

Sustainable Building Rating Tool towards Learning Improvement in Malaysia's Higher Institution: A Proposal

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Abstract—The growing populations of students in higher institution is increasing year by year, therefore, it is important to ensure that the building is performed and well functioned throughout its lifecycle. It is inevitable that the educational process and learning activities may be interrupted if the building experience a poor performance conditions, thus affect the students' academic achievement. Precedent studies have proved that there is significance in providing holistic performance in educational buildings that able to improve the students' learning environment. This study is aimed to provide a new rating tool of building performance, which is hoped to be used extensively on Malaysia's higher educational buildings in improving the students' performance level and learning efficiency. The design of sampling selects five Malaysia's public higher educational institutions, as a case study to obtain the building performance score by visual inspection and determine students' satisfaction level through questionnaires distribution.

Keywords-building performance, higher educational buildings, performance evaluation, occupants' satisfaction, learning efficiency

I. INTRODUCTION

Sustainability in higher educational buildings has become a worldwide and global issue. According to [7], back in 1990 there are several universities signed a 10-point action plan for incorporating sustainability and environmental literacy in teaching, research, operations and outreach at colleges and universities. Inevitably it shows that sustainability in universities is vital to prolong the education system. Higher learning institutions generally occupy a large land area due to the growing populations year by year. As stated in [1], transmitting knowledge and culture is one of the business agendas of universities. Various activities which are not limited to education and research activities alone are conducted on the campus involving students; as the dominant occupants of higher institutions. Therefore, the academic and non-academic activities resulted in two significant ways; which are direct and indirect impacts on the conditions, environment and sustainability. Building evaluation is the first priority as it is imperative to know the status quo of the building before one can effectively predict the future building performance [10]. Seeing this importance, the evaluative criteria derived from the occupants of the

educational buildings need to be measured in terms of the quality of the building facilities for its general condition and suitability for educational purposes.

In the current situation where people concern about the building performance and sustainability, the occupants demand to have the priority in terms of comfortability to use and utilize the facilities and services as it must be fit for the purpose of the users. The educational process and learning activities may be interrupted due to the poor building conditions. Hence, there is a need to adopt the application to evaluate the performance of the technical aspects of the higher institutions. For Malaysia's context, to propose an appropriate framework, an analytical study must be reviewed from the experiences of other countries such as New Zealand, the United States of America and Canada regarding the strategies that they have adopted to address the indoor environment evaluation and its impact on students' learning efficiency. A test is needed to seek the relevance of the proposed strategies to cater for the needs of Malaysian environment. Therefore, this study is purposely conducted to propose a new guideline to evaluate the building performance as a rating tool, by using behavioral suitability. This study is limited to the end-user of the higher educational building, i.e. the students, in five (5) public institutions (IPTA) in Malaysia. The aspect of building performance that needs to be drawn is generally in terms of technical aspects; i.e. the superstructure elements and the architectural elements.

II. PROBLEM STATEMENT

The learning environment in the higher institutions is generally different than the primary or secondary education. Every higher institution is built to serve the tertiary education to the students based on the various programmes offered and therefore, the design and facilities provided in the higher institutions must suit the objectives of the education programmes. However, the assessment of the building condition does not explicitly address the educational inadequacy of the academic buildings that is the relationship between the physical condition of the schools and the various educational goals and activities that take place within the building [2]. Problems in educational buildings include various aspects such as building designs, technical building elements, rooms, facilities, safety aspects, indoor and outdoor environmental problems and noise pollution. According to [6], the increasing number of students and

learning activities in higher institution has contributed to the inefficient of energy use and these may decrease the total performance system of the building year by year.

There are many terms used in evaluating the building performance, such as Building Dilapidation Survey, Tenants' Satisfaction Survey, Total Building Performance, Post Occupancy Evaluation and many more. However, [5] states that "most building performance assessment is done at the design stage of a building through the use of simulation tools, some assessment is carried out at the construction and commissioning stage by means of commissioning tests, but thereafter, there is little or no assessment carried out at the operation and maintenance phases of a buildings lifecycle". Many building practitioners are not aware of the requirement of building evaluation after it is occupied. Despite many research done towards building performance in higher educational buildings, the standard guideline of the building rating tool towards improving students' learning efficiency is not yet introduced in Malaysia. Many studies are delineated to the environmental conditions of the building, such as visual aspects, thermal comfort and air movement, but, none of the research is merely done on the technical aspects of the building element (superstructure and architectural elements).

For instance, [11] develops a general guideline of an indoor environment quality for any types of building and analyse its impact on health purposes but the study does not relate the specific guideline to be used towards the students' learning efficiency. Another similar study conducted by [9] address the concept of an indoor environment and its sustainability in campus by reviewing the used practices, the organizational approach and measurement of technical improvement towards sustainability. He suggested that universities must preserve the environment, stimulate economic growth, and improve the well-being of the surrounding community, but, the study does not provide any new method achieving the sustainability aspects concerned. Ideally, the initial existence of building starts from the concept of design and the provision of building elements, not merely on the environment. Hence, the suitability of buildings in terms of technical aspects needs to be captured earlier in order to suit the occupants' comfortability.

III. LITERATURE REVIEW

The goal of building performance evaluation in higher educational buildings is merely to improve the building delivery processes which incorporate the flexible and efficient evaluation process into the daily learning activities. Hence, it will support all the stages of the building delivery system such as the facilities plans, designs, construction and operations towards its improvement for the students' learning efficiency. Some of the major focuses of such evaluation are for better understanding on the impact of early design delivery decisions on long term building efficiency and also the impact of building delivery processes and decisions on customer response both initially and over the life cycle of the building. Lynch and Peters (as cited [3]) in their study revealed that there is an increasing awareness to improve building performance whereby there is a direct link between the quality of the work place and the effect it has on

the performance of its most critical resource, i.e. employees. This can be applied as well at the higher institution, whereby, if there is a poor quality of building performance and if the technical delivery system is deteriorated, it may reduce the students' efficiency in their learning activities. A preliminary study conducted by [8] shows that 40% of the students at one of the higher institution in Perak agreed that their learning process can be affected by poor provision of the indoor environment. The analysis has shown that if a higher educational building experiences poor environmental conditions, it will demotivate the students during the learning process, thus reduce the quality of students' achievement (refer to Fig. 1).

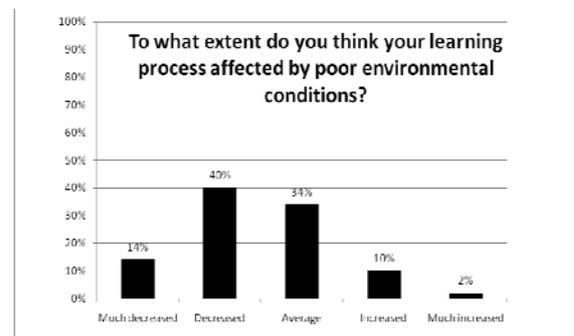


Figure 1. Assessment of student's learning process affected by poor environmental conditions.

The satisfaction parameters of the occupants; especially the academicians and the students must be addressed as to fulfill their requirements and expectations while they are at the academic buildings. A study conducted by [4] found that students' performance is significantly correlated with the satisfaction of the academic environment and the services received. He also found that the existence of the professional development programs and internship opportunities are associated with better academic performance. With regard to the background variables, he found a positive effect of high school performance and school achievement while there was no statistical evidence of the significance of the association between the family income level and the academic performance. Therefore, based on the literature and studies derived from the precedent research, there is a significant correlation in providing a good and quality building performance that can engage the whole performance of the tertiary students in higher institutions. Hence, this study is aimed to provide a new rating tool of building performance, which is hoped to be used extensively for Malaysia's higher educational buildings towards improving the students' performance and learning efficiency.

IV. AIM AND OBJECTIVES

The introduction and the problem statement above led to the formulation of the research aim and objectives. This study is aimed to generate a new guideline of building performance rating tool, with regards to the improvement of the learning environment and students' learning efficiency. The objectives for this study are;

- a) to investigate the concept of building performance evaluation in higher institutions
- b) to determine the performance criteria in higher academic institutions
- c) to develop a new guideline of building performance rating tool, specifically for Malaysia's higher institution
- d) to test the proposed guideline; by correlating the building performance criteria and the occupants' satisfaction level

V. SCOPE AND SAMPLING

There are two types of sampling done which are random sampling and selected sampling. For the purpose of this study, both types of sampling are used to achieve the third objective; to test the proposed guideline by determining the technical performance aspects of the higher institutions and determining the students' satisfaction level.

A. Selected sampling – Higher educational institutions

Selected sampling is used in the case study for the research area. There are 5 public institutions (IPTA) identified as the subject for the case study i.e. University of Malaya (UM), National University of Malaysia (UKM), University of Science Malaysia (USM), University of Technology Malaysia (UTM) and University of Technology MARA Malaysia (UiTM). The selection of the buildings is based on the accessibility of the buildings, location, problems or issues raised and reliability of the occupants. This helps to clarify the general overview of the building performance. The selected institutions comprise for both public and private institutions, which is hoped to give different perspectives of the issues related to the aspects of the building performance of the chosen buildings. The selected sampling is found to be more proper and appropriate in evaluating the building performance as it is able to outline the relevant characteristics of its technical aspects.

B. Random sampling – Students

Random sampling is used in distributing the questionnaire to the respondents, which is only given to the occupants of the building that is based on the selected sampling. This research targets to obtain 500 samples of respondents and the population of the respondents is identified from the building samples that need to be drawn. The percentage of the respondent's population for this research is 100% students. Random sampling is used for this survey as it is able to obtain various probability of satisfaction from different genders of respondents, their perception towards the performance of the technical aspects of the building, their experiences and hours spend in the selected buildings.

VI. METHODOLOGY

Both, qualitative and quantitative methods will be used as a research method to achieve the objectives of this study and to answer research questions. Generally, this research strategy is divided into three (3) phases (refer to Fig. 2).

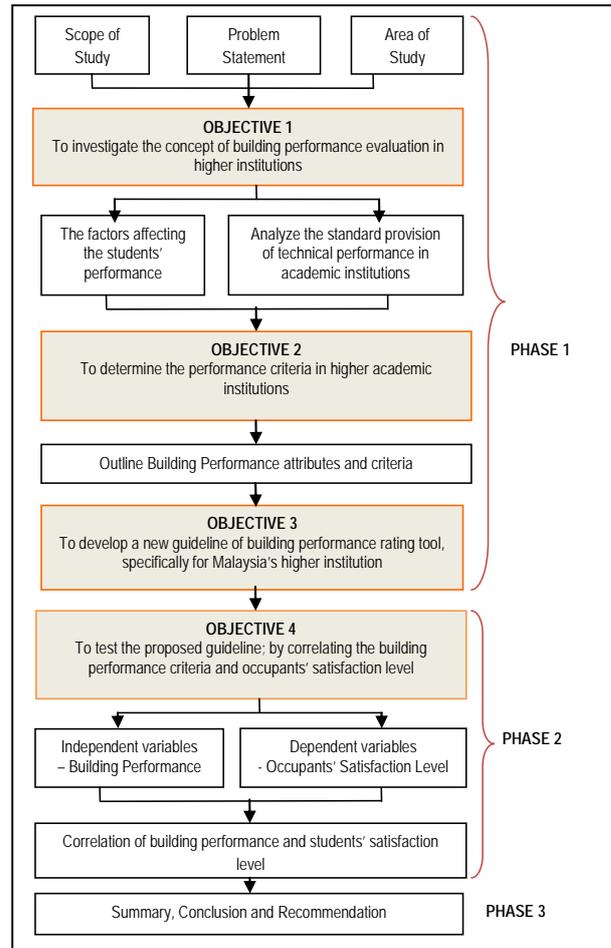


Figure 2. Research Strategy Chart.

The first phase in doing this research is to study the theory and the concept of building performance evaluation and analyze precedent application of such evaluation. All of the factors and constraints of the building performance is determined and the standard provision of the technical performance in academic building is also analyzed. From the study and analysis, the author generates a new guideline of building performance evaluation as a rating tool for higher educational buildings, with regards to the effect of students' learning efficiency in Malaysia. Objective 1, 2 and 3 will be achieved in this phase.

In second phase, data will be obtained through the instruments which will be collected in the first stage of the research in order to seek the effectiveness of the proposed guideline. The hypotheses for the findings are defined and the performance problems occurred in all building samples will be photographed clearly in order to proof the problem occurrence and for documentation and record purposes. All collected data is analyzed to get the findings of the research and to achieve the research objectives. The rating percentage will be presented to reveal the respondents' perception level towards the technical aspects of the buildings and the data from the samples are analyzed using SPSS (Social Package

Statistical Science) and the findings are documented. Objective 4 will be achieved this phase.

At the third phase, the author concludes all the findings gathered in Phase 1 and 2 and provides recommendation to improve the performance of the indoor environmental aspects and also suggest recommendations for future research.

VII. SIGNIFICANCE OF STUDY

By providing opportunities for the improvement of building performance and the relationships of the behaviors among the users, the proposed guideline of the performance rating tool can play a significant role in the building industry. It is hoped that based on this study, it would be able to be a vital contribution in terms of the following:-

- a) Achieving building sustainability throughout the building delivery process and its lifecycle.
- b) Extending and improving the design consideration related to the functional requirements of the educational buildings in Malaysia
- c) Suggesting systematic way that is able to collect all data and information in the buildings to enhance the building performance
- d) Reducing defects, depreciation of building service and protecting the life of the buildings by improving the level of knowledge and skills
- e) Enhancing the quality of the building performance by addressing the sensitivity and the changing needs of the occupants
- f) Improving the building technical performance towards a more effective learning process

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