DETERMINATION OF GREEN TECHNOLOGY PRACTICES IN THE CONSTRUCTION PROJECT MANAGEMENT OF MALAYSIA

by

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LIST OF ABBREVIATIONS

ANOVA	Analysis of Varience
BREEAM	Building Reasearch Establisment Environmental Assessment Method
CASBEE	Comprehensive Assessment System for Building Environment Efficiency
CIDB	Construction Industry Development Board Malaysia
GBI	Green Building Index
K-GBCS	Korean Green Building Certification System
LCCF	Low Carbon Cities Framework
LEED	Leadership in Energy and Environmental Design
PMBOK	Project Management Body of Knowledge

PENENTUAN AMALAN TEKNOLOGI HIJAU DALAM PENGURUSAN PROJEK PEMBINAAN DI MALAYSIA

ABSTRAK

Walaupun pembangunan hijau telah tersebar luas dalam industri pembinaan di Malaysia, masih terdapat jurang dalam integrasi pembangunan hijau dan pengurusan projek. Tidak dapat dinafikan bahawa ramai orang dalam industri yang peka terhadap teknologi hijau ini. Namun begitu, sesetengah daripada mereka enggan melaksanakan teknologi hijau ini disebabkan beberapa perkara tertentu. Konsep hijau boleh dikatakan tidak diterima secara meluas dalam industri kerana banyak pemaju enggan melaksanakannya di dalam projek mereka. Oleh itu, tujuan kajian ini dijalanakan adalah untuk menentukan amalan hijau yang perlu dilakukan dan perlu ditambah dalam pengurusan projek tradisional melihat dari sudut pandangan pihak berkepentingan. Hal ini akan mempercepatkan penerimaan mereka terhadap teknologi hijau dalam industri pembinaan. Kaedah yang digunakan dalam menentukan amalan hijau dan menganalisis hasilnya adalah skala Likert dan perisian SPSS. Hasil menunjukkan hanya 22 daripada 48 amalan yang diterima oleh pihak berkepentingan bagi dilaksanakan dalam pengurusan projek hijau. Walaupun semua amalan adalah realistik dan kebanyakannya telah dilaksanakan di negara luar, ia tidak bermakna bahawa ia boleh dilaksanakan di Malaysia. Kajian ini mencadangkan senarai amalan hijau yang realistik dan dapat dilaksanakan dalam pengurusan projek hijau dengan mengambil kira pandangan pihak berkepentingan.

DETERMINATION OF GREEN TECHNOLOGY PRACTICES IN THE CONSTRUCTION PROJECT MANAGEMENT IN MALAYSIA

ABSTRACT

While green development has been spread largely in construction industry in Malaysia, there is still gap in integration of green development and project management. It is undeniable that many people in the industry are alert to this green technology. However, some of them are refused to apply green building technologies due to several reasons. Green concept is practically not accept widely in industry as many developers are refuse to apply it in their projects. Hence, the aim of this study is to determine the green practices that need to be done and added in traditional project management from stakeholder perception so it will speed up their acceptance of green technology in construction industry. Method used in determining the practices and analyze the result is the 5-point Likert scale and SPSS software. The result show that only 22 out of 48 practices are accepted by all stakeholders to be implemented in green project management. Even all practices that are identified in the review are realistic and most of them are implemented in other countries, it doesn't mean that it can simply be implemented in Malaysia. This research also proposed list of green practices that are realistic and practicable by taking into consideration of all stakeholders' perspective.

CHAPTER ONE

INTRODUCTION

1.1 General

Many countries have started implementing green building policies and scheme that centered upon a building rating system. This tool is intended to rate the building performance based on a specified criteria that has been set. It usually covers material, water, energy, site, indoor environment quality and other matters involving sustainable design (Gou & Lau, 2014). In addition, there are many systems that can help to deliver green development objective including quality management system, energy efficiency, using environmentally friendly materials and et cetera. However, more attention was given to components of this system where it is often referred as technical related issues. Project Management can be considered as a set of tools that will help to fulfill the system's requirements such as material management, waste management, site management and so on. However, due to long duration, green building should be seen as a process rather than a product. If attention is not given to the project management as a component of these systems, it will cause efficiency problem and lead to project failure (Wu & Low, 2010). Therefore, project management should be seen as an important component in delivering green technology.

1.2 Background

Green technology is an action taken to maintain the environment that will give benefits to people, society, health, environment and life cycle cost. This is based on the concept of "sustainable development" which also serves as the driving force to this technology (Wu & Low, 2010). In addition, green technology is also built on the principle of sustainable construction which addresses the issues of ecological, social and economic

building (Hwang & Tan, 2010). The concept of green technology is becoming more known in the construction industry due to the growing awareness of sustainable development (Wu & Low, 2010). With this concept, another concept has existed in the construction industry that is called green building. According to the Green Building Index Malaysia (GBI), green building is the building that focuses on increasing the efficiency in using energy, water and materials resources while reducing building impacts on human health and environment during life cycle of the building through better placement, design, construction, operation and maintenance. Green building should also be designed and operated to minimize the impact on the environment (Richard & Ramli, 2011).

However, it is not simply about green buildings that use new materials, technologies and environmentally friendly innovation components. It should be a comprehensive solution to achieve the concept of sustainable development in the project lifecycle including project planning, design, construction and operation. In other words, construction of green building process reduces the impact on the environment due to construction process starting from site development, procurement or contract and use of materials for safe reuse or disposal of a building at the end of its useful life. In a general meaning, the green construction is about sustainability. Sustainability is defined as the ability to supply the needs of the present generation without compromising the ability of future generations to do the same thing (Gavenor, 2010).

It can be summarized that green construction is intended to reduce the impact on environment, promote energy efficiency, have effective use of resources, and create a healthy environment that is safe for construction workers and building occupants (Gavenor, 2010). In the last few decades, green technology has undergone rapid

development due to the increase in market demand for solutions and production of environmentally friendly products (Wu & Low, 2010). The various initiatives taken could be seen as an effort to implement green technologies.

Prime Minister, Datuk Seri Najib Tun Razak announced that Malaysia intends to reduce 40% of carbon released by 2020. Correspondingly, Green Technology Policy formulated which aims to provide a way for Malaysians to enjoy a better life and a healthy environment (Esa et al., 2011).

Through the Construction Industry Development Board Malaysia (CIDB), various action plans had been formulated and implemented to meet green aspirations. CIDB green technology program begins with the development program of environmental initiatives in 1999 by establishing the Environmental Practices Technical Committee or TC9. The committee in CIDB also aims to assist in mobilizing policies and proposals to improve environmental practices in the construction industry and as a result of establishing this committee, a number of publications such as guidelines and books of good environmental practice guide were produced. Furthermore, in 2010, CIDB had established a Technical Committee Green Technology Best Practice in construction industry which consists of government departments, professionals' bodies, academics and association that are related to the construction industry. It aims to help CIDB in identifying, preparing and developing the Industrial Construction Standard, manuals, guidelines, technical report and training module related to green technology in construction industry (Samari et al., 2013)

In addition, the government also has established green technology financing scheme with a fund totaling about 3.5 billion Ringgit Malaysia. Besides, this is also in line with the decision to create a fund amounting to RM1.5 billion in the development of

the supply and use of green technologies. Through these funds, manufacturers and users of green technology can make a loan to finance activities that support the growth of green technology industry. The maximum loan for manufacturers is up to RM50 million and as for consumer companies, it is up to RM10 million (Chan, Lee, & Lee, 2014). This proves that the government is really committed in developing this industry. Furthermore, the involvement of KeTTHA and GreenTech can also be seen by the existence of programs like Low Carbon Cities Framework (LCCF), MyHijau and YaHijau (Esa et al., 2011).

For measuring and awarding a building as a green building, the green building rating system was established. Green building rating system usually includes the world environmental impact up to the internal effects. The rating system is also closely related to the design and planning and engineering standards (Gou & Lau, 2014). According to Zhang, many countries have been developing and applying various green building rating system. For example, in the UK, they have used the system Building Research Establishment Environmental Assesment Method (BREEAM), Leadership in Energy and Environmental Design (LEED) in US, Germany's Deutsche Gutesiegel Nachhaltiges Bauen (DGNB) in German, Japanese Comprehensive Assessment System for Building Environment Efficiency (CASBEE) in Japan and Korean Green Building Certification System (K-GBCS) in Korea. This system outlines things like the reduction of operating costs, the creation, advancement and development of the market for green product and services to be certificated as a green building (Son & Kim, 2014).

In Malaysia, Green Building Index (GBI) is used as green building rating system. The objective of GBI establishment is to save resources, energy, recycle materials and

make the building harmonize with Malaysia's culture, traditions, climates and environment while maintaining the capacity of ecosystem at global and local levels. There are six different rubrics in GBI which are energy efficiency, sustainable site planning and management, water efficiency, indoor environment, material and resources and innovation. GBI also aims to increase awareness among stakeholders such as developers, architects, engineers, planners, designers, contractors and also contractors regarding sustainable development issues (Saadatian et al., 2014).

However, there are several problems faced to implement green building. They are the increase in project cost, lack of communication and interest among project team members, high implementation cost of green practice, lack of research on benefit of green building, and lack of interest from the clients. Increase of project cost is a large challenge in implementing green development followed by lack of communication and interest among project team members (Hwang & Tan, 2012). Therefore, the government has given a fund with a total amount about RM1.5 billion in the development of the supply and use of green technologies (Esa et al., 2011).

In the problem of lack of communication and interest among project team members, it is supposed to be under project manager's responsibilities. Components of green technology system have been seen as a group of work done by different people as defined by other group, planned by other groups and carried out by other group. Hence, project management process is important to ensure smooth delivering of green development (Wu & Low, 2010).

Furthermore, failure in delivering green building may cause legal liability under contract. Contract claim can be grounded in misrepresentation or fraud, breach of contract, negligence and product liability. Rating system that was used in green

building added the complexity in completing the project and significantly alter the liability scope for all participants. These issues include the importance of time lines, documentation, uses of certain materials in achieving certification. Moreover, responsibilities in that area are distributed wholly to reach credit in all aspect of the project (design, construction, material choose) which also means that there is no one party who can control all steps to gain the certificate.

As a result of the rating system's lack of privacy between contractors, designers and owners, any party that provides warranty or guarantee of final certification is being risked to being exposed to liability. Claim can include consequential damages that are related lost sales or decrease in value if a project fails to get green building certification (McLachlan, 2012). Therefore, it is important for the project manager to have efficient project management process in the lifecycle of the project in order to gain the green building certification. The project manager must ensure that sustainability goals should be placed as the main goal, not at each stage of construction so that every party is working towards the same goal (Wu & Low, 2010).

Therefore, based on the literature review, information on green technology has been largely spread among the various parties in construction industry to build sustainable or green building. There are also various initiatives that had been undertaken by the government in delivering the green building. Furthermore, the green building rating system has been developed to assess the sustainability of the building. Nevertheless, there are some problem faced in implementing this green development. Failure in delivering green building may lead to legal issue. As the project management has direct influence in the project's success, it is important to know the adjustments that are needed in traditional project management for successfully delivering green

development (Mat Nor, 2013). This green building project will lead to the problem of loss efficiency to failure if we are simply looking at project management.

1.3 Problem Statement

While green development has been spread largely in construction industry in Malaysia, there is still gap in the integration of green development and project management. Malaysia also does not have a proper green project management practices that can be implemented in green building project and applied by project team members. In addition, GBI also announced increases in green technology. However, the number of registered projects with GBI is still unsatisfactory in quantity and can also be categorized in small quantities. The little involvement in green building will cause less number of certified green buildings. This can contribute to a problem in green development and we will be left behind in this technology compared to other countries. Besides, our environment will also be susceptible to pollution because of the lack of green awareness within the construction industry (Mat Nor, 2013).

It is undeniable that many people in the industry are alert about the green technology (Gou & Lau, 2014). However, some of them refused to apply green building technologies due to several reasons which are lack of knowledge, education, experience, poor legislation and enforcement, and a passive culture. Green concept is practically not accepted widely in industry as many developers are refusing to apply it in their projects especially developers from small and medium companies. Stakeholders in construction industry think that they do not have enough skills to apply the concept, incapable to fulfill the government's minimum standard and can not ensure that their product is sellable. It becomes a barrier in green development where small and medium companies are representing a large population in the construction

industry . Their reluctance to get involved in these technologies have a big impact on green development. Hence, adjustment on traditional project management should be made to approach green building concept besides speeding up the acceptance of green development in all parties (Abidin, 2010).

Robichoud & Anantatmula (2011) suggested a specific modification to the traditional project management practice to optimize the delivery of green building projects. They found several practices that can be implemented in the green project management. However, this study is only based on literature review and focuses generally on project management process without taking the perception from parties involved into consideration. It is important to know what stakeholder wants in green project management process so that it will give a practical view of the current situation in the industry. Besides, it also can propose green practices that can practically applied by organization in all construction companies in delivering green building project and can speed up their acceptance of green development.

1.4 Research Aim

The aim of this study is to determine the green practices that should be added in traditional project management from the stakeholder's perception in order to deliver green development so it will speed up their acceptance of green technology in the construction industry. Hence, it will improve project management process of green building project besides increasing the green development in Malaysia.

1.5 Research Objective

This study have three objectives which are:

I. To investigate the acceptable green practices by stakeholders in green project management.

II. To conduct a comparative study on the ranking of acceptable green practices by stakeholders in green project management.

1.6 Scope of Study

In this study, respondents are choosen form Engineers, Architects, Quantity Surveyor, Developer and Contractors. Expectation of other stakeholders is crucial to know to give a practical view on the current situation of project management in green building project and conventional building practice thus give opportunities to stakeholders speed up their acceptance on green building project. 15 numbers of questionnaire distributed to Engineer, 10 to Architect, 50 to Contractor, 10 to Quantity Surveyor and 10 to Developer. Total number of 95 questionnaires are distributed.

1.7 Significance of Study

This study attempts to describe the adjustment of green project management practices that should be made in traditional project management in delivering green building from Contractors, Engineers, Developers, Quantity Surveyors and Architects' perception. This study will give a more practical view of the situation of project management in green building and conventional building project thus provide opportunities to them to speed up their acceptance of green development in this industry. The result of this study will provide valuable data for green development in Malaysia. This will help in improving project management process in delivering green

building projects besides providing possible actions that can be taken in delivering this technology.

1.8 Research Framework

Research framewok is a network of the relationship between independent variables. In order to conduct this research, it must follow several steps to gain the result as shown in Figure 1.1. In the research framework, there are four items used to determine accepted green practices which are green practices in feasibility phase, green practices in design phase, green practices in construction phase and green practices in close out phase.

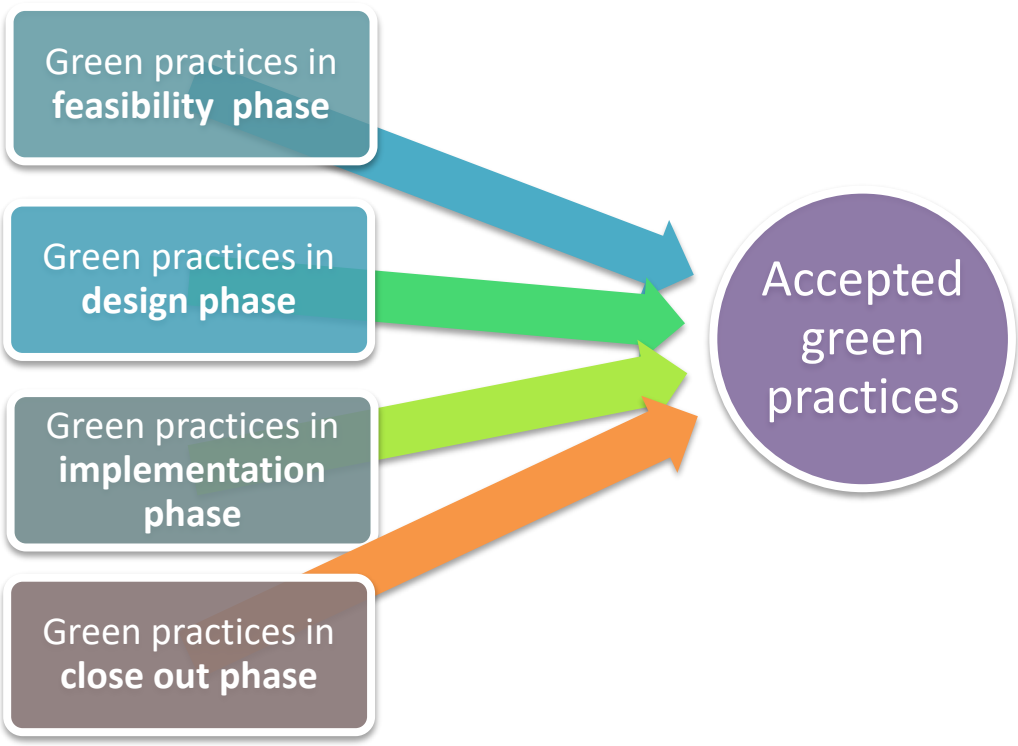

Figure 1.1: Research Framework

1.9 Thesis Structure

This research followed a few steps in order to gain the result. Each step is explained in details in each chapter. There are 5 chapters in this research as follows:

Chapter 1 Introduction

This chapter contains overall information about the study that has been carried out. This chapter explain background, problem statement, research aim, research objectives, scope of study, significant of study and research framework.

Chapter 2 Literature Review

In chapter two, the relevant literature on green project management from various countries are evaluated and summarizes. The literature review consists of journal articles, reports and books that were obtained from mass media to get in depth information. Each information obtained is recorded and compared with each other to see how the project management system works in delivering green building project. The literature review also applies to the preparation of survey form. The information obtained will be used as an alternative answer in the questionnaire which will help respondents generate their ideas about the issues. Summary of journals, articles, reports and books used are shown in Appendix C.

Chapter 3 Research Methodology

This chapter explains methodology applied for the study conducted. Data collection was done using primary method where the data obtain through questionnaire forms. The questionnaire distributed to the respondents whom are from Engineers, Developers, Architects, Quantity Surveyors and Contractors.

Chapter 4 Data Analysis

Chapter four discusses on the findings from the survey conducted to identify the determinants of respondents perception on green project management. The findings of this study can specify the green practices that can be implemented in green project management.

Chapter 5 Conclusion and Recommendation

This chapter concludes the findings and answer the objectives of this study. It also give suggestions for future research regarding the study area and discuss the weaknesses that occur during the conduct of the research.

1.10 Conclusion

In conclusion, project management practices are very important in delivering green development. There are so many research that had been conducted on project management in delivering green building. But it only focuses on the project manager's perception. It is important to know other stakeholders' perception on green project management practices. It will provide opportunities to speed up their acceptance on green building project.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Green tecghnology is an action taken to maintain the environment that will give benefits to people, society, health and most importantly our environment. This is based on the concept of "sustainable development" which also serves as the driving force to this technology. The concept of green technology becoming more known in the construction industry dute to growing awareness of sustainable development (Wu & Low, 2010). With this concept, another concept has existed in the construction industry that is called green building. However, it is not simply about green building that use new materials, technologies and environmentally friendly innovation components. It should be a comprehensive solution to achieve the concept of suatainable development in the project lifecycle including project planning, design, construction and operation. In other words, construction of green building process reduces the impact on the environment due to construction process starting from site development, procurement or contract and use of materials for safe reuse or disposal of a building at the end of its useful life (Gavenor, 2010).

The growth of sensitivity and pressure about green and sustainability in construction industry needs some adjustment in the traditional project management in order to deliver successful green projects. Project manager acts as a 'driver' and also important 'change agents' in construction projects that have strong influence in green project and they have to play an important role in achieving this green project (Silvius & Schipper, 2014). Since there is need of adjustment in project management, project manager needs to consider some competencies and strengthen their role in realizing green