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SUSTAINABILITY INTEGRATION INTO BUILDING PROJECTS: MALAYSIAN CONSTRUCTION STAKEHOLDERS' PERSPECTIVES

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Abstract

Planning process is the most crucial stage for sustainability integration in building construction projects. This paper aims at proposing a framework to integrate sustainability through planning process of building projects in Malaysia. The proposed framework consists of the strategies that should be implemented during the project planning process. Based on the available literature, twenty-one strategies were found to be significantly related to the proposed framework. A total of 357 Malaysian building project stakeholders were selected to be contributed for questionnaire survey to identify locally relevant and priorities of the strategies. The respondents were chosen from the stakeholders who are directly involved in sustainable building project and/or the stakeholders who were judged as knowledgeable on the project. A framework was then developed using the identified strategies. The findings are useful for future researchers and practitioners to find solution for encouraging and improving sustainable building project implementation in Malaysia.

Keywords: Project Planning Process; Sustainable Building; Cronbach's Alpha; Factor Analysis

1. Introduction

The growth of urbanization has been increasingly in Malaysia which led to greater economic growth in construction industry. In 2009, Malaysia's total population was estimated to be about 28.3 million, which over 70% was living in urban areas (Department of Statistics Malaysia, 2011). Building construction is considered to be the highest demand of construction projects in Malaysia as it forms about 67.6% of the overall construction work (CIDB, 2008). The fast growth of building construction project however has created pressure on sustainability issues especially in urban area of the country. Malaysia's buildings were reported to consume about 12.85% of the total energy consumption and 47.5% of the country's electricity consumption, which most of the energy is used for lighting and air-conditioning (Department of Electricity and Gas Supply Malaysia, 2001). Wu and Low (2010) claimed that building sector is the largest sources of global greenhouse gas emission and it consumes about one-third of the world's energy.

Malaysia is looking at making their buildings more energy efficient and sustainable. The government of Malaysia has realized the important of saving the environment through sustainable building development especially toward reducing carbon emission and resources use (Md Darus et al, 2009; Zainul Abidin, 2009). The government of Malaysia has introduced the implementation of photovoltaic systems in buildings through the 'Malaysia Building Integrated Photovoltaic Program' (MBIPV). They have also launched renewable energy programme called 'SURIA 1000 for developers' to encourage the Malaysian property developers to be involved in renewable energy efforts (Zainul Abidin, 2010). Sustainable building and energy efficient designs have also been ventured. The LEO (Low Energy Office) and GEO (Green Energy Office) buildings are the pilot projects that provide a platform for proof of the concept in driving forward the sustainability goals of the Malaysian building industry. Green Building Index (GBI Malaysia) has been developed in 2009 for the reason of evaluating the environmental design and performance of Malaysian buildings (GSB, 2012).

Sustainability in Malaysian building project is also supported by the numerous current spatial planning of the country such as Malaysian National Physical Planning, National Urbanisation Policy, Development Plans and the development control activities (GSB, 2012). A special attention is also given in the Tenth Malaysia Plan (2011-2015) towards improving sustainability in the building sector of the country including to the economy plan to harness its energy savings potential and to reduce carbon emissions and dependence on fossil fuel. Revision of the UBBL (Uniform Building Bylaws) to incorporate MS1525 Code of Practice is highlighted in the plan for the integration of renewable energy and energy efficient systems in buildings. Wider adoption of GBI to benchmark energy consumption in the new and existing buildings is also emphasized (APEC, 2012). It can be considered that many efforts relating to sustainability in building project have been implementing in the country but the question remain is 'why the unsustainable issues in this industry are still continuously happening? This denotes that there is a gap between the field of sustainability and their integration strategies within Malaysian building projects.

Building sustainably is fundamentally a process of best practices that leads to sustainable outcomes (Muldavin, 2010). Hence, it is critically important to get these processes right in order to deliver a successful sustainable building. Planning process at the early project stage is the most important process conducted in managing the whole life of projects (Zwikael et al., 2009). The process holds the strategic position to integrate sustainability considerations to have the most sustainable effect on the overall project (Reyes et al, 2014; Wu and Low, 2010; Hayles, 2004). For the reason of sustainability integration, 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 integration. The idea has been accepting since long time ago, (Muldavin, 2010). However, till now the sustainability integration in Malaysian buildings are still remain without proven. There is also no a clear framework on the strategies to integrate sustainability during project planning process was innovated in the current Malaysian building industry. The GBI Malaysia rating system is obviously to focus more on environmental aspect of sustainability, while planning process matters are not often considered. The project management process is highlighted in the LEED and Green Mark however, most of the points are allocated to commissioning and certification activities and no points are allocated to planning (Wu and Low, 2010). The planning process that does not encourage sustainability matter clearly and limited interaction between various diciplines have hindered sustainable building projects from reaching the expected achievement.

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). The lack of training, education and exposure towards sustainability principles and the integration strategies has resulted of the lack of professional capabilities to consult on sustainability (Zainul Abidin, 2009). Construction Industry Master Plan Malaysia (2006-2015) has reported that 50% of the failure in Malaysian construction industry can be attributed to design faults, while 40% are due to construction faults and only 10% are because of material faults (CIDB, 2007). It shows that responsibility on the performance of sustainable building project specifically will have to be focus towards the pre-construction stage of the project especially during the planning process. Malaysian project stakeholders always offered a range of different thoughts that point to misconceptions and uncertainty about sustainable development (Zainul Abidin, 2009). The traditional linear project planning process and minimal input from the operation and maintenance groups, construction manager and trade contractor or outside stakeholders during the design stage and planning process of building project made the sustainability principles are hard to be incorporated in the project, for instances the use of Industrialized Building Systems (IBS), one of the sustainable construction methods, is still not widespread in this country due the reasons of poor knowledge and lack of integration at the design stage, which IBS component manufacturers are currently involved only after the design stage (CIDB, 2003). The lack of integration among relevant players in the planning process of the design stage has resulted in the need for plan redesign and additional cost to be incurred if the method is adopted. Besides, many of the country's public sectors approvals and permitting processes are not equipped to handle sustainable project. Building codes that are written for conventional developments often do not allow sustainability system. Lack of collaboration among Malaysian construction players such as pointing fingers culture and the weakness of government involvement especially in term of enforcement matter (Shafii et al, 2006) and devising new policy (Zainul Abidin, 2009) also have delayed the accelerating of sustainable building projects implementation in the country.

For that reason, this study attempt to response to these issues by proposing a framework for integrating sustainability into building projects through planning process relevant to the Malaysian context. This has entailed the need to answer a major question: How sustainability principles should be integrated during the planning process of Malaysian building project?

A literature review was used to develop the preliminary set of the strategies to integrate sustainability during project planning process to be included in the framework. The strategies however required of inputs and refining processes which involve Malaysian building project stakeholders to consider the local context of where the framework is applied. Thus, quantitative technique of research by using questionnaire survey was considered to ensure views from the project stakeholders are considered throughout the framework development process. A statistical analysis of the survey responses has provided information for the identification of the most relevant strategies to be addressed in the proposed framework and assigning their appropriate weighting level. The findings can help the project stakeholders to be clear on how sustainability principles should be integrated into building projects during the planning process and ultimately encourage them to acquire and to get involved in the project.

2. Review of the strategies to integrate sustainability during project planning process

Planning process has a significant impact on the ability of a construction project to success (Hamilton et al, 1996; Syal et al, 1992). 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, 1992). Planning process for a sustainable building project is different from the traditional planning process due to its complexity and holistic approach. The process held responsibility to deliver sustainable development goals throughout the project (Yudelson, 2009). During this process, decisions are made to achieve sustainability standards so that maximum capital and whole life costs can be achieved (CIOB, 2010).

Robichaud and Anantatmula, (2011); CIOB, (2010) and Yudelson, (2009) suggested that sustainability goals and project priorities must be considered seriously in the planning process of the early stage of project development. At this stage, the level of understanding and commitment to sustainability may vary among different parties (Halliday, 2008). Thus, how the stakeholders are communicating and how the sustainability inputs are given to the stakeholders ensures this responsibility (Wu and Low, 2010; CIOB, 2010). Problems exist when the project team transfers the sustainability goals into the following period throughout the life cycle of project, where there is a high risk of the sustainability baton being dropped throughout the process. Thus, it is crucial to ensure all relevant stakeholders are participated during the project planning process. They are expecting to understand the sustainability goals and directions of the project so that the project plan that is delivered is able to be a sustainability guide to the projects whole life and the rest of the project management process (CIOB, 2010).

Robichaud and Anantatmula, (2011) highlighted that sustainable concerns should be included during the establishment of project scope, project charter, drawing, contract and detailed project plan and the rest of project documents. The sustainability requirements should be mentioned clearly in the project documents (CIOB, 2010; Yudelson, 2009). The optimal sustainability performance will then evolve from project decisions made to meet the performance target (Muldavin, 2010).

To plan for a successful sustainable building project, the project stakeholders should interact closely throughout the planning processes 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. According to Yudelson (2009), an integrated project team should consists of a wide range of specialist and functions including architect, general contractor, stakeholders from the owner’s side including project manager, structural engineer, mechanical engineer, civil engineer, electrical engineer/technology consultant, landscape architect, interior designer, lighting designer/consultant, energy expert, cost management consultant, specialized design consultant, mechanical contractor, commissioning authority/agent (especially at the design development phase) and others depending on the nature and complexity of the project, the specific sustainability goals sought and local site and community conditions. The project team has to be initiated and maintained throughout the project planning process. They should commits to follow through all the way to the end of construction phase (Yudelson, 2009). Local community representatives, including a local government planner should be involved in the planning process to support the project (Robichaud and Anantatmula, 2011). Locally driven coalitions are viable means of improving the status and future well being of communities in which they live. Perkins et al. (2011) believed that an absence or low level of local engagement on the part of team members inhibits planning across community sectors. For instances, with local government stakeholders involved in the process, the project's initial design is more likely to comply with local, state and federal development needs and regulations. Their involvement provides opportunity to represent the local community voices for the matters such as amenities, public transport and many more (Sayce et al, 2004). Local government stakeholders are the party who may financially support or approve the project during the planning stage so that the approval process can go smoothly, or offer perks and incentives that are exclusive to the projects (Robichaud and Anantatmula, 2011; Choi, 2009).

An integrated design or a sustainability coordinator, who is a sustainable building specialist, should be assigned for the project. This person should involve in the planning process from the earliest stage of development and must have experience of delivering certified sustainable building project through integrated design process. He/she also should be a person who is an effective communicator and a good negotiator, given the highly collaborative nature of this position (Muldavin, 2010).

Robichaud and Anantatmula (2011) highlighted that sustainable development knowledge and education needs to reach beyond designers and architects for the acceptance of the sustainable building project. Without a sustainability project knowledge base, they will not be able to evaluate and deliver such projects accurately and effectively. Choi (2009) suggested that one of the factors that should be considered when evaluating project proposals is experience of design team on sustainable buildings and their ability to deliver products with fewer cost overruns and change orders. It would be very difficult for a design team without experience and knowledge of sustainable building project to build a structure that capitalized on all the social, economic and environmental benefits.

Continual communications and training for all project personnel are essential during the planning process to ensure the accomplishment of sustainable project goals in a cost effective manner. There is a need to educate team members and market representatives on sustainable development issues throughout this process as they determine property value and viability (Choi, 2009; Glavinich, 2008). The project personnel, including vendors, should be educated to ensure they follow the company's sustainable development methodology and focus on sustainability in their work for the projects (Halliday, 2008). Besides, to support the sustainable building project, all professionals, project managers, customers and other stakeholders, will need to be educated on sustainable buildings including on expected performance of sustainable building features (Robichaud and Anantatmula, 2011; Choi, 2009) so that they can better gauge the value of their investment and purchases. For a project manager, Hwang and Ng (2013) revealed that the top three knowledge areas critical to sustainable project planning in order to effectively deal with sustainable projects are schedule management and planning, communication management and risk management.

Doyle et al. (2009) and Bogenstätter (2000) claimed that sustainability quality and capability should be considered during the selection of a project manager, consultants, designers, contractors and the team members of a sustainable building project. They are selected based on their right attitude, one of being willing to learn and to participate in the new things and process

(Yudelson, 2009). The priority is also given to those who are familiar with the product type and market, and having exposure to the project (Bogenstätter, 2000). Difficult situations can often occur on projects where the client has hired the team members who will not commit to participate in a team process or even to attend all the key project meetings. Thus, choosing a team with a portfolio of successful sustainable building projects is also beneficial to ensure the successful of the project (Choi, 2009).

Hwang and Ng (2013) revealed that it is crucial to inform sustainability goals and project priorities to the team members at the initial discussion of a new project. The early planning process of the project generally includes a group discussion about the needs and requirements for the project. Potential bidders should be given an opportunity to understand the vision of the project team and the importance of the sustainability aspect of the project in a pre-bid meeting (Doyle et al., 2009).

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 process (Doyle et al., 2009; Choi, 2009). Unlike a conventional project, a sustainable building project works best when the expanded group of stakeholders work together to concentrate the majority of their creative efforts very early in the planning process (Choi, 2009; Doyle et al., 2009; Riley et al., 2004).

An integrated design approach is very crucial to be practiced for the reason of integrating sustainability into building projects. This approach requires all stakeholders who would usually be involved and influenced at every cycle of the building's whole life, based on the suitability of the project, to commit and collaborate throughout the project planning process since the conceptual and development stages to address project goals, needs and potential barriers in order to optimize the whole construction project (Robichaud and Anantatmula, 2011; Choi, 2009). 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). Every stakeholder has to participate during planning process and no one allowed considering just their own special interest (Yudelson, 2009). Active design professionals' involvement in planning was repeatedly claimed as the key to increase project success (Gibson and Gebken, 2003). Depending on the developer's goals and the type of project, an integrated design team will include different combinations of professionals to accommodate the project's specific skills and service needs. This multidisciplinary integrated design approach can be a very effective tool to understand the clients' needs and requirements, evaluate and correct design flaws, determine proper sustainable material usage and installation, and foster communication among all of the stakeholders.

Choi (2009) and Yudelson (2009) suggested that, it is crucial for all members of the integrated design team to share their knowledge and work together through the planning process to ensure that the systems they put in place are complementary. They should be committed to the integrated design process in order to ensure that the project attains its desired goals. Bringing all of the project stakeholders together as early as possible during the planning process of early conceptual and design stage allows the project team to take a whole building approach towards achievement of a sustainable building at lower costs (Robichaud and Anantatmula, 2011; Yudelson, 2009; Lapinski et al., 2006; Beheiry et al., 2006). The team will have more influence on some of the most important project decisions, such as site selection, strategic planning, and the preliminary design concepts. Early involvement also allows the project team to create a highly effective analysis of the project and to leverage synergies between various building functions and site characteristics (Robichaud and Anantatmula, 2011; Choi, 2009; Bogenstätter, 2000). Perkins et al. (2011) highlighted that how well teams functioned in the early stages is strongly related to the quality of their later preparations for sustainability. Inputs from their collaboration are able to minimize sustainable building costs throughout all phases of a building's lifecycle. This approach can organize priorities to align with a project's budget, avoiding cost overruns, minimize delays, and decrease the change orders during construction. It is also can streamline operations and the maintenance of the building in the post-occupancy phase, as well as provide lower utility and maintenance costs because of its superior planning and design from the onset (Muldavin, 2010).

Muldavin (2010) and Choi (2009) stated that it is important to incorporate the requirements for integrated design and the process also the sustainability aspects into the project documents including the strategic and comprehensive plan. The cost, benefits and the performance target of a sustainable building and sustainability issues must be documented and communicated to expand the market for a sustainable development. The integrated design process could be even more important than the design of the building for delivering a successful sustainable building (Muldavin, 2010). Recent research shows that whole building designs or the holistic approach is very important towards delivering a sustainable building project (Hwang and Ng, 2013; Robichaud and Anantatmula, 2011). It requires an integrated design team and all affected stakeholders work together to evaluate the design for the life cycle cost analysis, quality of life, future flexibility, efficiency, overall impact, productivity, post-occupancy evaluation and how the occupants will be enlivened (Doyle et al., 2009). It draws from the knowledge pool of the stakeholders across the life cycle of the project. A whole-systems analysis that treats the building as a system and takes into account the interactions and synergies between the different components should be done when possible (Muldavin, 2010; Glavinich, 2008). Although the analysis generally requires more time upfront than standard design process, but it can maximize potential of sustainable benefits (Hwang and Ng, 2013).

Muldavin, (2010), Halliday, (2008) and Glavinich (2008) recommended that a commissioning process should be added during the planning process and described in a specific commissioning section. It is very important to make sure that all the systems perform as designed. The availability of competent commissioning agent is a key risk factor influencing cost and quality of the project (Yudelson, 2009). The best commissioning can properly diagnose complicated problem, while less experienced commissioning agents may spend more money and not really solve the problem. The commissioning agent should be able to coordinate and collaborate with the architects, engineers and contractors in order to complete commissioning. Since the commissioning agent serves as check on the work of others to ensure the project meets the design intent and perform up to expectations, bringing commissioning agent on in planning process at pre design phase will ensure that any problems that arise can be fixed during the design stage at minimal cost to the owner (Muldavin, 2010).

Sayce et al, (2004) suggested that decision making in project planning process which involved in determining the future life of a building should take into account the needs of both internal and external stakeholders. Internal stakeholder is the group that have a direct legal or financial interest in the building such as owners, occupiers and consultants. The external stakeholder group includes all those with no legal, equitable or no financial interest in the building but who are affected by decisions about it such as shoppers, visitors, local authorities and others public bodies. A truly sustainable development should recognise all the stakeholders in decision making as they have rights, whether or not they are enshrined in legislation.

Sayce et al. (2004) argued that planning for building design should consider the user's community needs and fit for purpose. Buildings that are loved are more likely to be maintained and to be sustainable. The team should works with prospective occupants or end user to establish their requirements and interiors spaces, adjacencies and other programming requirements (Yudelson, 2009). This can be achieved by involving at least a representative of the end user during the project planning process. It is vital to ensure that the project is built with high level of user involvement in the planning process of conceptual and design project phase or the client and designers cannot be expected to produce distinctive and forward looking sustainable buildings.

A common challenge in conventional construction projects is the 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). This situation inhibits the project from taking advantage of system optimization, which can save time and money (Reed and Gordon, 2000). That lack of working together is a typical conventional construction issue which can cause most sub contractors try to get in and out as soon as possible (Robichaud and Anantatmula, 2011). Buildings not only affect their immediate users but also impact a broad range of other people, land use and communities. Therefore, communicating with the stakeholders efficiently since the planning process of the project assures that key groups understand and support the project's sustainable goals (Hwang and Ng, 2013). The most effective way for effective communication and exchanging ideas among the project stakeholders group is the incorporation of charrette at the beginning of the project. Charrette is a collaborative planning process that harnesses the talents and energies of all interested parties to create and support a buildable smart growth plan (NCI, 2003). This involves regular progress meetings and a multiday charrette during the planning process. Robichaud and Anantatmula (2011) suggested that successful charrettes often result in stakeholders feeling included and listened to, even if they do not agree with every aspect of the end product.

Sustainable project often encounter regulation and code compliance problems in meeting broader regulations. The problems can occur due to the gap that often exist between the ambition statements of city leaders or building owners and the realities of day to day implementation of regulation and code compliance with specific building code and building operational personnel. Muldavin (2010) and Choi (2009) recommended that it is very important to be fully aware of the nature of regulation and code compliance problems that can arise and appropriately research and communicate with local and state officials critical to achieving compliance.

Public and government policies can heavily influence whether the sustainable project get built. For example policies that educate stakeholders about the benefits and true cost of sustainable building are key success of the sustainable buildings movement. Choi (2009) recommended that governments at all levels can show leadership in sustainable development by including sustainability requirements for all their building projects. By being a supervisor of sustainable building project, government can use the experience to shape all future land and building development within their authority to be aligned with their sustainability goals.

Regulatory processes and codes that meet the sustainability goals can help to promote sustainable building project practices. Muldavin (2010) and Choi (2009) suggested that codes and ordinances can be used as a regulatory tool to encourage sustainable development by setting clear sustainability criteria that developers need to meet. It is vital to adopt and align the codes to meet sustainability goals and use the codes, utility fees and process improvements to encourage sustainable development practices. Codes for sustainability practices should be continually developed and improved. This will allows more sustainable building plans to be assessed efficiently and ultimately minimizing developers' frustration with the regulatory process. 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 (Choi, 2009).

To sum up, even though, there are many intellectual publications on the subject of sustainable building, but the ones that relate to planning process and the strategies of sustainability integration during this process are very few. Several papers were published, which discussed the importance of planning process towards delivering a sustainable building project successfully. Those papers however were more theoretical-based than research-based. This paper attempts to bridge the gap by identifying and proposing a framework to integrate sustainability into building projects through planning process that is relevant to the Malaysian context.

3. Research Methodology

In order to identify the strategies of sustainability integration through project planning process from the views of local project stakeholders, a quantitative survey involving 357 Malaysian building project stakeholders was employed. The quantitative approach by using questionnaire survey is believed as the best instrument to explore perceptions or opinions of the people on the issue studied and able to compare the data (Bernard, 2000) towards producing the expected outcomes needed by this research. Judgment sampling was chosen for this study to obtain desire information from the project stakeholders who are having the experiences of involving in sustainable building project and/or knowledgeable on the project. Sekaran and Bougie (2009, p277) highlighted that *'judgment sampling involves the choice of subjects who are most advantageously placed or in the best position to provide the information required'.* Sustainable building project is still infancy in the country and there are still limited stakeholders who are familiar with the project. Thus, judgment sampling was useful to select the respondents who reasonably be expected to have expert knowledge by virtue of having gone through the experiences and processes themselves and might perhaps be able to provide good data and information to the researcher. Sekaran and Bougie (2009, p277) recommended that '*judgment sampling design is used when limited number or category of people have the information that is sought'*. In this case, any type of probability sampling a cross section of entire population is not useful. The sampling design may limit the generalizability of the findings, however, it is the only practical sampling method to obtaining the information required from the specific persons that can give the information required (Sekaran and Bougie, 2009).

In October 2011, there are 4846 Malaysian project stakeholders' companies were first approached by electronic mails and telephone calls asking whether they are able to provide a competent representative to be involved in the questionnaire survey. The stakeholders are including, 1014 developers that are registered with the Real Estate and Housing Developers'

Association of Malaysia (REHDA), 149 engineering firms that are registered with the Malaysian Institute of Engineers (IEM) and also registered members of consulting firm in the Association of Consulting Engineers Malaysia (ACEM) - ACEM is one of the bodies who involved in preparing GBI, Malaysia, 1006 corporate member firms of Malaysian Institute of Architects' (PAM), 122 planner firms that registered with Malaysian Institute of Planners (MIP), 2181 class A contractors companies that registered in the Malaysian Contractor Service Center (PKK), Ministry of Works, 20 representatives from Malaysian public local universities and 144 local authorities that are listed in KPKT (Ministry of Housing and Local Government of Malaysia) website. Telephone calls were also conducted to the most priorities companies, which are the stakeholders of GBI Certified building projects (GSB, 2012) and the ASEAN Energy Award projects (Chantanakome, 2006). The priority was given based on judgment that the project stakeholders will be able to give useful inputs for the research as they have been directly involved in the prestigious sustainability related award winning projects. The different groups were targeted because they occupy the difference roles and involved in the different stage throughout the project life cycle, therefore their views are sought for this study. In selecting the seven groups of respondents, the developers were selected as representing the owners, financer and users, meanwhile, architects and engineers were selected as representing the design team. 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) that should be engaged by the developer to prepare the layout plan and will act as PSP for all planning approvals at the planning permission stage (Abdullah et al, 2011). The inputs from planners are very important towards successful of a sustainable projects and its planning process. Thus, town planners were also selected as the respondents for this quantitative research. Besides, local authorities were chosen on the ground of being the legal client and approval party. Contractors were incorporated as representing the construction contractors, operation and maintenance personnel, material and equipment suppliers and builders. Last but not least, representatives from the local universities were involved to get inputs from the knowledge and academic institutions side.

A total of 357 companies gave positive replies and agreed to involve in the questionnaire survey. One respondent was representing of an organisation. The respondents are including 160 contractors, 75 professional architects, 11 professional engineers, 10 professional town planners, 88 developers, 2 representatives of public local universities and 11 officers who are working in various local authorities. The rest stakeholders were not response or gave negative response due to some problem encountered such as the reason of lack of sustainability knowledge, not familiar or don't have experiences on the project.

The questionnaire survey was conducted from December 2011 until May 2012, and consisted of close-ended questions with sufficient space provided for the respondents to give additional information. The respondents were required to rank each strategy on a five-point Likert scale of 1 (not at all important) to 5 (very important) as the case might be. The time spent for questionnaires distribution was approximately seven months including the time spent for pilot study of two months (October to November 2011). By the end of May 2012, 188 samples were successfully obtained within the range of 42%-100% from each group, making the overall response rates of 53%. The response rates are considered satisfactorily accepted as argued by Rozhan, (2001); Nordin and Arawati, (1993); Kanapathy and Jabnoun, (1998) and Sarachek and Aziz, (1983) that the average response rates of academic research in Malaysia were normally obtained around 15%

to 25% only. Dulaimi et al (2003) also highlighted that the normal response rate in the construction industry for postal questionnaires is 20% to 30%.

In the effort to analyze the collected data for the most significant strategies, three stages of data analysis that have been utilized: Cronbach's alpha Measurement, Factor analysis, and the RII. Analysis of the data was undertaken using SPSS (Statistical Package for the Social Sciences) version 17.0. The findings of Cronbach's alpha Measurement and Factor analysis are significant in providing accurate estimate of internal consistency and indicate how well the items (strategies) in the set are correlated each other. It is also important in reducing the items and selects only the important ones to be included in the proposed framework. Relative Important Index (RII) was next employed to indicate the weighting value of each item and assigning the appropriate weighting levels to each of the final selected item of the strategies. A framework of integrating sustainability through project planning process was then developed before concluding the paper.

4. Results and Discussion

4.1 Identifying the strategies

The review of available knowledge offered a starting list of 21 items of strategy to integrate sustainability into building projects through planning process to be investigated for their possible inclusion in the proposed framework as indicated in the third column of Table 2. The strategies were divided into four groups namely, Sustainable Project Orientation (PO), Integrated Project Team (IPT), Integrated Design Process (ID), and Regulations and Code Compliances (RC). PO consists of two strategies (PO1 and PO2), IPT consists of seven strategies (IPT1, IPT2, IPT3, IPT4, IPT5, IPT6, and IPT7), ID consists of nine strategies (ID1, ID2, ID3, ID4, ID5, ID6, ID7, ID8 and ID9) and RC consists of three strategies (RC1, RC2 and RC7) as illustrated in the first and second column of Table 2. The strategies then have gone through refining processes by involving Malaysian project stakeholders to consider the local context. It is also to ensure the market acceptance and support from the industry. Quantitative survey was employed to elicit this knowledge.

Analysis of the respondents' background revealed that 71% of the respondents were male (refer Table 1). It explains that construction industry in Malaysia is predominantly male. 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 42% 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 construction stakeholders in Malaysia (Zainul Abidin, 2010). Majority (81.9%) of the respondents have been active in construction industry between 11 to 15 years and 38% of them also having experiences in sustainable building projects. The rest of 18.1% respondents have been active in the industry between the ranges of 16 to 26 years and above and 56% of them have also been directly involved in sustainable building projects. Therefore, by considering their 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.

Table 1: The Background of the Respondents

Characteristic		Frequency	Valid Percent (%)
Gender	Male	133	70.7
	Female	55	29.3
Total		188	100.0
Highest Educational Level	Degree	168	89.4
	Masters	17	9.0
	PhD	3	1.6
Total		188	100.0
Membership and Training	Professional Institution Membership	97	51.6
	CSCS Card (Construction Skill Certification Scheme)	1	0.5
	Specific Training on Sustainable Building Project	15	8.0
	Ongoing CPD	9	4.8
	Professional Institute Membership and CSCS Card	3	1.6
	Professional Institute Membership and Ongoing CPD	5	2.7
	Others	58	30.9
Total		188	100.0
Experiences in Construction Industry	11-15 years	154	81.9
	16-20 years	20	10.6
	21-25 years	13	6.9
	26+ years	1	0.6
Total		188	100.0
Involvement in Sustainable Building Project	0 project	110	58.5
	1-5 projects	71	37.8
	6-10 projects	5	2.7
	11-15 projects	2	1.1
Total		188	100.0

4.2 Internal consistency reliability

The first stage of the quantitative analysis was related to the reliability test where the reliability of the questionnaire was tested according to the Cronbach's alpha measurement. Through the analysis that has been done, the alpha reliability of the scale in this study was 0.950 for the items (strategies). Since the result was achieved above 0.7, it showed that all items have indicated internal consistency and achieved high reliability. Gliem and Gliem (2003) highlighted that the closer Cronbach's alpha coefficient is to 1.0 the greater the internal consistency of the items in the scale which, the rule of thumb is >0.9 is excellent, >0.8 is good, >0.7 is acceptable, >0.6 is questionable, >0.5 is poor and <0.5 is considered unacceptable (George and Mallery, 2003). 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 further investigated for the proposed framework. Nevertheless, even if a high value for Cronbach's alpha indicates good internal consistency of items in the scale, dimensionality of the scale is still need to be determined by factor analysis method (Gliem and Gliem, 2003).

4.3 Factor analysis

In the second stage of data analysis process, the data was analyzed using factor analysis in order to enhance the results of Cronbach's alpha. Factor analysis was employed to reduce a large number of variables to a smaller set of underlying factors that summarize the essential information contained in the variables. This study adopted Principle Component Analysis (PCA) to set up which items could capture the aspects of same dimension of the sustainability integration strategies and examine the underlying structure or structure of interrelationships among the 21 strategies items.

The sample was first examined for its suitability to the factor analysis application by employing the Kaiser-Meyer-Olkin (KMO) Sampling Adequacy Test and Barlett's Test of Sphericity. The value of overall measure of sampling adequacy (MSA) of 0.5 point and above and significant coefficient of Bartlett's test of sphericity of less than the significance level of 0.01 explains that the data suited for factor analysis method (Jantan and Ramayah, 2006 and Hair, et al, 2005). Table 2 shows that the data recorded for each groups of items were suitable for factor analysis method, where the scores were more than the minimum requirement of 0.5 point for overall KMO measure of sampling adequacy (MSA) and significant coefficient of Barlett's test of sphericity is less than the significance level of 0.01.

Table 2: Summary Results of KMO measure of sampling adequacy (MSA) and Significant Coefficient of Barlett's test of sphericity

Strategies			MSA	Barlett's test of sphericity (Sig)
Groups	Items			
PO	PO1	Specific sustainability goals and project priorities	.820	.000
	PO2	Sustainable concern during establishment of project scope, project charter, drawing, contract & detailed project plan		
IPT	IPT1	The project team members are involved and maintained throughout the planning process	.810	.000
	IPT2	Local community representative is involved in support of the project		
	IPT3	An integrated design/ sustainability coordinator is appointed as one of the project's team members		
	IPT4	The team should have the core knowledge of sustainable building project		
	IPT5	Team members are educated on sustainability issues and process including vendors		
	IPT6	Team members' selection with sustainable development quality and capability		
	IPT7	Team members are fully informed on sustainability goals and priorities of the project.		
ID	ID1	Involve diverse set of stakeholders on the team	.846	.000
	ID2	Committed and collaborative team throughout the process		
	ID3	Bringing the team together as early as possible during planning process		
	ID4	Integrated design requirements and the process are included into the project documentations, strategic & comprehensive plan.		
	ID5	Do whole building design and systems analysis		
	ID6	Commissioning process is added during this process and described in a specific section		
	ID7	Planning should reflect all the project stakeholders		
	ID8	Design should reflect the end user community		
	ID9	Effective communication and incorporation of charette process		
RC	RC1	Government policies to encourage sustainable development	.659	.000
	RC2	Compliance with code and regulatory tool of sustainability		
	RC3	Incentive to encourage sustainable development		

Factor analysis was then carried out to examine the communalities. The communality is defined as amount of shared or common variance among the variables. Communalities indicate the proportion of the variance in the original variables that is accounted for by the factor solution. Initial communalities are estimates of the variance in each variable accounted for by all components or factors. Higher variance means higher importance of the variables. Extraction communalities are estimates of the variance in each variables accounted for by the factors or components in the factor solution. The general guidelines mentioned that the factor solution explain at least half of each original variable's variance, thus the communality value (score after extraction) should be more than 0.5 point for the data to be justifiable for application of the factor analysis method. Communalities less than 0.5 were considered too low, since this would meant the variable share less than half of its variability with other variables (Larose, 2006). Thus, variables with loadings less than 0.5 were removed from the analysis due to low communality. The analysis revealed that the values extracted communalities for all factors (strategies) were higher than 0.05. Accordingly, this set of data input is justifiable for the application of factor analysis method.

To examine which variable significantly contribute to dependent variables, the PCA was applied with varimax rotation to validate which constructs to be distinct as perceived by the respondents. The eigenvalue criterion stated that each component explained at least one variable's worth of variability, and therefore only components with eigenvalue greater than 1 should be retained (Larose, 2006). Rotation is a method used to simplify interpretation of the extracted components. Rotation assigns uniquely each variable to only one factor that is highly correlated with them (Hair et al, 2005). An item that has significant value of more than 0.3 is loaded on more than one factor which consequently, the problem of cross-loading existed. Applying Varimax rotation results a clearer pattern of assignment with minimal problem of cross-loadings. Each item should load 0.5 or greater on one factor and 0.35 or lower on the other factors (Igbaria, 1995). Hair et al (2005) indicated that a component loading of ±0.3 meant the item was of minimal significance, ±0.4 indicated it was more important and more than ±0.5 indicated that the component was significant.

Table 3 depicts the results of total variance explained for all variables (strategies) under the group of PO. The result shows that there was only one component with eigenvalue greater than 1 (1.819) and the total variance explained was 90.966% of the total variance in the variables was included on the components. Only one component was extracted which consists the items of PO1 and PO2.

Table 3: Total Variance Explained of PO

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.819	90.966	90.966	1.819	90.966	90.966
2	.181	9.034	100.000			

Extraction Method: Principal Component Analysis

Table 4 shows that the total variance explained for all variables under the group of IPT. The results showed that there were two components with eigenvalue greater than 1. The components solution explained a sum of the variance with component 1 contributing of 55.693% and component 2 contributing of 16.481%. Thus, two components have been extracted for these variables which would explain 72.174% of the total variance. The result of applying rotation method of Varimax with Kaiser Normalization showed that the strategy of IPT group can be represented by two components which each variable on each factor was highly correlated each other. Factor 1 consists of the variables of IPT4, IPT5, IPT6 and IPT7. Meanwhile, factor 2 consists of the variables of IPT1, IPT2 and IPT3. As highlighted by Igbaria (1995), each item should load 0.5 or greater on one factor and 0.35 or lower on the other factors. On the basis of this test, one item has been removed from the group which is the variable of IPT1 (the item loads 0.480 on one factor and 0.740 on the other factor).

Table 4: Total Variance Explained of IPT

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.899	55.693	55.693	3.899	55.693	55.693	2.619	37.416	37.416
2	1.154	16.481	72.174	1.154	16.481	72.174	2.433	34.758	72.174
3	.623	8.900	81.074						
4	.469	6.695	87.769						
5	.385	5.493	93.262						
6	.265	3.793	97.054						
7	.206	2.946	100.000						

Extraction Method: Principal Component Analysis.

Table 5 shows the total variance explained for all variables under the group of ID. The results explained that there were two components with eigenvalue greater than 1 and consequently, there were two components extracted for these variables which would explain 65.160% of the total variance. The results after applying rotation method of Varimax with Kaiser Normalization showed that the strategy of ID can be represented by two components which each variable on each factor was highly correlated each other. Factor 1 consists of the variables of ID1, ID2, ID3, ID4, ID7 and ID8. Meanwhile, factor 2 consists of the variables of ID5, ID6 and ID9.

Table 5: Total Variance Explained of ID

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.792	53.249	53.249	4.792	53.249	53.249	3.688	40.974	40.974
2	1.072	11.911	65.160	1.072	11.911	65.160	2.177	24.187	65.160
3	.792	8.796	73.956						
4	.635	7.059	81.015						
5	.494	5.485	86.500						
6	.408	4.529	91.029						
7	.374	4.160	95.189						
8	.225	2.498	97.687						
9	.208	2.313	100.000						

Extraction Method: Principal Component Analysis.

Table 6 depicts the results of total variance explained for all variables of RC group of strategy. The result showed that there was only one component with eigenvalue greater than 1 (2.320) and the total variance explained was 77.337% of the total variance in the variables. One component was extracted for this group which consists of the items RC1, RC2 and RC3.

Table 6: Total Variance Explained of RC

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.320	77.337	77.337	2.320	77.337	77.337
2	.480	15.989	93.326			
3	.200	6.674	100.000			

Extraction Method: Principal Component Analysis

Overall, based on the PCA analysis output, one item was eliminated from the set of the strategies, which is the strategy of IPT1. The rest of the 20 strategies are then considered to be included in the proposed framework. This exclusion, however does not necessarily indicate that the strategy is not important to be considered for the framework but a more rational argument would be the strategy has not much very well exposed among the Malaysian project stakeholders as the traditional planning process are carried out linearly throughout the process. Without this exposure, the strategy would only be considered to be non critical among the project stakeholders. Another reason is the strategy was perceived as not the current priority issues in Malaysia to be resolved as compared to the others. Several respondents also claimed that maintaining the same project team members throughout the whole planning process is sometimes difficult due to unforeseen circumstances.

4.4 Establishing the weights for the strategies

For the purpose of indicating the weighting value of each strategy that has been selected through PCA method, the data was analyzed using RII approach. By using mean values (MS), the resulted RII value was transformed into three important levels: high ($0.8 \leq RII \leq 1$), medium ($0.5 \leq RII \leq 0.8$) and low ($0 \leq RII \leq 0.5$) (Tam et al, 2007). The RII ranges are from zero to one and the factors will be ranked based on the biggest value. It was measured based on the following formula (Tam et al, 2000).

$$RII = \frac{\text{Sum of weights } (W1 + W2 + W3 + \ldots\ldots + Wn)}{A \times N}$$

'W' is the weights given to each factor by the respondents and will ranges from 1 to 5 where '1' is not at all important and '5' is very important, 'A' is representing of the highest weight (i.e. 5 in this case), and 'N' is representing of the total number of respondents (i.e. 188 in this case). Put differently, RII is calculated by dividing the mean of the weightings assigned by the respondents with the highest weighting.

$$RII = \frac{\text{Mean}}{5}$$

The results tabulated in Table 7 shows the RII for each of the chosen strategies. The RII values of PO group of strategies are within the ranges of 0.86 to 0.87, IPT group are within the ranges of 0.81 to 0.91, ID group are within the ranges of 0.82 to 0.89 and RC group are within the range of 0.86 to 0.89. The strategies of IPT4 (RII of 0.91), RC1 (RII of 0.89) and ID3 (RII of 0.89) scored the highest rank of RII among other strategies. The resulted RII value of the 20 strategies are above 0.8 which representing of 'highly important' to be included in the proposed framework.

Table 7: RII of the Strategies to Integrate Sustainability through Project Planning Process

Strategies		Respondents' feedback		Important Level
Groups	Items	Mean Score	Weights (RII)	
PO	PO2	4.3	0.87	High
	PO1	4.3	0.86	High
IPT	IPT4	4.5	0.91	High
	IPT5	4.4	0.88	High
	IPT7	4.4	0.88	High
	IPT6	4.4	0.88	High
	IPT3	4.2	0.84	High
	IPT2	4.1	0.81	High
ID	ID3	4.4	0.89	High
	ID8	4.4	0.87	High
	ID4	4.4	0.87	High
	ID5	4.3	0.86	High
	ID2	4.3	0.86	High
	ID1	4.2	0.84	High
	ID9	4.1	0.83	High
	ID7	4.1	0.83	High
	ID6	4.1	0.82	High
RC	RC1	4.5	0.89	High
	RC3	4.4	0.88	High
	RC2	4.3	0.86	High

4.5 Developing a Framework for Sustainability Integration during Project Planning Process

The findings of this research have recommended a framework to integrate sustainability into building project through planning process relevant to Malaysian context as described in Table 8. The proposed framework includes the strategies that considered the Malaysian context and the local building project stakeholders views based on their knowledge and experiences on sustainable building project.

Table 8: Strategies to Integrate Sustainability in Building through Project Planning Process

STRATEGIES	RANK
SUSTAINABLE PROJECT ORIENTATION	
1. Sustainable concern during establishment of project scope, project charter, drawing, contract and detailed project plan	1
2. Specific sustainability goals and project priorities	2
INTEGRATED PROJECT TEAM	
3. The team should have the core knowledge of sustainable building	1
4. Team members are educated on sustainability issues including vendors.	2
5. Team members are fully informed on sustainability goals and priorities of the project.	3
6. Team members' selection with sustainable development quality and capability	4
7. An integrated design/ sustainability coordinator is appointed as one of the project's team members	5
8. Local community representative is involved in support of the project	6
INTEGRATED DESIGN PROCESS	
9. Bringing the team together as early as possible during planning process	1
10. Design should reflect the end user community	2
11. Integrated design requirements and the process are included into the project documentations, strategic and comprehensive plan.	3
12. Do whole building design and systems analysis	4
13. Committed and collaborative team throughout the process	5
14. Involve diverse set of stakeholders on the team	6
15. Effective communication and incorporation of charette process	7
16. Planning should reflect all the project stakeholders	8
17. Commissioning process is added during this process & described in a specific section.	9
REGULATIONS AND CODE COMPLIANCES	
18. Government policies to encourage sustainable development	1
19. Incentive to encourage sustainable development	2
20. Compliance with code and regulatory tool of sustainability	3

5 Conclusion

The advantages of sustainable building have been revealed through much researches and case studies conducted worldwide. However, as this subject is a new territory in Malaysia, some issues such as the lack of knowledge on sustainability principles and the integration strategies made the project less appreciated. To surmount the issues, there is a need to search and introduce effective ways to integrate sustainability in the building project. An efficient planning process can significantly improve the ability of sustainability integration into a project. A successful project planning process in integrating sustainability principles will then able to minimize the challenges and barriers of a sustainable building for many projects. In turn, this research sought to develop a framework to integrate sustainability throughout the project through its planning process to enable this aspect to be considered in an efficient manner. Significant adjustments to the conventional project planning process were explored. A shift in mindset towards the longer term benefits of sustainability need to be initiated. The concepts of sustainable development need to become more prevalent in the project planning process and decision in order to consider costs and times over the entire life cycle of construction project, as opposed to the considerations at the initial stage only. Although practices in other countries were considered, the local context was a vital component and it was addressed by engaging local competent project stakeholders' inputs. From the survey, most stakeholders in Malaysia believed that focus should be given especially throughout the project planning process, which the project should be oriented towards sustainability, employing of an integrated design process by an integrated project team and supported by sustainability code and regulatory tools. For further studies, it would be interesting to look deeper into the proposed strategies and investigate how the strategies influence the performances of building projects. It is hoped that these strategies as described in the proposed framework will provide an essential guide during planning process towards delivering a successful sustainable building project in Malaysia in the future.

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