

The Application of Green Project Management and Green Supply Chain Management in Minimizing Cost Overrun in Construction Projects

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Abstract— Over the last few years, the green building and technology movement has leaped bountifully. While environmental sustainability for greener construction has been emphasized, research needs to be conducted to analyze cost performance of green construction projects. As a result, this study aims to address schedule cost performance of green construction projects and to provide some recommendations that may improve the targeted performance. To achieve this objective, a questionnaire need be developed and the responses from construction companies will be analyzed, and interviews with project managers were conducted to further supplement and substantiate the survey results. Lastly, a list of recommendations was also introduced, aiming to improve the cost schedule performance. This study will offer a benchmark for the industry to gauge the overall cost performance of green construction projects.

Index Terms— Green project management, Green supply chain management, Recycling material, Renewable energy, Project planning, Construction management, Cost overrun.

1 INTRODUCTION

The Construction industry (CI) is growing rapidly all over the world. The Construction Industry is one of the largest sector more dynamic industry using more energy, consuming raw materials than any other economic activity (Malia et al., 2013). Construction activities are not environmentally sound because of various adverse impacts as a result of noise, resource depletion, dust, discharge of toxic waste, air pollution, etc. (Lu and Yuan, 2011). However, for the development of a country economy, construction industry plays a major role.

Due to continuous globalization, the requirement of new infrastructure and residential facilities are increasing rapidly. To meet increasing demand in Malaysia the investment in infrastructure is increasing. But there are some financial and environmental impacts due to poor project management and supply chain practice, as a result, many projects are suffering from cost overrun. The main objective of this research is to minimize the cost overrun of construction projects by applying Green Project Management and Green Supply Chain Management.

Over the last few years, the green building and technology movement has leaped bountifully. While environmental sustainability for greener construction has been emphasized, research needs to be conducted to analyze cost performance of green construction projects. As a result, this study aims to address schedule cost performance of green construction projects and to provide some recommendations that may improve the targeted performance. To achieve this objective, a questionnaire need be developed and the responses from construction companies will be analyzed, and interviews with project managers were conducted to further supplement and substantiate the survey results. Lastly, a list of recommendations was also introduced, aiming to improve the cost schedule performance. This study will offer a benchmark for the industry to gauge

the overall cost performance of green construction projects.

Ofori (2000) stated that integrated construction supply chain is the best way, to reduce waste and develop positive environmental impact. A number of organizations like the environment agency the UK government, BREEAM (Building Research Establishment Environmental Assessment Methodology), the construction industry board (CIB), Building Research Establishment (BRE) Waste concerns, Bangladesh Association of Construction Industry (BACI), the Construction Products Association (CPA), US Environmental Protection Agency (EPA) etc have stated their concerns to make sustainable of the construction sector.

2 LITERATURE REVIEW

2.1 Green Project Management

Green Project Management (GreenPM) integrates environmental thinking into all of the project management decisions. It is a way to ingrain “greenthink™” into every project management process. The point about green project management is not that you make every decision in favor of the one that is most environmentally friendly. The point is that companies start to take the environment into account during the decision-making process. Thousands of projects, making hundreds of thousands of different decisions, could make a difference. Green Project Management is designed to bringing more information into the decision-making process which could be best for the business. To successfully implement Green Project Management needs

- Strong sponsorship.
- A commitment to try.
- Training.
- Process updates.

The bottom line is that an organization can get on board with

Green Project Management and implement it with very little investment of money. In fact, it can also be implemented with a very little commitment of time as well. The key is to find a sponsor with the vision and drive to get the process started. Save the World – Use Green Project Management.

2.2 Green Project Management for Construction

Other than conventional construction procedures, green construction projects have to implement sustainable construction practices, which are usually listed in green building rating systems such as LEED. One example of such practices is a waste management plan (CIRIA, 2001) to minimize waste generation on the construction site (Kibert, 2008). A green building construction also has to adopt sustainable practices such as using recycled aggregates for concrete work and using timber which is from renewable sources (CIRIA, 2001). In addition, the main contractor and project manager have to ensure that pollution from the construction is kept to the minimum by controlling soil erosion, waterway sedimentation and airborne dust generation (USGBC, 2009). Furthermore, the natural habitat should be conserved through a prudent siting of building to minimize the disturbance to existing natural environment (USGBC, 2009). These considerations are often neglected in traditional construction.

Green project management is a model where we think green throughout our project and makes decisions that take into account the impact on the environment – if any. It is a way to ingrain "green think" into every project management process. Here are two examples using the Project Charter and issues management.

- Determine project-related environment objectives and targets, which may align with your company's Environment Management System (EMS)
- Describe how project deliverables affect the environment
- Monitor and control your project with the environment in mind
- Describe how risks, assumptions, and constraints affect the environment positively or negatively
- Include environmental performance goals that may relate to the project
- Define environmental-related stakeholders
- Include a section when closing projects for environment-related lessons learned
- Factor environmental approaches into your Project Management Plan
- Ask about the environment in any integrated change control activity
- Consider the influence of the environment in your

overall success of delivering the owner's physical development within the constraints of cost, schedule and quality requirements. Thanks to the changing environment and the unprecedented challenges in the building industry, now it is not sufficient to correspond to these traditional criteria of project management. It was already suggested to improve the iron triangle with other aspects of safety, environmental sustainability, information system, stakeholder or organizational benefits by many types of research. [1, 5] The success of the project depends on the implementation of environmental criteria in this study. The aim of green management is to satisfy the user's and the natural environment's demands. [9] The successful design of a construction means that the building is in synergy with nature and the surrounding environment, its energy consumption is minimal, the building's materials are natural, and the house is in correspondence with sustainability. The environmental conscious criteria are also the part of the quality criteria as the indoor environmental quality has positive effects on productivity and health.

2.3 Supply Chain Management

SCM definition changes day-by-day according to its broadening scope [1]. SCM includes logistics and trade while operating both customers and suppliers [2]. The supply chain is a cycle that starts from suppliers and ends at customers as the product or service flow [3]. Another definition is that supply chain is the network of organizations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services delivered to the ultimate consumer [4]. Supply chain traditionally starts from the cradle to the grave, which means from raw material state till the end product reaching the customer. However, today environmental issues force processes to change and come up with new operations such as recovery options. For this reason, closed-loop supply chain, a new definition, allows the finished good collected from customers which are end-of-life products now, and go into some other processes for recovering them [5]. The aim of the end-of-life recovery options is to recover material, energy and avoid landfill. This recovery is a value. If it is managed properly, high profits will be the gain for both producers and customers [6].

2.4 Green Supply Chain Management in Construction

An Constructions cause air, water, and noise pollution and today with global warming environmental issues became very important. Even in construction design, green materials are being preferred to minimize waste and construction firms are starting to use GSCM to make their work sustainable. Green buildings, sustainable design, and constructions, construction waste management are some of the sustainability topics that are being used by producers [9]. The best way to minimize the construction waste generation is to reduce materials while designing the structure. It will also eliminate many environmental problems such as disposal. Also, material types have to be selected very carefully to get rid of recycling limitations that means recyclable materials should be preferred [10].

Today companies are aware of their responsibilities about the environment depending on regulations. This leads to sus-

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tainable systems that will continue their processes without giving any harm to the environment. Environmental issues are seen at every step of a supply chain that starts with getting the raw material and ends with reuse or recycle or disposal [7]. This causes a requirement for companies to have a GSCM. A study in India found that there are different pressures for different sectors to be able to adopt GSCM in their own traditional supply chains [8]. To integrate GSCM to a company, five different applications can be used as environmental management systems, green purchasing and design, investment recovery and strong relations with customers [7]. Common green activities and sustainability have an intersection in practice which is 4R: reduction, redesign, reuse and remanufacture [2].

To leave a healthy environment with high level of social, economic and environmental conditions to future generations, sustainability is important which leads to improved quality of systems [11]. SCM has four specific roles in construction; improving the interface between site activities and the supply chain, improving the supply chain, transferring activities from the site to the supply chain, integration of site and supply chain. SCM helps to understand construction problems and shows a direction to solve them but practical methods for SCM should be improved to implement for the specific situation of construction [12].

GSCM practices have been investigated in the construction industry to attain environmental sustainability emphasizing on reducing solid waste (Begum et al., 2009; Ofori, 2000). Eventually, it is economically profitable, sustainable, and socially acceptable (Sarkis et al., 2011). Even though GSCM is alleviating environmental issues through economic benefit to the organizations (Eltayeb et al., 2010), the philosophy of GSCM is explored insignificantly in the construction industry for reducing waste. Studies of GSCM in developed countries have been progressed significantly than those of developing countries. Despite the growing concern of environmental sustainability, there is no significant progress of GSCM practices in the chosen context, Malaysian construction industry.

3 RESEARCH QUESTIONS

- I. A How to avoid the construction cost overrun by applying Green Project Management and Green Supply Chain Management?
- II. Impact on cost overrun after implying Green Project Management and Green Supply Chain Management in Malaysian Construction Industry?
- III. Environmental and cost impact in the construction projects.

4 RESEARCH OBJECTIVES

Through proper research, improve or set certain guideline for the Malaysian construction industry so that they can run their projects more cost-effective way and reduce the carbon footprint towards the global environment. Some other objectives of this research are as follows,

- I. Improve the uses of construction material to

- II. reduce the cost of material or material waste.
- II. Improve the quality of the construction and environment.
- III. Identify the processes of Green project management and green supply chain management which can be applied in the Malaysian construction industry.
- IV. Ensure the construction project time management through the help of project management process and supply chain management concepts.
- V. Train Malaysian construction industry to manage their projects environment-friendly and more cost effectively.
- VI. Propose methodology and process for managing construction projects with the help of Green Project Management and Green Supply Chain Management.

5 RESEARCH METHOD

This research work needs both Qualitative and Quantitative method for data collection, analysis, and recommendation based on analyzed results and existing literature.

Qualitative method will help to understand the current condition and practice of the Malaysian construction industry. Understand the existing research works, current industry practice, methods and process of managing project, supply chain concept in the construction industry. Clarifying the concepts of both green project management and green supply chain management for the construction industry.

Quantitative method will need to collect data from the construction industry or company, analyze the collected data. Make the necessary decision based on analyzed data. After applying new methodology and process collect the relative data, analyze and compare with the previous data and present in a suitable format for the general people.

Population: Management level employees in construction projects in Malaysia

Unit of Analysis: Individuals

Data Analysis method: Cost analysis

Data gathering method: Distributing questionnaire by hard copy and soft copy.

6 CONCLUSION

Although a conclusion may review the main points of the paper, do not replicate the abstract as the conclusion. A conclusion might elaborate on the importance of the work or suggest applications and extensions. Authors are strongly encouraged not to call out multiple figures or tables in the conclusion—these should be referenced in the body of the paper.

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