

TOWARDS DEVELOPMENT OF SUSTAINABLE DESIGN IN MALAYSIAN UNIVERSITY CAMPUS: A PRELIMINARY FRAMEWORK FOR UNIVERSITI UTARA MALAYSIA

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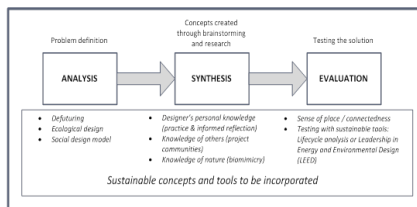
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Graphical abstract



Abstract

This paper highlights the framework derived from a research in developing a framework for Development and Maintenance Department (JPP UUM) which employs sustainable design within the development of Universiti Utara Malaysia (UUM) campus. In realizing the aim of implementing sustainability, this paper also showcases Integrated Project Delivery (IPD) method as the potential mechanism in enabling sustainable design in planning for campus development. Through a number of semi-structured interviews, a framework for integrated project delivery is derived from themes identified in the insights of various functions within JPP UUM. It is concluded that a more proactive approach from the campus management is needed to ensure all components in the framework to come together for sustainable efforts to succeed.

Keywords: Integrated project delivery, campus development, sustainability, UUM.

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1.0 INTRODUCTION

Sustainability in campus development is becoming a critical issue in Malaysia. The expanding higher education 'industry' is reflected in the numbers of universities being established in Malaysia. In 2006, there were only 20 public universities established in Malaysia. More recent statistics from the Department of Higher Education, Malaysia indicates that 40 private universities have been incorporated since 2011 which are in the process of establishing their campus [1]. The rapid expansion of the education industry is also reflected by the increasing number of foreign universities launching local campuses in Malaysia. This is in line with the aim of the Malaysian Ministry of Education to place Malaysia in the map for foreign student higher education. Accordingly, campus development issues should cater the needs the growing population of both local and international students. The

Sintok campus of Universiti Utara Malaysia (UUM) as the 6th public university in Malaysia has been developed as a planned university campus in 1984 and has won awards, which have placed the campus as one of the best landscaped campuses in Malaysia. The UUM campus has commenced operations in 1990 and has since become the second home for approximately 25,000 users on campus which includes students and staff [2]. UUM also has the second largest international student population among Malaysian public universities [1]. Due to this growing number of users on campus with each semester, it is imperative that measures must be taken to minimize the amount of carbon footprint resulting from daily activities and interactions of the users.

Accordingly, sustainability in campus calls the university to promote green buildings that can reduce energy and water consumptions while having minimal carbon footprint [2]. The target of the energy-efficient

green buildings is to have better lighting, temperature control, improved ventilation and indoor air quality which contributes to healthy environments by reducing the dangerous air-pollutants that cause respiratory disease in campus buildings [3]. However, in order to support the existence of green buildings and environmentally friendly structures, holistic measures should also be taken to shift the political and managerial mind-sets of the government and more specifically campus administrators to ensure that the systems support the existence of green buildings and will enable the sustainable efforts to be successful. This paper aims to report part of the findings of an on-going research to develop a framework for sustainable design for UUM and highlights the challenges faced by the university's Department of Development and Maintenance (JPP) in moving towards sustainable campus.

Sustainability practices in higher education institutes range from involvement in regional development, to reduction of greenhouse gas emissions (low carbon), and to academic leadership commitment via the inclusion of sustainable development in their mission and vision statements [20]. In Malaysia the top 4 research universities; Universiti Malaya (UM), Universiti Kebangsaan Malaysia (UKM), Universiti Sains Malaysia (USM) and Universiti Teknologi Malaysia (UTM) have initiated the steps to achieve sustainability in higher education. This effort is pioneered by Malaysia's oldest university, Universiti Malaya who had signed the Tallories Declaration in 1990 [21]. Since then other universities have followed suit by showing their commitment through the establishment of institute or research centres such as UKM through Institute for Environment and Development (LESTARI) in 1994, USM by the establishment of Centre of Global Sustainability Studies (CGSS) in 2009 and UTM via the rebranding of its campus as a Sustainable Campus in 2011.

2.0 ISSUES AND CHALLENGES

2.1 Developing A Sustainable Campus

The awareness raised by several declarations such as Tallories, Kyoto and Thessaloniki Declarations on sustainable universities and higher education institutions has paved the way for sustainable efforts in universities worldwide [4]. In the context of this paper which discusses the significant efforts in the sustainable campus development, the definition provided by [5] shall be applied. A sustainable campus community acts upon its local and global responsibilities to protect and enhance the health and well-being of humans and ecosystems. It actively engages the knowledge of the university community in addressing the current and future challenges, be it ecological or social in nature [5]. This definition implies that sustainable campus does not only reflect on the existence of green and environmentally structures, moreover, it encompasses

the entire social system in the proximity of the campus. Accordingly, a sustainable university campus should be a healthy campus environment, with a prosperous economy through energy and resource conservation, waste reduction and an efficient environmental management, and promotes equity and social justice in its affairs, as well as export these values at community, national and global levels [6]. The authors proposed a framework for sustainable campus by focusing on three strategies; university EMS, public participation and social responsibility and promoting sustainability in teaching and research. More recently, the efforts of higher education institutions in the Asia-Pacific through several studies are compiled and it can be concluded that the following challenges are imminent in sustainable campus development [7]:

- The role of government and the place of policy making; where lack of inter-ministry communication and collaboration may cause inconsistencies in sustainable policy implementation.
- The need to build sustainability progress not on generic approaches built on specific local features of the region and the academic strengths of the particular university;
- The complexity of creating sustainability learning opportunities within the formal curriculum of the institution. Students and faculty should be the driving force of sustainable efforts at their respective university.

It is apparent that the general awareness of sustainability in campus universities is directed towards the steps to be taken for maintaining the sustainable campus and resolving the challenges. However, a more proactive solution calls for enabling sustainable design to be incorporated with the existing campus development, as this is more reflective of the current situation in Malaysia where most universities were developed prior to the awareness of sustainability in campus development. In enabling sustainable design for campus development, several components must be considered. These components should reflect the need and unique requirements of that particular university. For example, the American University established a comprehensive 25-part manual which consist divisions from procurement and contracting requirement, concrete and masonry to integrated automation [8] This is to ensure that all works conducted in relation to campus development must comply with the standards set by the users or the persons responsible in managing the campus facilities.

2.2 The Concept of Sustainable Design

The idea behind sustainable design is to incorporate sustainability dimensions in the common design process. A designer may choose to influence their design with sustainability considerations at any stage of the design process. This paper chooses to highlight the sustainable design process as proposed by Barber-Estores (2010) [9] which is a variation of Kostelnick (1989) Three Staged Linear Method of Design [10]. This process is as shown in the following Figure1:

get involved early during the design phase of the construction project life cycle process. Implementation of this practice is significantly can improve the current fragmented design process, thus will lead to producing a comprehensive design and specification of the project without sacrificing the criteria and the concept of sustainability and green campus.

This emerging project delivery method takes advantage of several other relatively new ideas such as lean construction, building information modelling (BIM), integrated process and procurements, and other technologies that provide the potential for better collaboration on construction projects [12]. Based on this premise, this paper suggests that IPD can be beneficial in campus universities such as UUM to introduce sustainable design in campus development and maintenance practices. This is further supported by the findings of a recent study, which had highlighted that many of the key aspects of IPD are compatible with green building certification systems [12]. Furthermore, campus sustainability initiatives often encounter many barriers most of which are linked to the low priority of environmental issues on the campus agenda and are compounded by a lack of coordination among stakeholders involved during the design and construction stage towards sustainable practices. This is where IPD concept will be useful, where adapted into the proposed framework, shall necessitate the involvement of all stakeholders UUM in developing a sustainable campus.

3.0 METHODOLOGY

This paper investigates integration practice issues in order to appreciate and understand the current approach of design practice in UUM construction projects. At the same time, this research will review the current practice of maintenance and management of work that will be gathered from JPP UUM. Therefore, the data in this study lend itself more towards qualitative (subjective) instead of quantitative (objective) analysis. It means this research is associated with qualitative research and will not be involved in any creation and subsequent testing of a theory or hypothesis which is related to quantitative research [13]. Consequently, an inductive approach which is aligned to a qualitative research method was selected as the research approach. Pilot interviews were conducted to gain a general outlook on the subject under study, which findings shall be used in the development of an preliminary framework. Due to in-depth explanations needed to generate data and validate the developed framework, a series of industry workshops, especially among JPP UUM staff was selected as an appropriate research strategy to meet the aim of this research.

4.0 IPD AND SUSTAINABILITY

Subset to the philosophy of sustainability, is the green campus and sustainable construction which indicates the responsibility of the construction industry to attain sustainability [22]. Several studies have pointed out that traditional procurement methods in the construction industry may be a hindrance to the adaptation of sustainable practices [2, 3, 18, 23]. These methods causes fragmentation, adverse relationships and lack of inefficiency that has plagued the industry innovativeness.

Integrated project delivery (IPD) has been positively linked with sustainability in design and construction. This emerging project delivery method takes advantage of several other relatively new ideas such as lean construction, BIM, integrated process and procurements, and other technologies that provide the potential for better collaboration on construction projects [14][24]. With this in mind, it is suggested that IPD can be effective in campus universities such as Universiti Utara Malaysia (UUM) to introduce sustainable design in campus development and maintenance practice minimizes the impact to the environment. At any given time, there are approximately a total of 1.2 - 1.5 million students in higher education institutes, which include the public and private universities, colleagues and polytechnics in Malaysia [3]. In UUM itself, the population contributes to around 2.5% of total students, whereas all the students are living on campus; it provides accommodation for a number of figure 30 thousand students. If we include the academic staffs, researchers, administrative personnel and others, UUM consumption of energy and materials can be assumed to be almost comparable to small commercial cities.

4.1 JPP UUM Awareness in Sustainability Practices

A number of semi-structured interviews with JPP officers from different job functions (civil engineering, architecture, quantity surveyor and M&E engineering) were conducted in exploring the current practices of JPP in campus design and development, as well as their awareness towards sustainability practices. These preliminary findings as they were derived from the managerial level of practitioners, although were not conclusive, were indicative of the current understanding of JPP in promoting green and sustainability efforts in the design.

As part of a public university, JPP is subjected to certain procedures in dealing with campus development which varies according to the value of the project. In projects exceeding a certain amount of sum; decisions on design and implementation lies with the federal appointed external parties (Public Works Department etc). However JPP's awareness in sustainability practices is exemplified in the current on-going 'UUM Welcome Centre' which design incorporates certain green and energy efficient building characteristics, as well as the formulation of

an action blueprint which includes green elements in campus maintenance and improvement of facilities. As for the methods of project delivery, it was determined that most of the officers were unsure of project delivery methods other than Design and Build. However, they are well aware of the many challenges and problems brought upon by the implementation of Design and Build, and were open As part of a public university, JPP is subjected to certain procedures in dealing with campus development which varies according to the value of the project. In projects exceeding a certain amount of sum; decisions on design and implementation lies with the federal appointed external parties (Public Works Department etc). However JPP's awareness in sustainability practices is exemplified in the current on-going 'UUM Welcome Centre' which design incorporates certain green and energy efficient building characteristics, as well as the formulation of an action blueprint which includes green elements in campus maintenance and improvement of facilities.

As for the methods of project delivery, it was determined that most of the officers were unsure of project delivery methods other than Design and Build. However, they are well aware of the many challenges and problems brought upon by the implementation of Design and Build, and were open to the idea of IPD in executing potentially sustainable and green efforts for campus development. The following stage of research will take into consideration the findings from the pilot data collection and secondary data, which will both inform the development of a proposed framework for JPP UUM in sustainable design and campus development.

The next section describes the development of an IPD framework in this research.

4.2 IPD Framework for Sustainable Design in Campus Development

Based on the preliminary findings and the Barber-Estores [9] Four Staged Sustainable Design Techniques, this research put forth the following preliminary IPD framework for sustainable design in UUM campus development, as shown in the following Figure 3.

As a requirement of IPD, early involvement of key participants is crucial to the success of the delivery method. Throughout the entire process, open communication between all parties is a must. The generic IPD framework also requires early goal definition, hence all main agenda in regards to respect and trust; benefit and rewards, risk allocation, organization and leadership must be ironed out at the commencement of the project. With the use of appropriate technology, the key participants are also involved in collaborative innovation and decision making stage, which leads to the sustainable design techniques as previously highlighted in this paper. Intensified project planning and management stage should begin after the design stage and this shall lead to the validation of target and goals. In any case that the goals are not achieved by the team, the design shall be revised (indicated by dashed arrow in Figure 3 above) by the IPD team collectively before revisiting the sustainable design. If all goes to plan and goals are met, the team will deliver a project as first aspired by all key participants. The closing loop indicates the feed of information or best practice that could help in improving subsequent project in UUM.

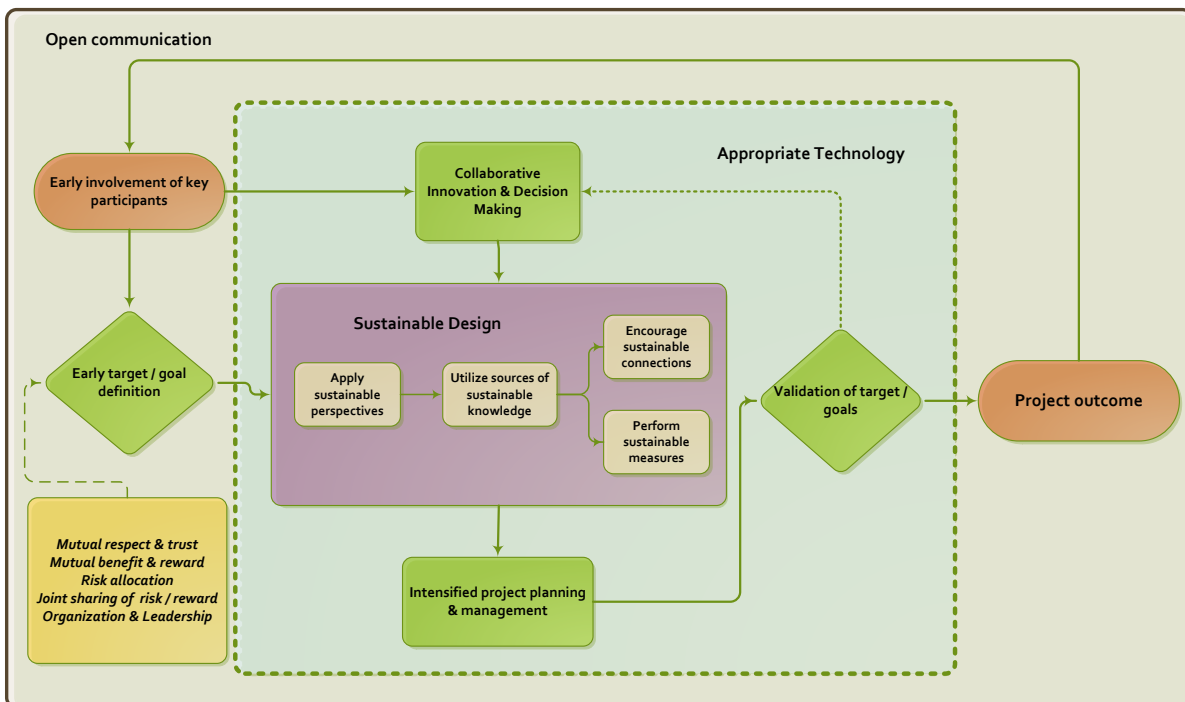


Figure 3 The preliminary IPD framework for sustainable design in UUM campus development

5.0 RECOMMENDATIONS

The preliminary framework developed in this study shall be presented and validated by a number of JPP UUM staff and experts in the field of project management in a workshop session to be held in the near future. The comments and suggestions from the framework shall be taken on board to improve the framework as a foundation for the developing UUM sustainability plan as implemented by many international universities. An extended workshop is required to finalize the strategies for sustainable design to be incorporated into JPP UUM campus development planning.

6.0 CONCLUSION

This research suggested that with the use of IPD, the goal of a sustainable campus is achievable. The sustainable design embedded IPD framework stipulates what is required to systematically enable UUM in general and JPP specifically to improve the functions of their department in accommodating sustainable efforts. Apart from that the use of IPD will enable JPP to contribute in highlighting the needs and requirements specific to the campus end users (UUM Campus community) during the design stage through direct involvement with the entire design and construction team from the inception of the project. Nevertheless, the suggestions from literature in treating the sustainable campus challenges must not be ignored. A top down involvement is required to ensure that all functions within UUM realize the criticality of the situation if the campus does not attempt to minimize its carbon footprint and energy consumption. Moreover, the faculty and student should become active advocates in promoting the sustainable practices that can be adopted in daily living through research and community engagement activities.

Finally, it should be highlighted that the move towards sustainability is always holistic in nature and requires total involvement of all users on campus as this is our responsibility for future generations.

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