

## **CHAPTER SEVEN**

### **CONCLUSIONS AND RECOMMENDATIONS**

#### **7.1 INTRODUCTION**

This chapter summarizes the works that have been undertaken over the course of the study, highlights the most important findings, revisits the aim and research questions of the research, provides a summary finding of the study, recommendations, limitations of the research and suggestions for future research areas.

#### **7.2 SUMMARY OF THE RESEARCH**

The research started from critically examining the key concepts and the current international context of sustainable development and sustainable construction, sustainable building project and the current practices of sustainability framework and building performance assessment systems. It then reviewed the sustainability integration strategies into the project planning process and the impact of the integration towards performances of the project. Even though it was many discussions about sustainability in building, but little was revealed about the strategy to integrate the principles into the project planning process.

Most building projects do not meet their sustainability targets due to the failure of integrating sustainability principles over the course of the project during the project planning process. The government of Malaysia had prepared many sustainable development framework, policies and various legislations and regulatory framework, but the one which specifically develop for the strategies to integrate sustainability principles into the project planning process was still not exist. The necessary balance between, environmental, economic, social and technologies (design and innovations) aspects had not been reached due to the shortage of knowledge and politically related constraints. Malaysia has several sustainability guidelines such as ASHRAE and GBI, however the guidelines were found to be adopted from foreign guidelines which some of them were not suit enough to the local climate and conditions and not support to the social cohesion beyond the individual building. The guidelines was revealed to be a single dimensional in their framework structure that skewed towards environmental

dimension, hence inadequate in addressing the complex concept of sustainability. The literature review revealed a crucial need to introduce a clear framework of the strategies to integrate sustainability into the project planning process for Malaysian buildings. The framework also should determine a clear list of sustainability principles of building that should be considered throughout the process.

In light of the foregoing, the aim of this research had been defined as ‘developing a framework for integrating sustainability into the project planning process for Malaysian buildings.’ The research questions posed at the beginning of this research were;

- 1) What are the sustainability principles of buildings, how to integrate the principles into the project planning process and their impact on influencing the project performances?
- 2) To what extent is the sustainability concept being practiced in Malaysia?
- 3) Do project stakeholders integrate the sustainability principles into the project planning process of Malaysian sustainable building? What? How?
- 4) How the sustainability integration practices during planning process influence the project performances?
- 5) What are the most significant sustainability principles of buildings and how the principles should be integrated into the planning process of Malaysian building project?

Conclusions from the research that answered these research questions formed the foundation on which the proposed framework was developed. In order to explore the research questions, questionnaires interviews and case studies approaches were undertaken.

In the first stage, 29 sustainability principles of building and 21 strategies to integrate the principles into the project planning process have been identified from the literature review and addressed to be the factors of the proposed framework. The 50 factors are presented in a form of ‘Preliminary Framework’ in the third chapter of the thesis (Table 3.8, p132). In the second stage, the factors have been validated through questionnaire surveys conducted with 188 respondents within the seven groups of Malaysian building project stakeholders (architects, engineers, developers, contractors and town planners, officers from local authorities, and universities’ representatives). The findings of this

survey have been discussed in Chapter Five. The results revealed that 42 factors (22 sustainability principles of building and 20 sustainability integration strategies into the project planning process) have been confirmed and the remaining 8 factors (7 sustainability principles and 1 strategy) have not been suggested by the interviewees. Thus, a total of 42 factors consists of 22 sustainability principles and 20 integration strategies were presented in a form of 'Framework of Integrating Sustainability into the Project Planning Process (Stage 1)' (refer Table 5.60, p213). The appropriate weighting levels to each of the selected factors were then assigned. The 'Framework of Integrating Sustainability into the Project Planning Process (Stage 2)' was then developed at the end of Chapter Five (Table 5.63, p217).

In the final stage, the 42 factors as identified in the proposed framework (stage 2) were further refined through semi-structured interviews conducted with 15 stakeholders from three case studies of sustainable building projects. The interviewees are the owners (representing clients and users), energy or sustainability consultants (representing the design teams), and local authorities (representing legal client, approval party and local community), main contractors (representing the construction contractors, operation and maintenance personnel, material and equipment suppliers and builders) and last but not least, the energy managers (representing operators and users) of each building. Interview questions were developed based on the reviews of the available literatures as discussed in the second and third chapters of this thesis. In addition to the interviews, the case studies also involved site visits and reviews of documentary evidence including photos, briefing documents, building plans, layout plans, media articles, GBI submission reports and other related reports. The interview responses from the interviewees have been analysed and interpreted together with the documentary evidence. The detail results are presented in the chapter sixth and Appendix M of the thesis. It was revealed that all factors in the proposed framework (stage 2) have been cited and validated.

Accordingly, a total of 22 sustainability principles and 20 sustainability integration strategies (the factors) are presented in a form of 'Framework of Integrating Sustainability into the Project Planning Process for Buildings (Final stage)' before concluding the chapter sixth of this study (Table 6.20, p251).

Returning to the research questions set out by the study, it is now possible to answer them individually.

- 1) What are the sustainability principles of buildings, how to integrate the principles into the project planning process and their impact on influencing the project performances?

From the available knowledge reviewed, this study identified 29 sustainability principles of building and 21 strategies to integrate the principles into the building project planning process. The 50 factors (sustainability principles and the integration strategies) were presented in a form of 'Preliminary Framework of Integrating Sustainability into the Project Planning Process' as tabulated in Table 3.8 (p132). The literature review also identified 20 key criteria of project success (but not limited to) (refer Table 2.7, p94) that are regularly cited in the available knowledge. The preliminary framework and the project success criteria were drawn based on the recent published works relating to the subject matters as discussed in the second chapter of this dissertation. For consistency, some changes to the groups, wordings and terms used for the factors were made during the pilot study. There is no specific success criteria model and framework is currently available for the needs of the sustainability in building projects. It was found that sustainability principles and the current criteria of successful project performance are related and parallel. The researcher believes that a successful performance of a building project can be achieved by accomplishment of the sustainability principles requirements of the project through practicing of a set of efficient integration strategies during the project planning process. These reviews and critiques are important in order for the study to conclude, simplify and suggest the sustainability principles and the integration strategies into the project planning process to be recommended in the proposed framework.

- 2) To what extend is the sustainability concept being practiced in Malaysia?

The research has investigated the current status of sustainability practices in Malaysian construction industry specifically on building projects towards understanding their awareness, knowledge, readiness, priorities and barriers regarding the implementation of sustainability in building projects. It was revealed that environmental deterioration and negative social impacts were still happening as a result of prioritizing economic

issues alone by the construction project stakeholders in order to reduce project costs and to get a maximum profit from the project. The exploitation of resources, uncontrolled and improper planned development in the country has resulted in the corrosion of the environment. The government of Malaysia is always striving to upgrade the sustainability in the industry. The efforts and commitments by the government and others have shown positive signs as Malaysian people are becoming more conscious in their responsibilities towards sustainable project. Nevertheless it was insufficient to overcome the sustainability issues in the country.

Generally, Sustainable building project in Malaysia is still in its infancy. The project is frequently regarded as 'a sustainable product' rather than the process of completion of the project. It was revealed that the highest failure in Malaysian construction industry was attributed to the design faults which involved the planning and design team of the projects. The concept of sustainability in the country has initially focused on the environmental issues such as limited resources especially energy consumption and how to reduce impacts on the natural environment with emphasis on the technical issues. However, the current trend of considering minimal initial costs among the project stakeholders has directed them not to accept the sustainability unless of the ones that leads to immediate paybacks. The imbalance between environmental and socio-economic practices has caused certain social and environmental issues in the country.

In conventional Malaysian building projects, early planning is typically not conducted very well due to its complexity and extra costs that almost always associate with it. 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. Until now, there is no clear aspect of sustainable building and the integration strategies were innovated in the current Malaysian building project planning process. The GBI rating system is obviously to focus more on environmental aspect of sustainability, while planning process matters are not often considered. The planning process which does not encourage sustainability matter clearly will hinder any future sustainable building project from reaching the expected sustainable achievement.

- 3) Do project stakeholders integrate the sustainability principles into the project planning process of Malaysian sustainable building? What? How?

Of the four sustainability goals, environmental aspects was given more priority in the Malaysian sustainable building projects followed by design and innovations aspect as compared to the economic and social sustainability aspects. The projects' main concentration was skewed towards realizing the greens and energy efficient target of buildings. Of the 22 sustainability principles studied, 6 principles have been considered and integrated by all the interviewees during the planning process of the three sustainable building projects. The principles are 'efficient environmental management', 'concern on quality of land, river and sea', 'site planning and management', 'air and emissions quality', 'noise control' and 'occupational health and safety'. These 6 principles were usually considered even though in conventional projects, but the extent of consideration in sustainable building projects was a bit different as the project should integrate the principles for the whole life of the building. The principles, exceptional of 'concern on quality of land, river and sea' and 'noise control' have also been considered by the stakeholders to be clearly mentioned in the project documents of the projects.

Five principles have been measured, communicated and integrated by all stakeholders during planning process of the three projects exceptional of one stakeholder (local authority) of GEO project. The principles are 'energy efficiency', 'urban design, visual impact and aesthetic', 'economic benefit to the stakeholders', 'sustainable design' and 'innovations'. These principles are quite new in the country and they were designed to be a part of the missions to achieve sustainability in the three projects. However, the consensus among the stakeholders about the principles' documentation levels were varies. The Findings reveal that 3 principles were rarely integrated into the projects during planning process namely: 'transport management', 'indirect economic impact' and 'improve local market presence'. Two principles which are: 'sustainable method' and 'improve local market presence' were never mentioned in any project documents during the process, even though the principles were considered by some of the stakeholders.

It was imbalanced between the sustainability principles documentation and practiced among the sustainable building projects in Malaysia. The sustainability principles mentioned in the project documents of the projects was at a medium level and the

consideration of the principles during the project planning process was at a high level. High documentation practiced was only achieved in the Diamond building project. The lowest stakeholders' involvement during the planning process at the pre-construction stage of sustainable building development project in the country was among the local authority group of stakeholders. The level of documentation practiced of sustainability requirements among the local authorities group of stakeholders were at a low level, while the principles' integration strategies were practiced at a medium to a very low level. The lowest practiced were among the local authorities of GEO projects. The facts show that the local authority especially the local authority of GEO project was not exposed to the sustainability considerations as well as the goal and objectives of the projects development. The level of documentation practiced of sustainability requirements among the owner and energy consultant groups of LEO and GEO projects were at a medium, while the principles' integration strategies were practiced at a high level. The highest practiced were among the owner and energy consultant group of the Diamond projects with a high level of documentation practiced and a very high level of integration strategies practices. The findings suggest that if the principles were well documented, and clearly communicated among the project stakeholders throughout the project planning process, they were likely to be considered and practiced at higher levels. This study asserts that balance consideration of all sustainability dimensions could be reached and equity in sustainable development can be implemented successfully when it is well received, reviewed, and clearly understood through well documentations, communications and considerations by all project stakeholders.

The owners and energy consultants of the sustainable building projects were also asked to assess and explain on how they integrated the sustainability principles mentioned earlier into the projects planning process. The local authority and contractor groups have not been involved to give their response as they claimed that they were unable to answer to this question. Of the 20 sustainability integration strategies studied, 16 principles have been practiced by all the owners and energy consultants of the projects during planning process. The strategies are 'sustainable concern during establishment of project scope, project charter, drawing, contract and detailed project plan', 'specific sustainability goals and project priorities', 'the team should have the core knowledge of sustainable building', 'team members are educated on sustainability issues', 'team members are fully informed on sustainability goals and priorities of the project.', 'an integrated design/ sustainability coordinator is appointed as one of the project's team

members', 'design should reflect the end user community', 'do whole building design and systems analysis', 'committed and collaborative team throughout the process', 'involve diverse set of stakeholders on the team', 'effective communication and incorporation of charrette process', 'planning should reflect all the project stakeholders', 'commissioning process is added during this process and described in a specific section.', 'government policies to encourage sustainable development', 'incentive to encourage sustainable development', and 'compliance with code and regulatory tool of sustainability'. Other 2 strategies which are 'team members' selection with sustainable development quality and capability' and 'bringing the team together as early as possible during planning process' have also been practiced throughout the planning process of the projects exceptional of the LEO building project. The findings reveal that 2 strategies have never been practiced throughout the planning process of the projects which are 'local community representative is involved in support of the project' and 'sustainability and integrated design requirements and the process are included into the project documentations, strategic and comprehensive plan'. The GEO and Diamond building projects were found to be the best projects among the three on practising the strategies as the projects implemented 18 out of 20 strategies listed in the proposed framework. Overall, the strategies that have been practiced by the owners and energy consultants of the three projects were almost similar. Basically, their efforts were considered to be at a high to a very high level based to the strategies that listed in the proposed framework. However, the way how they practiced each strategy was still limited to some extent. The limitations were such as; the team members' selection was based to the available limited quality and capability in the country. The stakeholders that have been involved the projects planning process were also imbalanced, such as the local authorities and contractors involvement was very limited throughout the process. The lack of sustainability and the integration strategies' knowledge and guidelines, the limited local sustainability experts and materials were among the cause of imbalanced practices of sustainability considerations in Malaysian sustainable building projects.

- 4) How the sustainability integration practices into the planning process influence the project performances?

The Diamond building project has revealed that the higher sustainability principles and the integration strategies practiced into the project planning process have enhanced the sustainability performances, quality and satisfaction towards the project. The project has



also been successfully completed within the budget and schedule. Considerations of sustainability principles after the planning process of the early project stage will possibly cause changes and ultimately increase the cost and schedule of the project. Sustainability practiced in the LEO project has given a lesson when the GBI requirements have been considered to be achieved after the building was completed. The project then needs another extra cost for retrofitting the building in order to fulfill the sustainability requirements outlined in the guideline. It was proved that adding systems have not resulted in optimal performance and cost savings as sustainability in building is a method for rethinking the way system synergies interact. This study emphasizes that incorporating sustainability principles early in the planning process enables to optimize the influential potential in determining the route of the project. Past mistakes should be learnt at this stage and the new proposed sustainable action should be produced by avoiding the mistakes.

Improper documentations of sustainability goals and decisions can interrupt the sustainability integration into the project planning process. Most issues are discussed and considered early during a project planning process, but if a new consultant or team member is brought on board, this can lead to a revising of already settled issues. Diamond building was found to have the highest project documentations level among the three projects and the project has practiced the most sustainability principles throughout planning process. Consequently, the performances level that has been given by the stakeholders to the project was at the highest level among others. The findings suggest that if all the sustainability principles were properly documented, clearly communicated and specifically practiced through effective integration strategies during early planning process, they are likely to be delivered at a higher level. Otherwise, as in the LEO and GEO projects, the sustainability performances remained at the good level with only 2 and 6 excellent performances respectively as compared to the Diamond building project which was able to achieved up to 12 excellent sustainability performances which, 9 of them were practiced by all of the stakeholders, meanwhile, 7 out of the 9 practiced principles were documented and clearly communicated among them. The 7 excellent sustainability performances of Diamond project that well documented and practiced among all of the project stakeholders are; 'efficient environmental management', 'site planning and management', 'energy efficiency', 'urban design, visual impact and aesthetic', 'occupational health and safety', 'sustainable design' and 'innovation'. The 2 excellent sustainability performances of

LEO project which are ‘energy efficiency’ and ‘sustainable design’ was also well documented and practiced among all the project stakeholders during the project planning process. Meanwhile, the documentation and practiced levels of 6 excellent sustainability performances of GEO project were varies and imbalanced.

The case studies’ findings confirmed that the key stakeholders involvement from the early planning process of the projects have improved sustainability performances, cost savings, stakeholders’ satisfaction, reduced changes and ensuring the projects to be completed on time. Bringing the contractor earlier in the project planning process will help pricing alternatives approaches to achieve the sustainability targets, giving inputs for construction stage and eventually, shorten the projects duration. The LEO and GEO projects performances have verified that the late involvement of contractors during planning process will cause of many changes orders during construction stages. This study highlight that sustainability integration in building project works best when the expanded group of stakeholders work together to concentrate the majority of their sustainability and creative efforts very early in the planning process. Using this approach early in the planning process can organize priorities to align with a project’s budget. It also can help avoid cost overruns, minimize delays, and decrease change orders during construction. In addition, it can streamline operations and maintenance of the building in the post-occupancy phase as well as provide lower utility and maintenance costs.

Sustainability integration strategies that have been practiced in the planning process of the projects have lengthen the duration during the conceptual and design stage, however it was proved that they have shorten the overall duration of the projects. The planning strategies were not increase the project cost. Most received complaints of the projects were regarding the technical issues such as lighting, ventilation, and temperature of the building. The fact shows that the projects were adopted foreign sustainable technologies which sometimes have not suited to the local climate and conditions. Thus, the stakeholders in the industry should be exposed to the sustainability knowledge, technologies and the project planning process. The country needs to enhance the availability of local materials and technologies that suit to the local building needs. Local experts who are understand the country’s conditions are also crucially needed in order to integrate sustainability in building project successfully.

- 5) What are the most significant sustainability principles of buildings and how the principles should be integrated into the planning process of Malaysian building project?

The finding across the quantitative and case studies interview analysis of this study highlighted that there are 22 sustainability principles of building as illustrated in Table 6.20, part A, p251) to be the most significant to be considered for Malaysian building projects. The conventional building projects have resulted of varies unsustainable issues through their unsustainable design, construction and operation and maintenance practices which resulting in new health concern and associated economic cost and liability.

The stakeholders believed that sustainability principles are very effective to be integrated during the planning process of the project. The case studies analysis have showed that the incorporation of the sustainability principles during the planning process will influence the sustainability, cost, time, quality and stakeholders' satisfaction performances of the project. It is clear that the Diamond project which has integrated the highest numbers of sustainability principles into the project planning process has also achieved the best performances among others in every aspect. The achievements have been recognized by multiple awards and recognition of many prestigious awards at the local and international level.

A traditional project planning process does not provide a very easy path towards successful sustainability integration into the building project. Majority stakeholders across the questionnaires survey and the case studies agreed that the 20 strategies as proposed in the framework (Table 6.20, part B, p252) to be the most significant to be practiced during the planning process of Malaysian building projects. The case studies analysis has revealed that the proposed sustainability integration strategies will influence the sustainability, cost, time, quality and stakeholders' satisfaction performances of the project. It is clear that the Diamond building project which has practiced the strategies at a very high level during the project planning process achieved the best performances among others in every aspect.

### **7.3 MAIN FINDINGS**

To summarize, the main findings from the questionnaires survey and the detailed study of three cases projects are as follows;

#### **7.3.1 Current Malaysian Stakeholders' Awareness, Knowledge and Commitment towards Sustainability in Building Project**

In Malaysia, the sustainable building projects are still at the pioneer stage and more efforts are needed to realize the sustainability agenda of the industry. It was revealed that there is imbalanced consideration on sustainability dimensions in the current sustainable building project in the country which heavy emphasis was put on the environmental aspect and the final product (the building) through sustainable design and innovation. Economic and social sustainability aspects of the building have been determined as separated entities by most of them. Aligned with the perception, sustainable building project were considered more contribute toward delivering a high quality of green product rather than the benefits of the rest of the successful project performance measure such as cost reduction, on time project delivery and achieving stakeholders' satisfaction. Sustainability integration in building project was believed by the developers and funders especially to whom those not responsible for the operational and maintenance cost of building, to increase a project upfront cost such as for the material, technology and the integrated process. Thus, they rather preferred with conventional project that is oriented towards adapting to existing economic than striving towards integration of sustainability goals. This study stresses that the awareness and knowledge of sustainability and positive sustainability attitude among the industry's stakeholders are very important to generate the interest and demand of the project. The industry should have their local sustainability expert for the project so that the planning process, design and technology to be implemented suit to the local climate, culture and conditions. Lack of sustainability knowledge and local expert in the current building projects have led the project to adopted foreign technology including modified equipments from oversea to suit the local climate and conditions which is always not suitable enough. Support from the government and funders are crucial if sustainable building project is to succeed. To obtain their support and commitment, a higher level of awareness and knowledge on sustainability in building project should also to be inculcated among them. Sustainable building project is a holistic in nature. Most people

are not going to get the main focus right away. They will need to have awareness, knowledge and some training available. Hence, responsible bodies like CIDB, PAM, IEM and others should strengthen their efforts to raise awareness and provide knowledge to the stakeholders and incorporate the knowledge through teaching and learning systems. Among other efforts are such as take revisions to current guidelines and standards in order to provide them with a clear sustainability principles and the best practice of sustainability implementation supervision.

### **7.3.2 Stakeholders' Involvement**

There is a high perception of a project performance when the stakeholders including contractor are fully involved since the early planning process of the project. It was revealed in the case study of Diamond building, where the involvement of stakeholders including the main contractor has led the project performance to be delivered at a very high level. In conventional Malaysian building projects, the planning process is typically conducted linearly. The mechanical engineer and contractor are often left out of the architect's building envelope design considerations, yet those decisions are often critical in determining the size and cost of HVAC plant. It will then increase the cost and time of the project and decrease the sustainability performances, quality and stakeholders' satisfaction of the project. One of the frequently overlooked aspects of LEED Platinum projects is the most of them had the contractor on board from the beginning, carrying out various aspects of pre-design and preconstruction works. It is worth to note that the current procurement systems such as contractor engagement which is normally happened after completing the detail design, should to be reviewed and revised so that they could be involved since the planning process of the early project stage.

### **7.3.3 Documentation and Implementation**

This dissertation provides evidence that the performance of a project is high when the sustainability principles and the integration strategies during planning process are clearly mentioned in the project documents and practiced since the early planning process of the project. The first sustainability planning is belong to the conceptual stage and should continue through the whole cycle of the project. The output of sustainability integration planning process should be a set of documented sustainability principles and

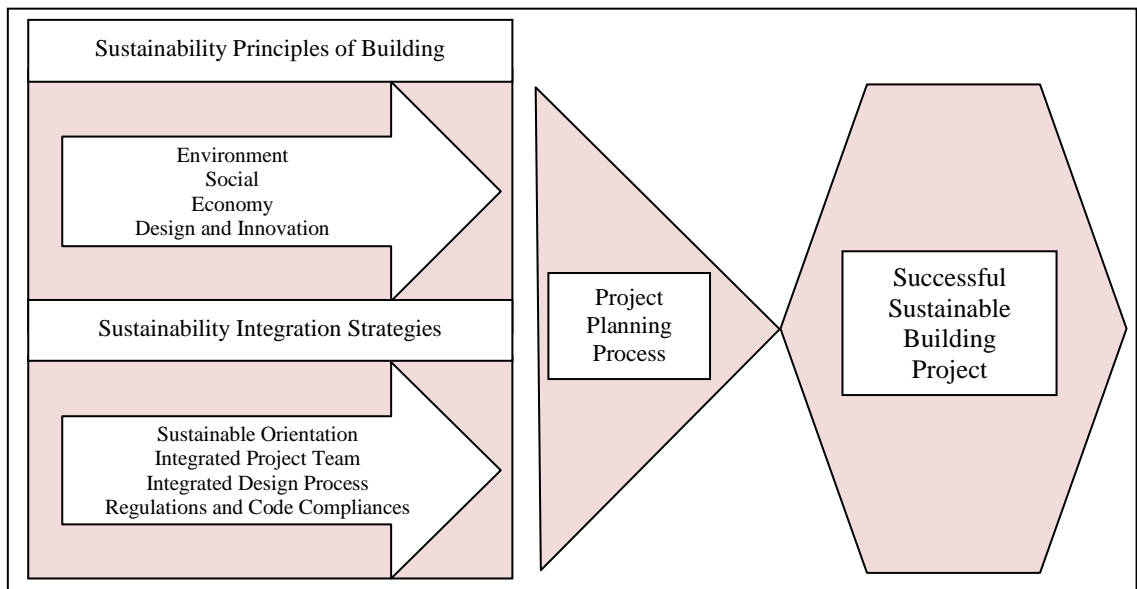
the integration strategies that can be used throughout the project and product life cycles to assess and reach the sustainability performances. Late sustainability consideration of the project will increase the project cost and duration for later changes or renovations. Thus, a clear and well documented aspect concerning sustainability and the integration strategies in building and the project planning standards and guidelines is very crucial so that the stakeholders are guided towards sustainability.

#### **7.3.4 The Project Sustainability Goals**

The goals of sustainability should be developed since the planning process at the earliest project stage and to be accomplished throughout the life cycle of the project. It is the key factors of a successful sustainable building project. Every decision for the project should run through the decision making process that integrates the sustainability principles and analysis through the project planning process. At this juncture, it is very crucial to get the right consultants who able to plan and design well and get the right contractor who able to build and comply the sustainability requirements to achieve the goals.

#### **7.3.5 Framework Recommendations**

A major contribution of this study is the formulation of a framework for integrating sustainability into the project planning process as presented in Table 6.20 (p251). The framework consists of the lists of sustainability principles of building and the strategies to integrate the principles into the building project through planning process. This dissertation provides evidence that the listed principles and strategies (42 factors) have been agreed to be significant to be addressed in the proposed framework, through the series of quantitative and qualitative analysis. The case studies analysis has revealed that, practicing most of the framework's factors has led the projects to reach the successful performances. The graphical presentation of the proposed framework is portrayed in Figure 7.1 (p270).



**Figure 7.1: Graphical Presentation of the Proposed Framework**

Unsustainable issues are often caused by different actors and for different reasons; a single policy change may not be enough. Thus, if this framework is adopted, it is recommended that a combination of policies will often be required. For example, reducing private car parking in Malaysia will require public transport services to be improved parallel. It is also recommended that the sustainability principles and the integration strategies in the framework to be gradually reviewed and updated over time. Last but not least, sustainability is not only a framework, it actually a requirement for all culture change initiatives which takes a strong sponsor with the leadership, vision and staying power to give the initiative a chance. Malaysian people need to be exposed to the new way of thinking and some slightly new aspects to their current processes.

The government and policy makers have a major role to play in realizing sustainability in building project in the country. Their supports are crucial needed by the project stakeholders to deliver the project successfully. Construction legislations such as planning and building regulations should cover and deals with sustainability issues throughout the whole life of the building such as concerning disabled access, carbon emission and others. Occupation legislations for instances, should cover legislation which deals with social issues such as licensing and employment. These forms of legislations are important to protect community's interest as such as the users or the neighboring communities of the building. The government should also enhance the local sustainability materials, technologies, equipments and resources by putting them into mass production to become common products. Through the competition, the

quality will be enhanced and their costs are reduced. Attention should be given to encourage the sustainable building projects through incentives, subsidies and policies so that the project will survive in the market. This study asserts that even though sustainable development has been acknowledged at the national level, its translation into action at the project level requires more concrete strategies and clarity.

#### **7.4 LIMITATION OF THE STUDY**

The first apparent limitation faced in this study was associated with the choice of representative contributed and all of whom may be presumed to have useful views to contribute. Even though only seven groups of stakeholders were contributed in the quantitative survey and only five groups of stakeholders were involved in the case study interviews, it is important to record that, this practical limitation was not intended to deny the importance of the perceptions of others involved in the building project. The numbers of interviewees per case were also set to provide a balance between cases to enable cross-case comparisons, depth and detail among the responses given limited time and resources of this research.

The planning process that focused in this study was only limited to the conceptual and design stage of building project (pre-construction stage). A further research focusing on other phases of project may wish to be conducted. The fieldwork for the research was done during the period of 2011 to 2012; therefore it does not covered changes that occur beyond that time. This study was also bounded specifically to study the main sustainability principles of building and the strategies to integrate the principles into the project planning process and the project performances affected by the practices. Hence, the detail assessment of sustainability principles, the integration strategies and the measured performances were excluded from this study.

The study has adopted quantitative questionnaires, case study and qualitative survey (interview). Sustainable building project is still at infancy level in the country and there are still limited stakeholders who are familiar with the project. Due to this main constraint and also other resources constraints (time and financial) this research only managed to study into three case studies and interviewed of 15 sustainable project stakeholders. Judgment sampling was employed to select the respondents who are 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, which finally having a total returned and answered questionnaires of 188 respondents. The printed and published document in relation to the sustainability principles, the planning process and performances of the case projects were difficult to get whether due to the confidentiality or they were totally not available. Thus, most of the data were gathered through interviews and discussions with the stakeholders, records, observations and presentation slide or newspaper clippings. More time spent to re-check and re-confirmation of the data with various sources in order to ensure the credibility of data used in this study.

## **7.5 FUTURE RESEARCH**

It is recommended for the following future research opportunities which this dissertation was unable to cover and which, to a certain extent, limits the findings of this dissertation.

- Finding out the link between a sustainable building project performance and the procurement system and how the procurement systems should be improved to facilitate the project delivery.
- Studies on the detail market evidence and financial performance of sustainable building project in Malaysia which is beyond the operation and energy cost or return on investment.
- A further research on sustainability integration strategies at the construction, operation and maintenance and demolition stages.
- Development of a Malaysian building sustainability assessment and performance systems using this framework as the basis by studying the detail requirements of every principles and strategies to be achieved.