction. Sustainable construction can be improved if these projects complete with an acceptable cost (Robichaud and Anantatmula, 2011). It is found that more attention has been given to economic concerns than environmental issues (Shen *et al.*, 2010). Robichaud and Anantatmula (2011) have given some recommendations to reduce the cost of green construction which are listed here:

- Project team integration
- Having full requirements of the project in mind
- Designing with the whole team and using rewards during the project construction

Reducing duration of green construction projects: Time is the other parameter which plays a significant role in a project. In order to the performance of green construction schedule an integrated approach and also a more detailed design is needed (Hwang *et al.*, 2013). Some recommendations given by Hwang and Leong (2013) that decrease duration of green buildings are listed below:

- Fast decision making by client or project team
- Efficient communication
- Using contractors with acceptable financial power
- Benefiting from experienced consultants

REFERENCES

Hong, H., S. Wang and Z.Z. Wu, 2011. Implementing sustainable management in construction industry. Adv. Mater. Res., 280: 85-88.

Hwang, B.G. and L.P. Leong, 2013. Comparison of schedule delay and causal factors between traditional and green construction projects. Technol. Econ. Dev. Econ., 19: 310-330.

Hwang, B.G., L.P. Leong and Y.K. Huh, 2013. Sustainable green construction management: Schedule performance and improvement. Technol. Econ. Dev. Econ., 19: S43-S57.

Kibert, C.J., 2008. Sustainable Construction: Green Building Design and Delivery. 2nd Edn., John Wiley and Sons Inc., New Jersey, USA., ISBN-13: 9780470114216, Pages: 407.

Matar, M.M., M.E. Georgy and M.E. Ibrahim, 2008. Sustainable construction management: Introduction of the Operational Context Space (OCS). Constr. Manage. Econ., 26: 261-275.

PMI., 2013. A Guide to the Project Management Body of Knowledge: PMBOK(R) Guide. 5th Edn., Project Management Institute, Pennsylvania, USA., ISBN-13: 978-1935589679, Pages: 589.

Robichaud, L.B. and V.S. Anantatmula, 2011. Greening project management practices for sustainable construction. J. Manage. Eng., 27: 48-57.

She, Y.J., Y.H. Zhu and Q. Huang, 2012. System of sustainable construction based on project whole life cycle management. Adv. Mater. Res., 403-408: 2093-2097.

Shen, L.Y., V.W.Y. Tam, L. Tam and Y.B. Ji, 2010. Project feasibility study: The key to successful implementation of sustainable and socially responsible construction management practice. J. Cleaner Prod., 18: 254-259.

The Business Times, 2010. Making their mark on the environment. http://www.greensingapore.com/news/591674/making-their-mark-on-the-environment.

The Economist, 2004. The rise of the green building. http://www.economist.com/node/3422965.

Zhong, Z.Y. and Y.G. Chen, 2011. Principles of sustainable construction project management based on lean construction. Adv. Mater. Res., 225-226: 766-770.