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Sustainable Building through Project Planning Process

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Abstract

Planning process has a significant impact on the ability of a construction project to success. This is the stage where the detailed directions are given which would affect the whole course of the project. The process is argued to be the most crucial stage which the principles of sustainability are integrated throughout the whole life of building. The purpose of this research was to investigate the Malaysian building project stakeholders' perspectives on the most significant strategies to integrate sustainability principles into the whole life of building through the project planning process. From the review of available literatures, there are 21 strategies to integrate sustainability principles during a building project planning process have been unveiled. A total of 357 Malaysian project stakeholders who have been directly involved in sustainable building project and/or the stakeholders who are judged to be knowledgeable on the project were selected to be contributed for questionnaire survey. The collected data were analyzed using cronbach's alpha measurement to assess their internal reliability, and frequency and descriptive analysis to measure the relative importance of the factors. The result shows that all the 21 strategies (the factors) to integrate sustainability during a project planning process were identified by the respondents to be very crucial to be implemented throughout the planning process of a sustainable building project in Malaysia. This paper offers ideas and recommendations on the sustainability integration strategies to be practiced throughout the project planning process towards delivering a successful sustainable building project. The concept is very useful to be a starting point for the development of a practical 'Sustainability Integration Framework' during the planning process of a sustainable building project in the future.

Keywords: Sustainable Building Project; Construction Project; Project Planning Process

1. Introduction

It is very difficult to define precisely the constitution of a sustainable building. However, most of them have been extended to be based upon the three pillars of 'triple bottom line' concept which developed in 1997 by John Elkington (Edward, 1998; Sayce et al, 2004; Adler et al, 2006). Sustainable buildings have many desirable attributes and ultimately growing in demand. In this project, buildings are planned and designed in parallel rather than series so that the cumulative effect of planning and design decision concerning one system can be evaluated on other systems. Thus, an integrated and determined planning process is needed to integrate the sustainability attributes into the project's whole life and this required a great demand on an efficient method of

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integration. Planning is the most important process conducted in managing the whole life of the projects (Kerzner, 2006; Zwikael et al., 2005; Hamilton et al, 1996; Turner, 1993). This is the stage which the detailed directions are given which would affect the whole course of the project. During this stage, the relevant stakeholders involved to understand and perform their part in the project. Incorporation of sustainability principles later after this stage will be a burden and should be avoided.

There are many intellectual publications on the subject of sustainable building, but the ones that relate to the planning process of the project are very few. Several papers were published, which discussed the importance of planning process towards delivering a sustainable building project successfully. These papers however were more theoretical-based than research-based. In Malaysia, there was some evidence that indicated the use of several sustainability principles during the project planning process for instances, integrated design process throughout the Malaysian Green Building Index (GBI) fully certified building projects – Low Energy Office (LEO), Green Energy Office (GEO) and Diamond building. Many other projects might have been conducted integrated design process throughout their project planning which is not known by the public. As planning process is believed as a strategic position to deliver a successful sustainable building outcome, one unanswered question remain which becomes the prominence gaps of this research - how do the sustainability principles should be integrated into the whole life of a sustainable building through the project planning process? For that reason, this study attempt to respond to the question by searching for the strategies/factors that should be considered throughout the planning process of a sustainable building project in Malaysia in order to perform the sustainability integration successfully. From that, sustainability principles are efficiently integrated into the project and ultimately, improve the changes of delivering a successful sustainable building outcome. This paper has taken initial step to venture into this area by studying the Malaysian building project stakeholders' perspectives on the most significant strategies that should be practiced throughout the planning process of a sustainable building project in order to integrate sustainability principles into the building whole life successfully.

2. Planning Process of a Sustainable Building Project in Malaysia

There was not much discussion about project planning process in Malaysia. A typical project planning process in Malaysia is involved with legislature and development plan. There are over fifty (50) laws and guidelines that should be considered by the construction players (Abdullah et al, 2011) when planning for a property development project such as National Land Code (NCL) 1965, Town and Country Planning Act (Act 172), the Government Act 1976 (Act 171), Uniform Building by Law 1984 (UBBL), the Environmental Quality Act 1984 and so forth. A layout and building plan that will be submitted should comply with various development plans such as the national physical plan, a structure plan, a local plan and a specific area plan that have been formulated under Part III of the Act 172 which a developer has to obtain all planning approvals before any physical work can commence on site. Preliminary discussion will normally take place between the planning consultants and the planning department at the

respective local authorities during the layout plan, building plan or planning permission submission process. A registered town planner is a principal submitting party (PSP) engaged by the developer or land owner to prepare the layout plan and will act as PSP for all planning approvals at the planning permission stage. The civil and structural engineer is required to produce the platform design for the earthwork plan application and structural building design for the architect to submit at the building plan approval. A good working relationship between the consultant, the developer and various respective departments at the local authorities will directly contribute to a successful planning approval (Abdullah et al, 2011).

In conventional Malaysian building projects, planning process is typically not conducted very well due to its complexity and extra costs that almost always associate with it (Mansur et al, 2003). Malaysian clients and consumers of the construction industry place on emphasis on costs, often at the expense of quality. Two practices that cause this focus on low cost are budget constraints imposed by clients and the use of many levels of subcontracting. Moreover, industry representatives have noted that many clients do not award projects to contractors based on their technical capabilities (CIDB, 2007).

On the contrary, in Malaysian's so-called sustainable building projects such as LEO, GEO and Diamond buildings, sustainability measures mainly on environmental aspects were implemented throughout various facets of the overall design. Passive architecture design has been incorporated in order to enhance the future operations for energy efficiency and lowering operational costs. An Integrated design process which emphasizes more upfront investment has been employed by a range of stakeholders' groups' involvements. On top of the usual laws and guidelines that should be considered by the construction players, they should also consider the MS1525 (Code of Practice on Energy Efficiency and the Use of Renewable Energy for Non-Residential Buildings) in the development of the building. The owners who intend their buildings to have GBI certified; an application should be submitted directly or through a GBI facilitator, of a comprehensive design and other necessary documents for GBI assessment. The information submitted should be based on preconstruction information such as tender documentation stage when all principles of the design have been finalized. A provisional design assessment certificate is given at this stage. Further completion and verification assessment for a full GBI certification will be given after the criteria have been properly implemented and verified within 12 months of getting certificate of completion and compliance (CCC) or earlier if not less than 50% occupancy (GSB, 2009).

3. Sustainability Integration through Project Planning Process: Developing a Theoretical Concept

A theoretical concept was developed to define the most significant strategies to be considered to ensure efficient sustainability integration into a sustainable building project during its planning process. There are four (4) main strategies have been unveiled as the most important to be implement during the project planning process as follows (Isa, et al, 2014);

- *Sustainable Project Orientation*

To deliver a sustainable building project, sustainability goals and project priorities must be set since the strategic and early planning stage of the project as they establishes the framework in which all future project decisions are made (Robichaud and Anantatmula, 2011). The early planning of a project generally includes a group discussion about the needs and requirements for the project, project scope definition, early designs are formulated, critical decisions are made and the specific project execution approach is defined. It is the project phase encompassing all the tasks between project initiation and detailed design (Gibson and Gebken, 2003) which is the starting point of achieving sustainability to realize the goal of sustainability (Wu and Low, 2010). Sustainability principles should be introduced to the team members during this stage so that they are able to improve the end result by ensuring that all building systems work cooperatively in the most sustainable manner (Glavinich, 2008). Success during the detailed design, construction and the rest phase of the project depends highly on the level of effort during this stage (Gibson and Gebken, 2003; Dumon et al, 1997).

- *Integrated Project Team*

Active design professionals' involvement in planning was repeatedly claimed as the key to increase project success (Gibson and Gebken, 2003). Thus, to plan for a successful sustainable building project, the stakeholders who are involved in the planning process must fully understand the issues and concerns of all parties and interact closely throughout the planning process of the project. Each project shall have a core integrated project team that shall be cross-functional to accomplish the various tasks of the project. Stakeholders from the operation and maintenance group, financial, environmental, health and safety, security, information technology and facilities, or space planning, also should be included and are involved and maintained during the whole process of project planning and delivery (The State of Minnesota, 2009; Department of Health and Human Services, 2008). They have to be committed and having core the knowledge of sustainable buildings project. Without a sustainable building project knowledge base, they will not be able to evaluate and deliver such projects accurately and effectively (Choi, 2009; Mochal and Krasnoff, 2010). The sustainable development education needs to reach beyond designers and architects for the acceptance of the sustainable building construction. The project personnel should be educated to ensure they focus on sustainability in their work for the projects (Halliday, 2008). The project team members should be informed on the sustainability issues. Sustainability quality and capability should be considered during the selection of the team members during the feasibility and planning stage. They are selected based on their familiarity with the product type and market, and will have exposure to all phases of the sustainable building project (Doyle et al., 2009; Bogenstätter, 2000). Continual communications and training for all project personnel are essential during the planning phase to ensure the accomplishment of sustainable project goals in a cost effective manner and within the time frame (Mochal and Krasnoff, 2010). Lack of understanding of the project's characteristics will lead to a defective delivery process and increased cost and time.

- *Integrated Design Process*

The traditional project management process runs linearly and usually has minimal input from engineering disciplines, operation and maintenance groups or the outsider during the planning and design stage (Doyle et al., 2009; Choi, 2009). There were also lack of effective communication among various technical experts who tend to use their own tools, protocol, and industry standards for making decisions and tracking information (Sappe, 2007). On the contrary, a sustainable building project works best when the expanded group of stakeholders work together to concentrate the majority of their creative efforts as early in the planning process (Prowler, 2011; Muldavin, 2010; Bogenstätter, 2000). There is the need to adopt strategies that facilitate collaborative working among project teams, as a prerequisite to achieving sustainability objectives (Ugwu and Chaupt, 2006). Sustainability principles in building are integrated successfully into the project by applying an integrated design process throughout the planning process. The process incorporates nine (9) sub-strategies; 1) Involve diverse set of stakeholders on the team, 2) Committed and collaborative team throughout the process, 3) Bringing the team together as early as possible, 4) Sustainability and integrated design requirements and the process are included into the project documentations, strategic and comprehensive plan, 5) Do whole building design and system analysis, 6) Commissioning process is added during this process and described in a specific section, 7) Planning should reflect all the project stakeholders (internal and external), 8) Design should reflect the end user community, 9) Effective communication and incorporation of charrette process (Isa et al, 2014). The adoption of these strategies ensures the lowering of overall building costs by the promotion of synergies between building systems that may minimize or eliminate the need for certain building features. Early incorporation and the modeling of design features may minimize change orders during later stages where increase costs and time may be much longer. The strategy also enable the production of a more efficient, durable structure, which will lower long term operating and replacement costs (Choi, 2009; Doyle et al., 2009, Lapinski et al., 2006; Beheiry et al., 2006, Reed and Gordon, 2000).

- *Sustainability Regulations and Code Compliances*

Regulatory processes and codes that meet the sustainability goals can help to promote sustainable building practices (Muldavin, 2010; Choi, 2009) for example, government policies can heavily influence the development of a sustainable building project. Codes and ordinances can be used as a regulatory tool to encourage a sustainable development by setting clear criteria that stakeholders need to meet. Meanwhile, regulatory guidelines and processes are areas where incentives or allowances can be adjusted to encourage sustainable practices. Monetary or process-oriented incentives can be offered such as to ease the initial cost differential or difficulty factor. Monetary incentives can offset any cost differential or provide savings for choosing a sustainable building, making the adaptation to a sustainable development more feasible for property owners and developers (Choi, 2009). It can also be used to fund an integrated design or bring in expertise for consultation. Additionally, a marketed incentive can bring positive publicity to the practices, offering developers an alternate design where the developers and the community may both benefit.

4. Research Methodology

The theoretical concept derived from understanding the literature forwarded the idea that planning process has the capability to integrate sustainability principles into a sustainable building project successfully. A total of 357 project stakeholders who have been directly involved in sustainable building project and/or the stakeholders who are judged as knowledgeable on the project were selected to be contributed for questionnaire survey. The respondents are 160 respondents from class A contractors who are registered in the Malaysian Contractor Service Center (PKK), 75 respondents from Malaysian Institute of Architects' corporate member firms (PAM), 11 respondents from the engineering firms who are registered in the Malaysian Institute of Engineers (IEM) and also registered member of consulting firm in the Association of Consulting Engineers Malaysia (ACEM), 10 planner firms who are registered with Malaysian Institute of Planners (MIP), 88 developers who are listed by Real Estate and Housing Developers' Association (REHDA), 2 representative from the Malaysian local universities and 11 officers who are working in among 154 local authorities in Malaysia which listed by the Ministry of Housing and Local Government of Malaysia (KPKT). However, only 188 samples were successfully obtained within the range of 42%-100% from each group, making the overall response rates of 53%.

5. Data Analysis

The responses received shows a hundred percent (100%) of the respondents are degree holders, which is 11% of them are also master's degree and PhD holders. A total of 62% of the respondents have been directly involved in sustainable building project. This percentage is considered unquestionable because this project is still new and unusual among the project stakeholders in Malaysia (Zainul Abidin, 2010). It was revealed that majority (81.9%) of the respondents have been active in the industry between 11 to 15 years and 62% of them also having experiences in sustainable building project. The rest of 18.1% respondents have been active in the industry between the ranges of 16 to 26 years and above, 62% of them are also involved in sustainable building project. The duration of working experiences between 11 to 15 years are considered fairly long for construction industry. Moreover it was found that the respondents within this group were also the majority (82%) out of the total respondents who have been involved in between 1 to 15 sustainable building projects (62%). Majority of the respondents (79 out of 117 respondents) who have been involved in sustainable building project were also occupied in the planning process of the project. Considering the level of education, working experiences and career development, the respondents who gave their responses in the survey are considered to be competent to give their ideas on the subject matter.

There are 21 strategies to integrate sustainability through a building project planning process were listed in the questionnaire in order to seek understanding and identifying the most important sustainability integration strategies from the views of Malaysian building project stakeholders as listed in the first column of Table 1. Respondents were required to give their opinion on the most important strategies to integrate sustainability

through a building project planning process. They were requested to rank the importance of the strategies on a scale of 1 to 5 where a score of '1' represents 'not at all important', '2' represents 'slightly important', '3' represents 'neutral', '4' represents 'important' and '5' represents 'very important'. Throughout this part of questionnaire, spaces were provided for respondents to suggest additional strategies that were not included. In the effort to analyze the collected data for the most important integration strategies through planning process, there were two stages of data analysis have been utilized which are cronbach's alpha measurement, and frequency and descriptive analysis.

6. Findings and Discussion

In the first stage, cronbach's alpha method was used to measure the inter-item consistency in this study. Through the analysis that was done, the alpha reliability of the scale in this study was 0.950 for the set of sustainability integration strategies. Since the result achieved above 0.7, it shows that all variables have indicated internal consistency and achieved high reliability. Thus, due to high coefficient values of cronbach's alpha, it can be concluded that the respective respondents were admitted the importance of the strategies to be implemented throughout the planning process of a sustainable building project.

In the second stage, the data was analyzed using frequency and descriptive statistic analysis in order to measure the central tendency and dispersion of the questionnaire responses. This stage is very important to the researcher because the related results are very useful in order to find the most important strategies that should be implemented throughout the planning process of the project. It was decided that only the strategies that recorded a mean score (MS) of more than 4.0 and above (range 'important to very important') are considered to be the most important factors.

The summary of the empirical analysis findings of the survey approaches are as tabulated in Table 1. It was found that all 21 factors of the strategies to integrate sustainability through project planning process have been determined to be significant which should be practiced throughout the planning process of a sustainable building project. There are 2 out of 21 strategies were rated as 'very important' (MS=4.5) by majority of the respondents to be the most important strategies to integrate sustainability during planning process of building project in Malaysia. The strategies are *'the team should have the core knowledge of sustainable building project'* and *'government policies to encourage sustainable development'*.

Table 1: Frequency and Descriptive Analysis of the Strategies to Integrate Sustainability through Project Planning Process

No.	The Strategies to Integrate Sustainability through project planning process	*Total Influencing Frequency (TIF)	**Total Influencing Percentage (TIP)	Score Mean (MS)	Standard Deviation (SD)	Stakeholders' Preferences
Category 1: Sustainable Project Orientation						
1.	Specific sustainability goals and project priorities	80	43%	4.3	0.796	Important
2.	Sustainable concern during establishment of project scope, project charter, drawing, contract and detailed project plan	85	45%	4.3	0.750	Important
Category 3: Integrated Project Team						
3.	The project team members are involved and maintained throughout the planning process	69	37%	4.2	0.760	Important
4.	Local community representative is involved in support of the project	59	31%	4.1	0.809	Important
5.	An integrated design/ sustainability coordinator is appointed as one of the project's team members	66	35%	4.2	0.701	Important
6.	The team should have the core knowledge of sustainable building project	112	60%	4.5	0.665	Very Important
7.	Team members are educated on sustainability issues including vendors	100	53%	4.4	0.695	Important
8.	Team members' selection with sustainable development quality and capability	83	44%	4.4	0.604	Important
9.	Team members are fully informed on sustainability goals and priorities of the project.	99	53%	4.4	0.730	Important
Category 2: Integrated Design Process						
10.	Involve diverse set of stakeholders on the team	79	42%	4.2	0.871	Important
11.	Committed and collaborative team throughout the process	82	44%	4.3	0.788	Important
12.	Bringing the team together as early as possible during planning process	95	51%	4.4	0.679	Important
13.	Sustainability and integrated design requirements and the process are included into the project documentations, strategic and comprehensive plan.	89	47%	4.4	0.746	Important
14.	Do whole building design and systems analysis	93	49%	4.3	0.854	Important
15.	Commissioning process is added during this process and described in a specific section	70	37%	4.1	0.818	Important
16.	Planning should reflect all the project stakeholders	66	35%	4.1	0.785	Important
17.	Design should reflect the end user community	98	52%	4.4	0.807	Important
18.	Effective communication and incorporation of charette process	68	36%	4.1	0.787	Important
Category 4: Regulations and Code Compliances						
19.	Government policies to encourage sustainable development	112	60%	4.5	0.782	Very Important
20.	Compliance with code and regulatory tool of sustainability	94	50%	4.3	0.853	Important
21.	Incentive to encourage sustainable development	107	57%	4.4	0.867	Important

Note:MS 1= Not at all important 2= Slightly important 3= Neutral
4=Important 5= Very Important
**TIF = Frequency score for answer scale 5*
***TIP = Percentage for answer scale 5*

There are 8 strategies have been revealed as the most popular choice by majority respondents where a half and above of them ranked the strategies to be 'very important' (answer scale of 5) to be implemented during project planning process in order to deliver a successful performances of sustainability in building project. Three (3) out of the 8 strategies, which are the 'team should have the core knowledge of sustainable building project' (TIP of 60%), 'team members are educated on sustainability issues' (TIP of 53%) and 'team members are fully informed on sustainability goals and priorities of the project' (TIP of 53%) come from the sub-factors of 'integrated project team'. Another 2 strategies which are 'bringing the team together as early as possible during planning process' (TIP of 51%) and 'design should reflect the end user community' (TIP of 52%) come from the sub-factors of 'integrated design process'. Meanwhile, the rest 3 strategies which are 'government policies to encourage sustainable development' (TIP of 60%), 'incentive to encourage sustainable development' (TIP of 57%) and 'compliance with code and regulatory tool of sustainability' (TIP of 50%) come from the sub-factors of 'regulation and code compliances'. The results revealed that all strategies indicated in 'regulation and code compliances group were considered to be very significant to be addressed in the proposed framework with the mean values ranges from 4.3 to 4.5 which represent to the answer of 'important to very important' factors. This study coincides with studies by most researchers such as Luce, 2011 and Choi, 2009 whereas; regulatory processes and code that meet sustainability goals are very significant to promote sustainability integration practices.

Surprisingly, the finding reveals that there is no one sub-factor has been selected as 'very important' (answer scale of 5) by more than 50% respondents from the first category of strategies which are 'sustainable orientation project'. Late consideration on sustainability principles, which is after planning process might leading to funding and other problems due to the changes such as plan redesign, rescheduling process and so forth. It is very critical that the specific sustainability goal and project priorities, needs and expectations to be considered and informed early to the project team during the planning process in order to minimize misunderstanding and future complication (Doyle et al, 2009 and Choi, 2009). The delay can cause sustainable project failure including cost overrun, reschedule and increase change orders during construction which also affect the quality of the building and stakeholders' dissatisfaction.

Sustainable building project works best when the sustainability ideas and efforts are considered very early in the planning process. However, the result shows that less than 50% of the respondents valued 'specific sustainability goals and project priorities', (TIP of 43%) and 'sustainable concern during establishment of project details (TIP of 45%) to be 'very important' strategies to integrate sustainability through project planning process. It shows that Malaysian building project stakeholders have placed these strategies as a second priority in during project planning process. The findings contradict with the studies by Robichaud and Anantatmula, (2011); Mochal and Krasnoff, (2010) and Wu

and Low, (2010) who revealed that sustainability goals and project priorities must be set since the strategic planning of the project in order to establish the framework in which all future sustainable project decisions are made. This is the starting point of achieving sustainability to realize the goal of sustainability (Wu and Low, 2010). At this stage, project scope, contract and construction drawing and detailed project plan which focus on sustainability and stakeholders' expectation should be prepared (Mochal and Krasnoff, 2010). Without a proper planning at this stage, the sustainability in building project will carry a lot of risk and tend to fail (Doyle et al., 2009).
Though, luckily both strategies from the 'sustainable project orientation' category has achieved the mean values of more than 4.0 which are MS of 4.3, meaning that the respondents appreciated the factors to be the 'important' strategies to integrate sustainability through project planning process.

Conclusion

The advantages of sustainable building have been revealed through much research and case studies conducted worldwide. However, as this subject is a new territory in Malaysia and lack of exemplar project made the project less appreciated. To surmount the issues, there is a need to search and introduce effective ways to deliver a sustainable building project. A clear guideline to highlight the principles of sustainability within this project and the strategies to integrate the principles throughout the project through its planning process should be invented to enable those aspects be managed efficiently. Significant adjustments to the conventional project planning process and procurement system should be explored. A shift in mindset towards the longer term benefits of sustainability need to be initiated. From the survey, many stakeholders in Malaysia believed that focus should be given especially throughout the project planning process. The project should be sustainability oriented, employing of an integrated design process by an integrated design team, comply and supported by sustainability code and regulatory tools. The sustainability integration strategies during a building project planning process are paramount towards a successful sustainable project delivery and the building performances through its whole life. This research is very useful to provide an essential guide to the project stakeholders and researchers especially for formulating a clear guide of sustainability integration strategies during planning process for upcoming sustainable building projects. For further studies, it is interesting to investigate in depth the proposed sustainability integration strategies for its possibility to be practiced within the industry.

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