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Research on Project Management System in the Delivery of Green Development from Stakeholders Perspective

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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 accepted 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 48 practices in all construction phase are accepted to be implement in green project by all stakeholders. This research also proposed a green project management framework that are realistic and practicable by taking into consideration of stakeholders' perspective.

Keywords

green technology, sustainability, project management, green practices, stakeholder perspective

1. Introduction

Green technology has been spread largely among the various parties in construction industry to build sustainable or green building. There are also has various initiatives that had been undertaken by government in delivering green building. Furthermore, green building rating system have 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 project management has direct influence in project success, it is important to know adjustment that are need in traditional project management for successfully delivering green development (Mat Nor, 2013). While green development has been spread largely in construction industry in Malaysia, there is still gap in integration of green development and project management. Malaysia also do not have a proper green

project management framework that can be implement in green building project and apply by project team members. In addition, GBI also announced increases in green technology, however the number of registered projects with GBI still unsatisfactory in quantity and also can be categorized in small quantities. This can contribute to problem in green development and we will be left behind in this technology compared to others countries. Besides our environment will also 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 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 especially developers from small and medium companies. They think that they do not have enough skill to apply the concept, incapable to fulfill government minimum standard and can't ensure their product is sellable. It became a barrier in green development where small and medium companies 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 speed up the acceptance of green development in all parties (Abidin, 2010).

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

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 in order to deliver green development so it will speed up their acceptance of green technology in construction industry. Hence, it will improve project management process of green building project besides can help in increasing the green development in Malaysia. Besides, this study also proposed a green project management framework that are realistic and practicable by taking into consideration of stakeholder's perceptive.

1.1 Project Management of Green Building in World

At feasibility stage, project's need is defined by considering environmental goals and market condition (Robichaud & Anantatmula, 2011). Amount of capital investment also be decided in this stage. Besides, green building project also must start with high aspirations of green performance standards to safeguard green baton during the project life cycle (Wu & Low, 2010). Charrettes are implemented in sustainable building project where all key stakeholders are group together so that their talents and energies will be

used to create buildable Smart Growth plan (Robichaud & Anantatmula, 2011). Final report that are produced from this charrette will be used as guiding documents for construction and design process. In design phase, cost of materials used in green building projects should be cheap since imported duties are suggested to be excluded. Imported duties for green projects are suggested to be paid by the government (Ihuah, Kakulu, & Eaton, 2013). Involvement of architects and contractor in design process can avoid rework and redesign problem (Lippaiova & Sebestyen, 2013). In implementation phase, a specific contract clause relating to green building should be included to make sure all stakeholders are play their roles in delivering green building (Sadaba, Gonzalez Jaen, & Ezcurdia, 2015). Contractors are responsible for the means and methods in construction of the green projects in accordance with the contract (Kubba, 2010). Additional risk related to insurance coverage of green project also should be addressed through contract language (McLachlan, 2012). Project manager will held monthly site meeting that includes green education for all on-site construction personnel (Delvanaz, 2012). In close out phase, testing is performed for building commissioning before the building start operation to ensure that all the building systems are function ad intended and follow the project criteria (Robichaud & Anantatmula, 2011).

1.2 Project Management of Green Building in Asia

In feasibility phase, collaborative work become the core of new management paradigms in green construction projects (Liu, Low, & Yang, 2013). In addition, there also some problems where owners are not professional and they do not have consciousness about additional costs brought about green practice. Hence, it is important to hire foreign expertise to give advices on green materials and additional cost of green project (Liu, Low, & Yang, 2013). At design phase, workshop and meetings are important for communications. Reviews of constructability and sustainability and modification are made during this process (Liu, Low, & Yang, 2013). Designers should be involve in construction stages and contractors must be involve in design stage (Liu, Low, & Yang, 2013). In implementation phase, regulations and incentives from government are key driving factors that push forward harmonious collaborative in project management. These incentives can be used to covered additional cost in implementing these green projects (Liu, Low, & Yang, 2013). Moreover, Contractors should set up plans for materials use and reuse, recycling and construction waste management. This energy simulation is an effective way to estimate energy consumption to make sure it meets green building requirements. With this, M&E designers can choose appropriate size and model for equipment and plan that will be used in the projects (Liu, Low, & Yang, 2013).

1.3 Project Management of Green Building in ASEAN

At this early stages, all green features must be incorporate with the project. Besides, all requirements that are stated in BCA's Green Mark Award must be analyzed at feasibility stage to determine whether it is within project teams capabilities (experience, cost and materials) (Hwang & Tan, 2010). Besides, specialist who has deeper knowledge about green buildings and familiar with this concept also be engaged (Hwang & Tan, 2010). In design phase, involvement of all team members in design process

will avoid redesign problem (Hwang & Tan, 2010). The cooperation between architects and engineers at this phase are very important where they can enhance the ability of designers to ensure that designers provide more green and sustainable design for Green Mark certificate projects (Li et al., 2011). In cost estimation, developers and building owners must considers their budgets, ROI, and cost saving for system and technologies. A detailed study about life cycle cost also necessary before making decision to green the project (Low, Gao, & Tay, 2014). In implementation phase, things like uses of recycle materials, minimize disruption to existing natural environment and minimum pollution cause by construction should be include in the contract (Hwang & Tan, 2010). Government must provide incentive to project team members which are developers, architects, contractors, Mechanical & Electrical (M & E) consultants to covers the extra cost that they used in delivering green building (Hwang & Tan, 2010). Besides, in contract also must include policies and regulations to protect human health and environmental issues. If they fail to comply with this, it may cause project delay, termination and fines (Hwang & Ng, 2013). In addition, project managers and contractors need to change workers from their traditional practices Lack (Hwang & Ng, 2013). In close out phase, it is important to make sure the facilities management team and end users have knowledge of green technologies. It is to ensure that they operate and maintain the building correctly so that the sustainability of the building can be maintain and ease the maintenance works (Hwang & Tan, 2010).

1.4 Project Management of Green Building in Malaysia

In feasibility phase, Malaysian government are suggested to bring in foreign expertise in green technology to provide training so that Malaysia can have their experts. This will reduce cost of bring in third party in each green project management (Esa et al., 2011). In addition, government also must add new regulation on green development and insert green practices in legislation (Abidin, 2010). Malaysia are also suggested to establish an interagency green building organization to collaborate with government to help coordinate green building works (Shari, Jaafar, Salleh, & Haw, 2010). In design phase, professional must have ability to present and defend green design options to their clients. This professionals have significant influence to their clients' decision (Shari, Jaafar, Salleh, & Haw, 2010). besides, in Implementation phase, government also are suggested to give incentives for those who implement this green technology (Chan, Lee, & Lee, 2014). Green labelling will help stakeholders to identify green product and help in formulating green specifications in a project (Mohamad Bohari et al., 2015). They also be financially reward for their extra effort by adding value to the building. In addition, authorities also can encourages banks and lenders to provide low interest and guarantees for green building projects loan. At close out phase, it is suggest to implement and award program for top green projects and be a part of annual conference, workshop and other educational event. This will provide competitive edge among the stakeholders and will give additional benefits in generating broad awareness about green development (Shari, Jaafar, Salleh, & Haw, 2010).

2. Method

2.1 Data Collection

Researcher used stratified random sampling since the population sample of the research requires the population to be divided into smaller groups called "strata". The strata for this sample are Engineer, Contractor, Architect, Quantity Surveyor and Developer. Researcher used disproportionate stratification where sample size of each strata is different from each strata. Formulae stratified random sampling is used in determining the sample size for each strata. The formulae are as below:

Sample size = size entire sample (target sample) X population each strata total population Total sample size targeted by researcher is 50 samples.

Table 1. Calculation of Sample Aize

Strata	Population	Sample Size
Contractor	198	50/305 X 198 **= 32**
Architect	38	50/305 X 38 **= 6**
Engineer	30	50/305 X 30 **= 5**
Quantity Surveyor	10	50/305 X 10 **= 2**
Developer	29	50/305 X 29 **= 5**
TOTAL	**305**	**50**

Survey method is used in this study. This methods make researcher easy to collect the data. A survey is an attempt to collect data from members of population in order to determine the current status of that population with respect to one or more variables. A set of questionnaires was used in this study as a medium to get the information from key stakeholders. Researcher used two techniques in distributing the questionnaire which are personally administered the questionnaire to each respondents and email the questionnaires to the respondents company. By this method of survey, this study manage to collect 62% of questionnaires. Table 2 shows the summary of the data collected from the distributed questionnaires.

Table 2. Summary of Questionnaires Distribution

Classification of Key stakeholders	Questionnaires Distributed	Questionnaires Returned	Percentages (%)

Architects	15	11	73
Engineers	10	6	60
Contractors	50	30	60
Quantity Surveyors	10	8	80
Developers	10	4	40
Total	**95**	**59**	**62**

2.2 Analysis Methodology

After data are collected from the survey form, each form are sort according to their position in the industry whether they are Architects, Engineers, Contractors, Quantity surveyors or Developers. Analysed are conducted accordance with the sections in the questionnaire. The data is analysed using Statistical Package for the Social Science 18 version software (SPSS). Data is then presented in various Tables and graphs to show the relationship between the variables. The analysis technique used are Cronbach's Alpha and Frequency Analysis.

3. Result

Before analyzing the data, reliability test are conducted to test the reliability of the data obtained from this research. Statistic for reliability test are shown in Table 3. To determine the characteristics of facility at the public bus station.

Table 3. Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.947	0.946	53

The value of 0.07 indicates an acceptable level of reliability. According to reliability statistics in Table 1, value of Cronbach's alpha is 0.947. The value is greater than .07. This shows that relation of each sets of items in group of variables are reliable. Hence the data obtained from this research are reliable.

3.1 Green Practices that Are Accepted by Stakeholders

In this section, it has one main question that are separated into four phases of construction. The practices that have percent frequency above 50% for agree and strongly agree from each group of respondents are considered as accepted. As the objective is to identify the practices that are accepted by stakeholders, it is important to analyze the data to gain the practices are accepted by each group of respondents.

3.1.1 Feasibility Phase

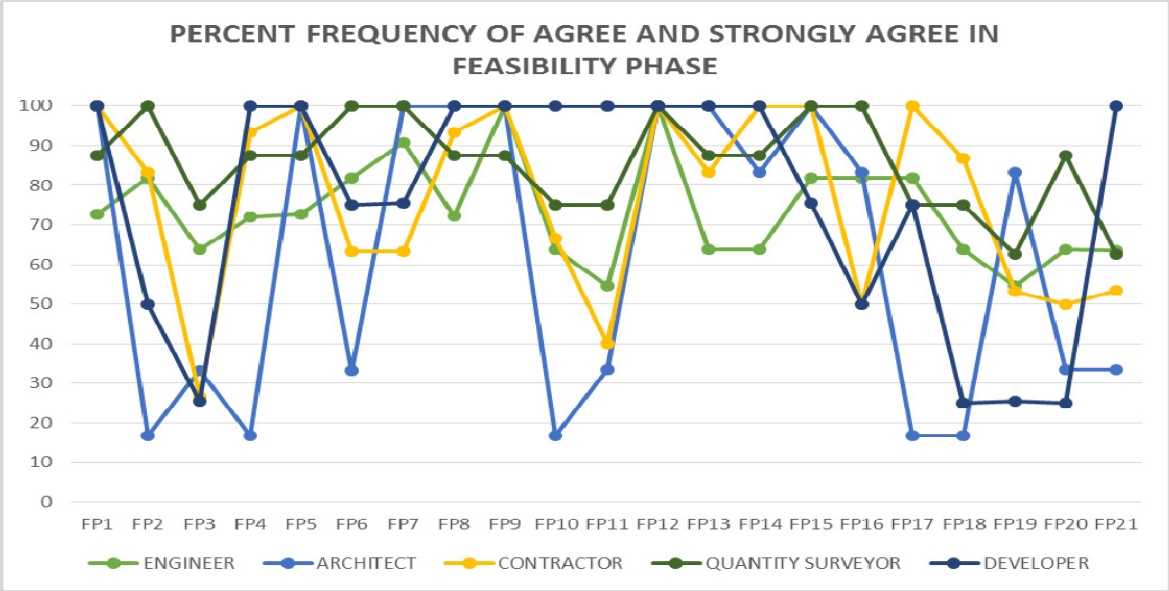

Figure 1. Percent Frequency Chart in Feasibility Phase

Table 4. Percent Frequency of Green Practices in Feasibility Phase

NO.	ITEM	TOTAL PERCENT FREQUENCIES OF AGREE AND STRONGLY AGREE (%)				
		ENGINEER	ARCHITECT	CONTRACTOR	QUANTITY SURVEYOR	DEVELOPER
FP1	Define project needs by integrate green concepts into project contents.	72.7	100.0	100.0	87.5	100.0
FP2	Hire Project Manager with high experience in green building project.	81.8	16.7	83.3	100.0	50.0
FP3	Hire third party (green professional) as Project Manager.	63.7	33.3	26.7	75.0	25.5
FP4	Each stakeholders contribute knowledge to identify performance goal.	72.1	16.7	93.3	87.5	100.0
FP5	Start the project with high aspiration of green standard.	72.7	100.0	100.0	87.5	100.0
FP6	Finalized ecological goal based on cost benefits analysis in sites analysis and plans.	81.8	33.3	63.3	100.0	75.0
FP7	Finalized economic goal based on cost benefits analysis in sites analysis and plans.	90.9	100.0	63.3	100.0	75.5
FP8	Implement charrettes (stakeholders group together include local government planners and others regulatory agencies).	72.7	100.0	93.3	87.5	100.0
FP9	Tackle decision making process from various criteria point of view.	100.0	100.0	100.0	87.5	100.0
FP10	Contractors contribute to the project at early stage.	63.7	16.7	66.7	75.0	100.0
FP11	Stakeholders emphasized more on impact of their ethical related risk (knowledge of green development, decision making, etc.).	54.6	33.4	40.0	75.0	100.0
FP12	Stakeholders have interpersonal competencies (communication, negotiation etc.).	100.0	100.0	100.0	100.0	100.0
FP13	Use final report from charrette as guiding document in construction and design.	63.7	100.0	83.3	87.5	100.0
FP14	Stakeholders fully involve in site selection.	63.7	83.3	100.0	87.5	100.0
FP15	Take into consideration of community impact in site selection.	81.8	100.0	100.0	100.0	75.5
FP16	Provide consultancy services to assist in green project.	81.8	83.3	50.0	100.0	50.0
FP17	Use internal consultant to assist in green project.	81.8	16.7	100.0	75.0	75.0
FP18	Use risk management in assisting selection of subcontractors.	63.7	16.7	86.7	75.0	25.0
FP19	Bring foreign expertise to provide training to create our own expertise.	54.6	83.3	53.3	62.5	25.5
FP20	Government insert green practice in legislation.	63.7	33.4	50.0	87.5	25.0
FP21	Establish interagency green building organization to collaborate with government.	63.6	33.4	53.4	62.5	100.0

Figure 1 and Table 4 highlight the item that are accepted by each group of respondents. There are

several items that are not accepted as the percent frequency that gain are not above 50% for each group of respondents. Hence, there are ten practices that are accepted by all group respondents due to the percent frequency show the value above 50% for each group of respondents. All group of respondents are agree to include FP1 as green practice in green project management. This practice is in line with the finding by Silvius (2010), which indicate that the aspects of green development are best integrated from the beginning of the process so that the work to be done are focus on green development and green building project can be deliver successfully. It is also same as found by Hwang and Tan (2010), which all green features must be incorporate with the project content at early stage of the construction. Late incorporation of green features in project contents may cause multiple changes and lead to expensive project cost problem and other possible problems. Besides, FP5, FP7 and FP8 also gained 50% above of frequency from all group of respondents. This is in line with the finding by Wu and Low (2010), which is indicate that green building project must start with high aspirations of green performance standards to safeguard green baton during the project cycle. As Robichaud and Anantatmula (2011) found, ecological and economical goals should be finalized based on cost benefits analysis in preliminary site analysis and plan. Cost model must be create by make sure that resources and program goals are in line to ensure project priorities are match with resources. For FP8, literature review found that almost all countries implement charrettes in their green construction industry. This charrette group all stakeholders together so that their talents and energies will be used to create buildable smart growth plan. According to Mir and Pinnington (2014), this charrette can help in knowing the stakeholders perspective since they are group together at the early stages of project. This practice give big impact in the successfulness of green project because it assist project team members to focus on common goals. FP9, FP12 and FP13 also accepted by all group of respondents. FP9 stated that environmental consideration must be add in green building project. Hence, it is important to make decision by tackle from various criteria point of view. FP12 is in line with Silvius and Schipper 920140 which indicate that interpersonal competencies important in development of stakeholders in their role in implementing green in project management. FP12 indicated that final report from charrette is then used in the next construction and design process. FP14, FP15 and FP16 also show the percent frequency above 50% and above from all group of respondents. According to Lippaiova and Sebestyen (2013), FP14 and FP15 practices are important in delivery green building project successfully. During this practices, construction team are put in place and all team members have their stake in site selection. Hence, this made them knows their responsibilities and objectives of the project from the beginning of the project stage. Moreover, FP16 is in line with Hwang and Tan (2010) where consultancy services is important to assist in green building construction where specialist who has deeper knowledge about green buildings and familiar with this concept be engaged. By engaging person with green expertise be a part of construction team members, he/she can give advice and motivate team members towards goal of green building project.

3.1.2 Design Phase

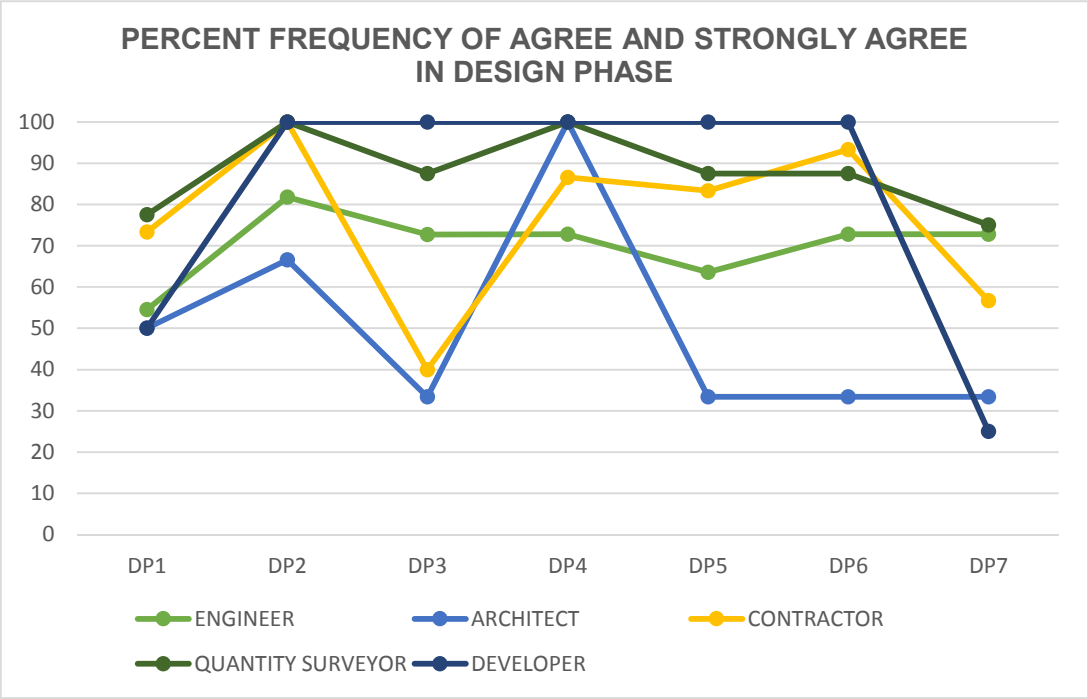

Figure 2. Percent Frequency Chart in Design Phase

Table 5. Percent Frequency of Green Practices in Design Phase

NO.	ITEM	TOTAL PERCENT FREQUENCIES OF AGREE AND STRONGLY AGREE (%)				
		ENGINEER	ARCHITECT	CONTRACTOR	QUANTITY SURVEYOR	DEVELOPER
DP1	Insert life cycle cost and return on investment from maintenance saving in preconstruction estimates.	54.5	50.0	73.3	77.5	50.0
DP2	Imported duties of green materials are paid by government.	81.8	66.6	100.0	100.0	100.0
DP3	Architect and contractor involve in design process.	72.7	33.4	40.0	87.5	100.0
DP4	Engineers cooperate with architects to provide more green and sustainable design.	72.8	100.0	86.6	100.0	100.0
DP5	Held workshop to discuss about green feasibility after schematic design is proposed	63.6	33.4	83.3	87.5	100.0
DP6	Held meetings to review constructability, sustainability and modification made.	72.8	33.4	93.3	87.5	100.0
DP7	Stakeholders must present and defend green options to clients.	72.8	33.4	56.7	75.0	25.0

Figure 4 show three practices that accepted to be implement in green project management. DP1, DP2 and DP4 gained above 50% frequency from all group of respondents. DP1 is in line with finding by Robichaud and Anantatmula (2011) which indicate that this life cycle cost and return on investment from maintenance savings include in estimation due to focus that are given on long term gains from operational saving compared to short term return on investment. Moreover, DP2 also in line with the finding by Ihuah, Kakulu and Eaton (2013) where they suggest that import duties for green projects to be exclude from the estimation and it should be paid by government. DP4 show that Engineer should cooperate with Architect to provide more green and sustainable design. According to Hwang and Tan (2010), green building design are more complicated and unique compared to conventional buildings. Hence, the cooperation between Architects and Engineers at design phase are important where they can enhance the ability of designers to ensure that designers provide more green and sustainable design.

3.1.3 Implementation Phase

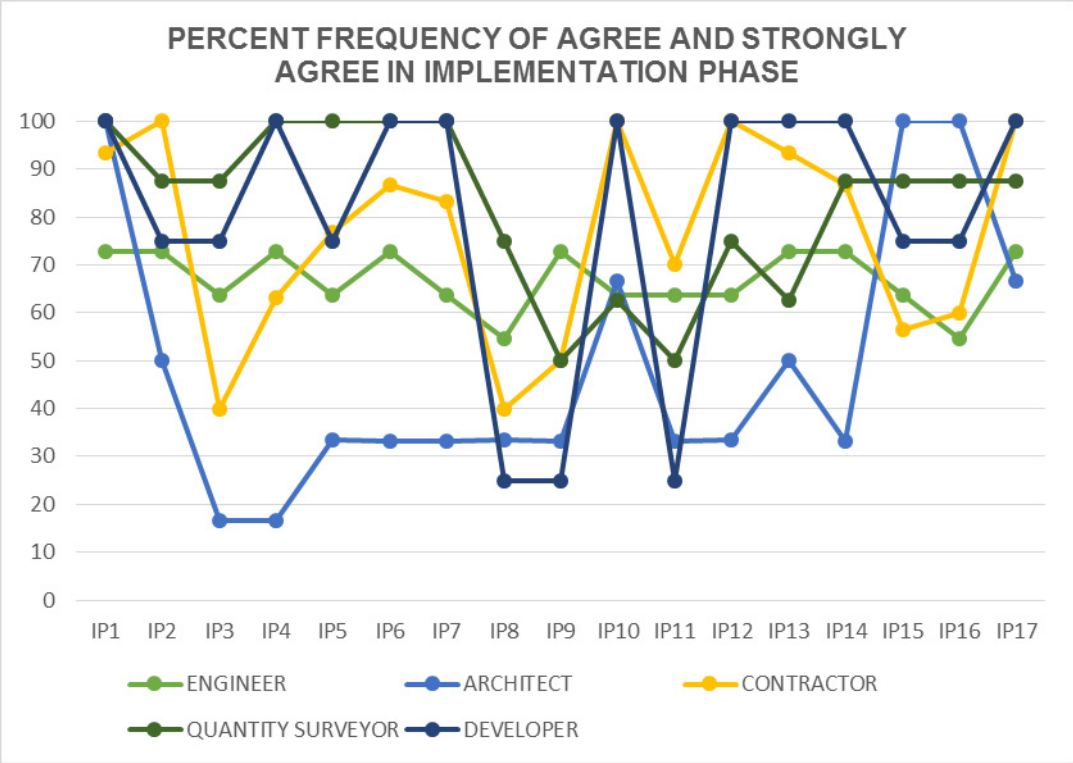

Figure 3. Percent Frequency Chart in Implementation Phase

Table 6. Percent Frequency of Green Practices in Implementation Phase

NO.	ITEM	TOTAL PERCENT FREQUENCIES OF AGREE AND STRONGLY AGREE (%)				
		ENGINEER	ARCHITECT	CONTRACTOR	QUANTITY SURVEYOR	DEVELOPER
IP1	Include incentive bonuses for perform green practices in contract.	72.8	100.0	93.4	100.0	100.0
IP2	Government provide subsidies for green building development.	72.8	50.0	100.0	87.5	75.0
IP3	Include specific clause related to green building.	63.7	16.7	40.0	87.5	75.0
IP4	Include performance agreement implementing green project in contract.	72.7	16.7	63.3	100.0	100.0
IP5	Include details of green design in contract.	63.6	33.4	76.7	100.0	75.0
IP6	Stakeholders identify risk specific to their roles and mitigate them through contracts.	72.7	33.3	86.7	100.0	100.0
IP7	Addressed additional risk related to insurance coverage of green project in contract.	63.7	33.3	83.3	100.0	100.0
IP8	Include energy star requirement in contract.	54.6	33.4	40.0	75.0	25.0
IP9	Include agreement to return unused materials to vendors in contract.	72.7	33.3	50.0	50.0	25.0
IP10	Include bonuses for exceed green development goals in contract.	63.7	66.7	100.0	62.5	100.0
IP11	Project Manager held monthly site meeting that includes green education for all on-site construction personnel.	63.7	33.3	70.0	50.0	25.0
IP12	Project Manager give training about green construction to all personnel.	63.6	33.4	100.0	75.0	100.0
IP13	Project Manager reviewed green requirement with subcontractor and contractor prior to commencing work.	72.7	50.0	93.3	62.5	100.0
IP14	Plan and schedule the project with high efficiency and low interruption to fulfil green project requirements.	72.7	33.3	86.6	87.5	100.0
IP15	Contractors set up plans for materials use and reuse, recycling and construction waste management to estimate energy consumption.	63.7	100.0	56.6	87.5	75.0
IP16	Implement green labelling to help stakeholders identify green product.	54.6	100.0	60.0	87.5	75.0
IP17	Authorities encourages banks and lenders to provide low interest and guarantees for green building project loan.	72.7	66.7	100.0	87.5	100.0

Figure 3 and Table 6 shows that both IP1 and IP2 represented frequency above 50% from all group of respondents. According to Liu, Low and Yang (2013), this practices have been implemented in China where Ministry of Finance (MOF) and the Ministry of Housing and Urban Rural Development (MHRUD) and some local government have introduced policies to provide subsidies to support green building development. This practices help in relieving owner's financial burden and allow stakeholders enjoy more economic incentives and it can be used to cover additional cost in implementing green projects. Furthermore, all group of respondents also represented percent frequency above 50% for IP13, IP15, IP16 and IP17. According to Robichaud and Anantatmula (2011), they also agreed with IP13 where Project Manager must review green requirement with Contractors and Subcontractors. IP15 is in line with finding by Liu, Low and Yang (2013), which indicated that this practice is important to make sure it is meets green building requirements where energy simulation is an effective way to estimate energy consumption. Moreover, according to Mohamad Bohari et al. (2015), green labelling should be mandatory in establishing green criteria where it will help stakeholders to identify green product and help in formulating green specifications in a project. This shows that all stakeholders are need this IP16 practice so that it will ease their work in determine the product that must be used in green projects. IP17 practices seems will overcome cost barriers arise in the green building projects. This also helped to relieve owners' financial burden by stakeholders. This practices is in line with finding by Shari, Jaafar, Salleh and Haw (2010) which indicate that low interest and guarantees of green building projects loans allows to overcome cost barriers to new technologies and practices that need to implement in green building project.

3.1.4 Close Out Phase

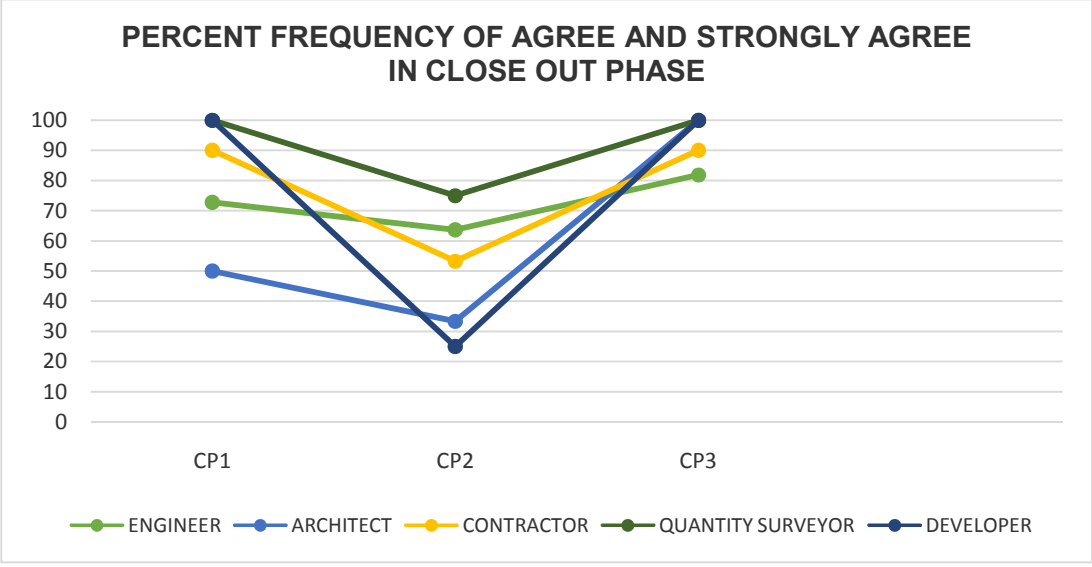

Figure 4. Percent Frequency Chart in Close Out Phase

Table 7. Percent Frequency of Green Practices in Close Out Phase

NO.)	ITEM	TOTAL PERCENT FREQUENCIES OF AGREE AND STRONGLY AGREE (%)				
		ENGINEER	ARCHITECT	CONTRACTOR	QUANTITY SURVEYOR	DEVELOPER
CP1	Testing for green building certification by commissioning authority that hired at early phase of construction.	72.7	50.0	90.0	100.0	100.0
CP2	Facilities management and end user highly understand of green technologies.	63.6	33.4	53.3	75.0	25.0
CP3	Implement an award program for top green projects as a part of annual conference, workshop and other educational event.	81.9	100.0	90.0	100.0	100.0

NO.)	ITEM	TOTAL PERCENT FREQUENCIES OF AGREE AND STRONGLY AGREE (%)				
		ENGINEER	ARCHITECT	CONTRACTOR	QUANTITY SURVEYOR	DEVELOPER
CP1	Testing for green building certification by commissioning authority that hired at early phase of construction.	72.7	50.0	90.0	100.0	100.0
CP2	Facilities management and end user highly understand of green technologies.	63.6	33.4	53.3	75.0	25.0
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CP1	Testing for green building certification by commissioning authority that hired at early phase of construction.	72.7	50.0	90.0	100.0	100.0
CP2	Facilities management and end user highly understand of green technologies.	63.6	33.4	53.3	75.0	25.0
CP3	Implement an award program for top green projects as a part of annual	81.9	100.0	90.0	100.0	100.0

	conference, workshop and other educational event.					
NO.)	**ITEM**	**FREQUENCIES OF AGREE AND STRONGLY AGREE (%)**				
		ENGINEER	**ARCHITECT**	**CONTRACTOR**	**QUANTITY SURVEYOR**	**DEVELOPER**
CP1	Testing for green building certification by commissioning authority that hired at early phase of construction.	72.7	50.0	90.0	100.0	100.0
CP2	Facilities management and end user highly understand of green technologies.	63.6	33.4	53.3	75.0	25.0
CP3	Implement an award program for top green projects as a part of annual conference, workshop and other educational event.	81.9	100.0	90.0	100.0	100.0
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		ENGINEER	**ARCHITECT**	**CONTRACTOR**	**QUANTITY SURVEYOR**	**DEVELOPER**
CP1	Testing for green building certification by commissioning authority that hired at early phase of construction.	72.7	50.0	90.0	100.0	100.0
CP2	Facilities management and end user highly understand of green technologies.	63.6	33.4	53.3	75.0	25.0
CP3	Implement an award program for top green projects as a part of annual conference, workshop and other educational event.	81.9	100.0	90.0	100.0	100.0
NO.)	**ITEM**	**TOTAL PERCENT FREQUENCIES OF AGREE AND STRONGLY AGREE (%)**				
		ENGINEER	**ARCHITECT**	**CONTRACTOR**	**QUANTITY SURVEYOR**	**DEVELOPER**
CP1	Testing for green building certification by commissioning authority that hired at early phase of construction.	72.7	50.0	90.0	100.0	100.0
CP2	Facilities management and end user highly understand of green technologies.	63.6	33.4	53.3	75.0	25.0
CP3	Implement an award program for top green projects as a part of annual conference, workshop and other educational event.	81.9	100.0	90.0	100.0	100.0

Figure 4 and Table 7 shows that two green practices in implementation phase are accepted by all group of respondents which are CP1 and CP3. Performing building commissioning testing before the building start operating is important to ensure that all building systems are function well and follow the project criteria. Besides, implement and award program practices also will help in delivering successful green building project. This practice will provide competitive edge among stakeholders and give additional benefits in generating broad awareness about green development.

3.2 Green Project Management Framework

There are several practices that acceptable to be implement in green project. There are different approach in different phase. It give the current view of green development in construction industry and describe the adjustment that should be made in traditional project management. This framework also describe the adjustment that should be made in traditional project management in delivering green building projects. This framework will help in improving project management process in delivering green building project besides provide possible actions that can be taken in delivering green technology. The proposed model is not intended to be the actual project management framework. The intention of research was to respond to the barriers and problems of green development in construction industry.

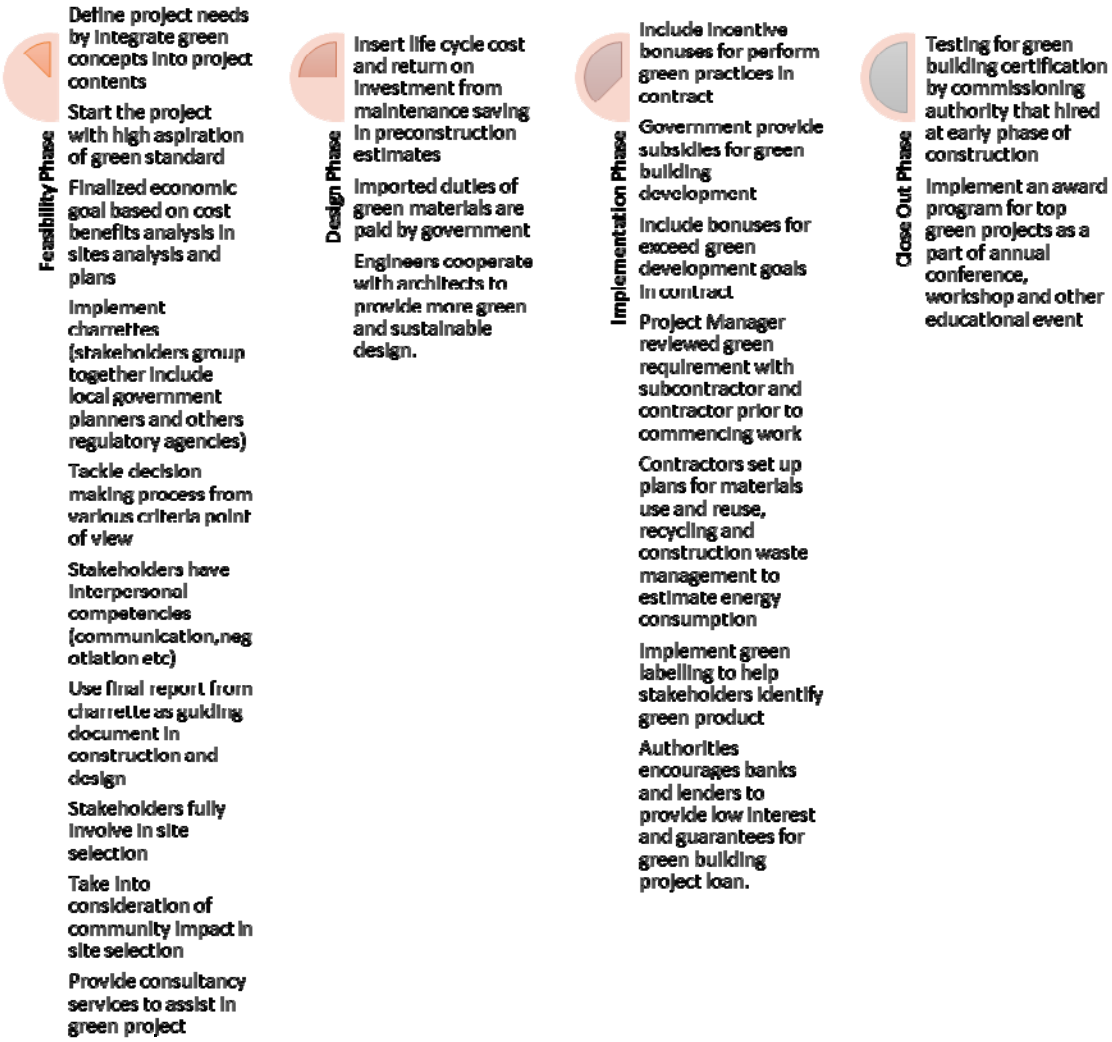

Figure 5. Green Project Management Framework

4. Discussion

Total 22 out of 48 practices are accepted by all stakeholders to be implement in green project management. Even all practices that are identified in review are realistic and most of them are implemented in others country, it doesn't mean that it can simply be implement in Malaysia. Stakeholders' perception and their acceptant to the practices are important since they are the people who play the main role in green building project. Their willingness in implementing all those practices are key to the green project success. Considering that our country have problem in stakeholders acceptant in implementing green development, their perception should be put as priority. Admittedly, the model developed in this study will not solve all the problems in green development. What is more important in order to reduce the problems and a step in increasing green development in construction industry is to have a proper framework to enhance green practices in construction. The new framework developed in this study calls for green practices by considering all stakeholders perspective to deal with green development in construction industry.

This study proposed a green project management framework that are realistic and practicable by taking into consideration of stakeholders' perspective. Hence, authorities must take possible action to implement this green project management framework to enhance green development in Malaysia. This framework will help in improving project management process in delivering green building project and provide opportunities to stakeholders speed up their acceptance of green development in Malaysia.

For further research, researcher suggested to do a case study by choose building project to implement this framework. As the beginning of implementation, the project can be a government project since several practices proposed are related to the authorities' roles. This is aiming to test the reliability and practicable of the framework. If the framework give the positive result and can be implemented in the green building project, it is a good start in enhancing green development in Malaysia construction industry. Since, it took a long time to do a case study, researcher suggested to do this study on small government projects

References

Abidin, N. Z. (2010). Investigation the Awareness and Investigation of Sustainable Construction Concept by Malaysian Developers. *Journal of Habitat International*, *34*, 421-426. http://dx.doi.org/10.1016/j.habitatint.2009.11.011

Carboni, J. (2014). Sustainability in Project Management (Governance and Integration of the P5 Standard). *International Project Management Association*, *25*, 1-9. http://dx.doi.org/10.1016/j.ijproman.2015.04.004

Carvalho, M. M., Patah, L. A., & Bido, D. (2015). Project Management and its Effects on Project Success: Cross-country and cross-industry Comparisons. *International Journal of Project Mangement*, *33*, 1509-1522.

Chan, Y. H., Lee, C. B., & Lee, J. C. (2014). Sustainability in the Construction Industry in Malaysia: The Challanges and Breakthroughs. *International Journal of Social, Behavioral, Educational, Economis, Business and Industrial Engineering*, *8*, 1218-1222.

Delvanaz, M. (2012). *Peoject Managers' Role in Sustainable Building Process*, *30*, 1-35.

Esa, M. R., Marhani, M. A., Yaman, R., Hassan, M. A., Noor Rashid, H. N., & Adnan, H. (2011). Obstacle in Implementing Green Building Projects in Malaysia. *Australian Journal of Basic and Applies Sciences*, *5*(12), 1806-1812.

Hwang, B. G., & Ng, W. J. (2013). Project Management and Skills for Green Construction: Overcoming Challenges. *International Journal of Project Management*, *31*, 272-283. http://dx.doi.org/10.1016/j.ijproman.2012.05.004

Hwang, B. G., & Tan, J. S. (2010). *Green Building Project Management: Obstacles and Solutions for Sustainable Development*, *20*, 335-348. http://dx.doi.org/10.1002/sd.492

Hwang, B., Leong, L. P., & Huh, Y. (2012). Sustainable Green Construction Managemen: Schedule Perfoemance and Improvement. *Technology and Economic Development of Economy*, *19*, 43-57.

http://dx.doi.org/10.3846/20294913.2013.869669

Ihuah, P. W., Kakulu, I. I., & Eaton, D. (2013). A review of Critical Management Success Factors (CPMSF) for Sustainable Social Housing in Negeria. *International Journal of Suatainable Built Environment*, *3*, 62-71. http://dx.doi.org/10.1016/j.ijsbe.2014.08.001

Korkmaz, S. M., Swarup, L., & Riley, D. (2013). Delivering Sustainable, High-Performance Buildings: Influence of Project Delivery Methods on Integration and Project Outcome. *Journal of Management in Engineering*, *29*(1), 71-78. http://dx.doi.org/10.1061/(ASCE)ME.1943-5479.0000114

Liu, J. Y., Low, S. P., & Yang, J. (2013). Conceptual Framework for Assessing the Impact of Green Practices on Collaborative Work in China's Construction Industry. *Journal of Professional Issues in Ingineering Education and Practice*, *139*(3), 248-255. http://dx.doi.org/10.1061/(ASCE)EI.1943-5541.0000153

Low, S. P., Gao, S., & Tay, W. L. (2014). *Comparative Study of Project Management and Critical Success Factors of Greening New and Existing Building in Singapore*, *32*(5), 413-433.