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The Development and Measurement of Conducive Campus Environment for Universiti Teknologi Malaysia (UTM) of Campus Sustainability

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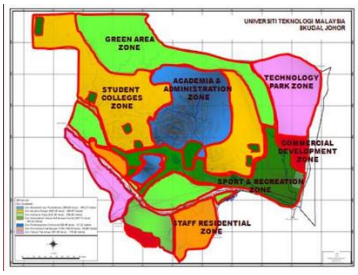
Graphical abstract



Abstract

The campus environment in a higher learning institution should be conducive to support the synergistic effects of its three basic functions namely: learning, social interactions and living. Campus conduciveness is rarely measured in the context of campus sustainability. This study will develop and establish Conducive Campus Environment (CCE) tools while measuring the level of conduciveness to improve the management of facilities, services, infrastructures and the physical environmental settings of the campus environment. It is implied in the context of campus sustainability initiatives at Universiti Teknologi Malaysia (UTM), Johor, to fulfil the three basic pillars of sustainability, hence environmental, social and economic. The standardized structured questionnaires distributed among 380 students focus on facilities, services and infrastructures in the campus setting. An inferential factor analysis has been applied and the four levels of conduciveness have been developed. At last, the study reveals the adoption of CCE ca be an example on how sustainable balance score card adopted in higher learning institution.

Keywords: Conducive campus environment; campus sustainability; facilities; higher learning institution; sustainability; sustainable balance score card

Abstrak

Persekitaran kampus di sesebuah institusi pengajian tinggi perlu kondusif bagi menyokong kesan-kesan sinergi bagi tiga fungsi utamanya iaitu pembelajaran, interaksi sosial dan kehidupan. Kekondusifan kampus amat jarang diukur dalam konteks pelestarian kampus. Kajian ini akan membangun dan mewujudkan kaedah pengukuran Persekitaran Kampus Kondusif (CCE) di samping mengukur tahap kekondusifan bagi mempertingkatkan pengurusan fasiliti, perkhidmatan, infrastruktur, serta penetapan persekitaran fizikal kampus. Ianya termasuk di dalam konteks inisiatif pelestarian kampus Universiti Teknologi Malaysia (UTM) Johor bagi memenuhi tiga tunggak asas pelestarian iaitu persekitaran, sosial dan ekonomi. Soal selidik berstruktur standard telah diedarkan kepada 380 pelajar yang menumpukan kepada fasiliti, perkhidmatan dan infrastruktur di dalam suasana tetapan kampus. Analisis faktor inferensi telah digunakan dan telah menghasilkan empat tahap kekondusifan. Akhirnya, kajian ini menunjukkan bahawa pengadaptasian CCE boleh menjadi satu contoh bagaimana kad skor imbangan lestari diaplikasikan di pusat pengajian tinggi.

Kata kunci: Persekitaran kampus kondusif; pelestarian kampus; fasiliti; institusi pengajian tinggi; pelestarian; kad skor imbangan lestari

1.0 INTRODUCTION

"Conducive" by definition refers to the situation or condition that creates, assists, or promotes work or learning environment (Longman Dictionary). The term is commonly used in education or work environments. Providing a conducive learning environment is fundamental to an educational institution in order to achieve total development in the cognitive, affective and psychomotor domains of the students (Ayeni and Adelabu, 2012). The conducive environment for learning and education is part of the development strategy of high-quality sustainable practices in the education sector. The quality assurance of education institutions is defined as the effort to provide quality in terms of learners, learning environment, curriculum content, teaching and learning process, and learning outcomes (UNICEF, 2000). To provide the three basic functions of higher learning institutions -

in terms of learning, social interactions and living as part of the societal development- demands a combination of conducive facilities, services and infrastructures (Cleveland and Garry, 1999). Specifically, the main facilities needed to support curricular learning outcome come in the form of lecture halls, libraries and laboratories. The main facilities needed to support extra-curricular social interaction include sports centers and the natural physical environment; and the main facilities to provide the basic living amenities come in the form of health centers and hostels(Omar *et al*. 2009). An adequately conducive environment is important to stimulate and encourage learning, teaching and research innovation (Olanrewaju *et al.* 2010). The issues above provide an important justification for further research into the development of a measurement for conducive campus environments (CCE) for institutions of higher learning.

As for the students, the physical aspects of the CCE send a transformative first impression vibe about the institution. The basic layout of the campus, building structures, accessibility, class interiors, library, sports facilities and open spaces, the design of the residences and cafeterias will influence the lives of the students and the campus community as a whole (Strange and Banning, 2001). The physical environment is one of the important factors of behavioral settings besides the human or social environment (Barker, 1968, Humpel *et al.* 2002). The scale, design and color of the campus, including buildings, pathways, parking lots, signs, furniture, landscape and natural physical environment will influence the behavioral setting of the community (Wicker, 1984, Kenney *et al.* 2005). Further, the effects of physical environment on human behavior have been conceptualized into three aspects; i. determinism: the people movement determined by the physical structure and design, ii. possibilism: where the physical environment provides sources of opportunity such as the provision of campus footballs stadium, and. iii. probabilism where attractive physical design and structure of the building will probably increase the interest (Strange and Banning, 2001). All this aspect contributes to the aspect of inclusiveness of campus sustainability to its society.

The myriad of interdependent relations among inhabitants, environments, and behaviors come under the concept of campus ecology which is a branch of environment sustainability (Orr, 1992). One special emphasis is on how the ecology of the campus can support or hinder the traditional goals of student growth and development. The campus ecology consists of three components, i. Organisms/inhabitants: students, faculty, staff, visitors, others; ii. Settings/environment: both social (the curriculum, the co-curriculum, the extra-curriculum and other social functions) and the physical (buildings, landscapes, walkways and other natural and built features of the environment); and iii. The activities/behaviors: learning, research, personal development, and other outcomes specific to higher education.

As an organization, provision of a conducive learning and living environment for the students is the role of a higher learning institution. Therefore the measurement of the conducive campus environment through the student perceptions would help identify the overall performances of the campus society that will cover not only the functions of the institution but also to ensure the quality of life and leisure activities of the students and campus society as a whole. Maintaining a conducive and sustainable teaching and learning environment is part and parcel of the organization to improve the services provided. Poor service often results from inadequate information about the customer. The study utilized by international student responses to measure the quality of learning environments at private higher learning institutions in Malaysia has helped re-strategize the organizational objectives and targets (Padlee *et al.* 2010). That study provided logical justifications using student perceptions for conducive campus environments in order to strategize and prioritize the improvement quality of facilities and infrastructures provided.

The importance of conducive learning facilities provided by higher learning institutions was highlighted by Mariah Awang and Abdul Hakim Mohammed (2011). The developed model enhanced the links between environment and educational outcome of the students whereby the *'performance of educational facilities must be* ***conducive*** *to the organization and functioning properly as to enhance the quality of learning outcomes'.* To support that outcome, the importance of core competencies was highlighted for the facilities manager to maintain and support the educational process. Besides the indoor facilities, the conducive sustainable outdoor learning environment is crucial for the development of learning, social and emotional intelligence in higher learning institutions (Mirahmi *et al.* 2011). The two separate studies above show the requirement of comprehensive conducive campus environment measurement that gathers the needs of facilities, services and infrastructures not only in indoors but also the outdoors such as in the physical environment and the sports facilities that create a conducive campus environment. This aspect contributes indirectly to the social aspects of campus sustainability.

The first reference of sustainability in higher education mentioned in Stockholm Declaration 1972 emphasized the interdependency of humans in achieving environmental sustainability (UNESCO, 1972, Lozano *et al.* 2013). Sustainability comprises of three (3) pillars; environmental, social and economic and the interactions and balance between the three namely, bearable, equitable and viable. Translating the three basic areas into campus sustainability means that in their operation , improvement must be achieved in economic efficiency, protecting and restoring ecological systems and enhancing the well-being of the society. Campus sustainability requires active coordination and participation between the administrative and operational departments, and the academic department through teaching and research efforts, and local community. The higher learning institution as an Ivory Tower provides a unique pool of educated personnel that function as an agent of change for the growing concerns of environmental degradation and a transition towards more sustainable society in the future. This research will portray the translations of sustainable efforts by top management into operational tasks of the facilities, services and infrastructures at the higher learning institutions which indirectly contribute to the students' and lecturers' quality teaching and learning.

Other studies of campus sustainability that link with the infrastructure have been conducted by Abd-Razak *et al.* (2011). The study that involves Universiti Kebangsaan Malaysia (UKM), Universiti Sains Malaysia (USM), Universiti Malaya (UM) and Universiti Putra Malaysia (UPM) concludes that a compact campus can achieve sustainability better than a dispersed one in spite of the weaker accessibility in the compact form. The research would give an insight on how the CCE measurement will inform the campus authorities on how the existing physical settings of campus sustainability influence the society and the interactions between the physical building environment and the society.

Another paradigm to discuss the importance of the measurement of CCE provided by the university is the possibility to be part of the university's environmental management system. The element of environmental management system has been mentioned by Alshuwaikhat and Abubakar (2008) as a strategy of campus sustainability. The three strategies proposed are (i) environmental management system (EMS) of the university, (ii) public participation and social responsibility and, (iii) promoting sustainability in teaching and research. Further, the transition

management framework of sustainability in higher education needs four types of governance or management activities that are strategic, tactical, operational and reflective (Stephens and Graham, 2010). Information gathered from the CCE in detail will translate into the action plan as part of the operations of the facilities provided to support the teaching and learning activities and monitoring the purpose of OAD performance by the UTM top management in the UTM balance score card. These strategies provide the link between sustainable campus efforts and conducive campus environment.

The continuous improvement of the facilities, services and infrastructures provided will help the organization achieve the quality assurance in the education industry in the long run. It measures facility performance in the activities of the organization as a core business. In relation to that, the performance of the facilities is clearly defined as the effectiveness and efficiency of the services or facilities provided in any organization to support its activities (Leung and Fung, 2005).

Most of the research conducted on the facilities provided in higher learning institutions focuses on the linkages between the indoor educational facilities and student performance (Krogh & Roos, 1996; Tinto, 1997), facilities and student attendance and learning performances (Nurul Syakima *et al.* 2011), include the student behavior in the relationship between facilities and student performance (Earthman 2002; Scott-Webber *et al.* 2000), the element of behavioural, attitude and physiological environmental evaluation of facilities (Sapri *et al.* 2008). Other studies have been conducted by Coyle(2009) and Mirrahmi *et al*. (2011), showing the important function of the built and the natural environment that contribute to student emotional, cognitive, social, and physical welfare in educational institutions, using the impacts of physical environmental factors such as lighting, noise and climate control (Young *et al*. 2003) and the impact of energy conservation programs in campus sustainability on student behavior (Marans and Edelstein, 2010). The lack of understanding of physical environmental conditions that impact the student performance indirectly requires more local research on user experiences with the facilities.

1.1 UTM Campus Sustainability

UTM is categorized as a large university with the ttotal population of 19,029 that consists of 14,592 students, 2,695 non-academic and 1,742 academic staff. UTM has two campuses in Johor and Kuala Lumpur. The main campus in Skudai, Johor where the study is conducted is surrounded by tropical forests and palm oil plantations on a total area of 2,829.90 acres. It was classified as a combination of compact and dispersed development type. The compact inner circle hence the Academic & Administration Zone in blue (Figure 1) consists of four faculties, an administrative zone, mosque, library and main hall. This area was developed with a radial concept to encourage pedestrianism with easy accessibility and connectivity of the buildings at the initial development phase of the campus. The inner circle known as the Knowledge Circle is surrounded by seventeen (17) hostels, ten (10) faculties, staff residences, sports and recreational zones. In this type of dispersed campus, different modes of transportation such as regular feeder buses and private vehicles are used. This combination provides a balance of centralized core activities over the inner circle.

In terms of land use, main UTM campus consists of the academic and administrative zone (14.61 %), student residential zone (25.58 %), sports and recreational zone (14.15 %), commercial development zone (2.42 %), staff residential zone (6.08 %) and technology park (15.49 %) (Alang and Omar, 2010). The total green area is 850 acres that consist of the forest reserve, fruit farm, artificial and natural landscape, rivers and lakes covering 21.67 % of the total area. It is complemented by a beautiful lake and river in the spread of faculty and residential buildings surrounding the inner circle. The whole campus enhances the green and healthy living of the society entirely as a blend of social and environmental factors.

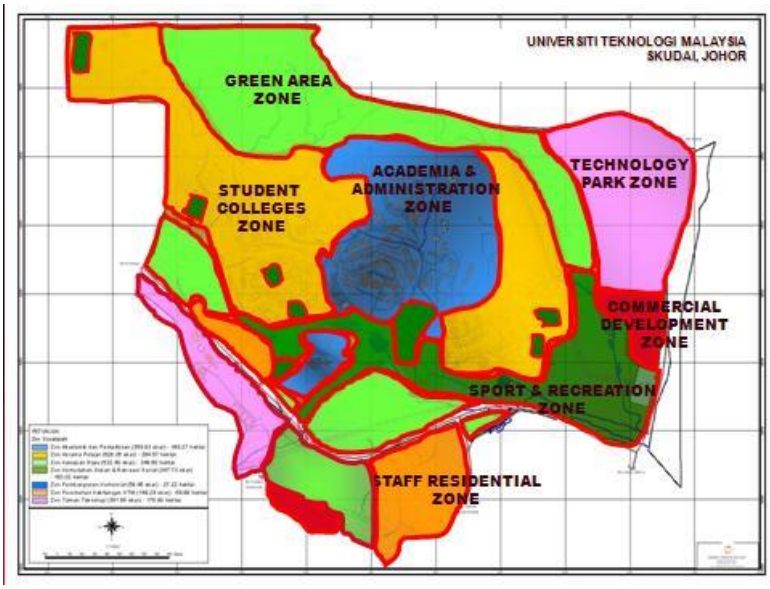


Figure 1 Zoning of the Campus Environment of Universiti Teknologi Malaysia (UTM)

The UTM campus sustainability commitment commenced in 2009 in simple initiatives such as saving paper, energy and recycling. The further formalization and enlargement of the efforts covering various aspects of water, and biodiversity entered

in the UTM Sustainable Campus Policy produce in August 2010. The policy that consists of 15 important items provides a combination of economic, social and environmental sustainability factors in order to improve the wellbeing of the society (www.utm.my/sustainability). The sustainability policy translates into several key strategic initiatives such as Sustainable Energy Management Program, Monday is UTM Recycling Day, Green Office, and Sustainable Arcade, which involve several key strategic stakeholders such as the Registrar's Office, Bursary Office and OAD. Measuring CCE will add another dimension of campus sustainability from the perspective of providing facilities, services and infrastructures especially for student life and the overall wellbeing of the campus society.

As an effort to support the sustainable campus initiative, UTM management decided to include CCE as one of the main components in UTM Balance Score Card. The efforts, on the other side portray the high commitment of the UTM top management to develop inclusiveness of campus sustainability society in line with the tagline 'Healthy Lifestyle, Happy and Sustainable' campus society (Zaini Ujang 2013). In practice, it will help prioritize planning facilities in the future related to better arrangement of financial sustainability. Conceptually, this study will demonstrate how the rigorous concept of sustainability translates into core functions of facilities management specifically and campus sustainability generally in a higher learning institution. The measurement is a combination of the physical aspects of CCE and the link with the wellbeing of campus society from social sustainability dimension. The discussion on the translation of Sustainability Balance Score Card (SBSC) into core management system has been elaborated in Bieker *et al*. (2001). This study however, is a showcase on the development of SBSC from campus organization, and how it is applied and adopted by the campus sustainability concept.

As the campus operator, the Office of Assets and Development (OAD) of UTM is responsible for providing the facilities, services and infrastructures and the development has been appointed to conduct a measurement of conduciveness around the campus. '*Providing Excellent and Sustainable Facilities to Meet the University's 'Environmentally Friendly' Goal* is stated as one of the Core Values (Laporan Tahunan Pejabat Harta Bina 2010). This effort portrays the institutionalization of sustainability into the management and operation of the campus (Sharp 2002).

This research will contribute by utilizing the student perception in the physical campus environment developing the measurement of the campus conduciveness scale. It will include not only the indoor or classroom facilities but also the physical and natural environment, transportation, sports and food and beverage facilities to support the curricular activities, leisure and basic living amenities. The main objective of the study is to measure the level of CCE among the students in UTM contributing to the quality teaching and learning of higher learning institutions and campus sustainability. It has been conducted to improve the management of facilities, services and infrastructures and at the same time identifying aspect that contributes to the campus sustainability.

2.0 METHODOLOGY

The study employs the quantitative questionnaire survey and qualitative semi-structured interview. The qualitative approach applies the semi-structured interview on selected responsible officers managing the facilities in OAD and selected students as the main clients (Harrel and Bradley, 2006). The information was used to help construct item variables in the standard structured questionnaire (Brace, 2004). In addition, several studies related to facilities and infrastructures that support the needs of conducive campus environment for sustainable learning and teaching environment were reviewed (Ayeni and Adelabu, 2012; Ceveland and Garry, 1999; Leung and Fung, 2005; Nurul Syakima, 2005; Korgh and Roos, 1996; Tinto,1997; Earthman, 2002; Scot-Webber *et al*. 2000; Mirahmi *et al*. 2011).

The questionnaire includes various ranges of physical environment that include building structures, accessibility and connectivity, facilities, services and infrastructures provided in the campus such as lecture rooms/halls, the landscapes around the buildings, transportation and bus services, arcades/cafeterias and services, sports facilities and natural ecosystems that are translated into 61 questions or item variables.

The questionnaire contained the following sections; A. Student Profile: age, gender, faculty and length of stay in UTM. B. A list of variables consisting of indoor classes, rooms, lecture facilities, outdoor facilities (manmade and natural environment), Sports and transportation facilities and food & beverage outlets. There are 54 variables used for the five Likert Scale developed by Rensis Likert in 1932 for the items that consist of questions on the conduciveness of facilities, services and infrastructures in UTM. The five units of the Likert Scale are: 1. Strongly Disagree, 2. Disagree, 3. No Opinion, 4. Agree, 5. Strongly Agree. Pilot study on the 30 students measured the reliability of the item variables and internal consistency of the scale using coefficient Cronbach Alpha (Cronbach and Shavelson 2004). The correlation of each score to the total scale score ('item-total correlation') was also measured through Pearson's correlation coefficients.

The study employed a standardized structured questionnaire survey on 380 students as representatives of the 14,592 student population at the campus. The students consist of 76.7 percent of the total population. It shows the importance of student responses as the main clients of the organization. Using the samples formulation by Israel (1992) with a different combination of levels of precision, confidence, and variability, the size population applied is 380 students that consist of local and international student which are consist of undergraduate and post-graduate.

The inferential statistics of Factor Analysis were used as a technique to simplify complex sets of data by analyzing the correlations between item variables (Foster, 2001; Tabachnik and Fidel, 2001; Zen *et al.* 2014). The factor analysis is designed to simplify the correlations matrix and reveal the small number of factors which can explain the correlations and apply in various studies (Bonomi *et al*. 2001, ElBardissi *et al*. 2007, Zen *et al*. 2014). Factor analysis and reliability analysis were used to test the goodness of data. Varimax rotation was applied for confirmatory factor analysis (Hair *et al*. 1995). Principle component analysis of factor analysis was used to as an exploratory factor analysis that could yield as many components as there are variables to cover the issues in the study areas, in this case facilities, services and infrastructures' of the UTM's campus. The result of the survey was coding and analyzed using the SPSS (Statistical Software of Social Science) version 12. During the analysis process and determination number of factors, there are several steps to be taken such as rotated matrix, Eigen value, screen plot, percentage variances explained and alpha cronbach.

In detail, the questions in the six constructs of independent variables namely indoor environment in lecture rooms/halls, outdoor building environment, bus services, arcades/ cafeterias, sports facilities and natural ecosystem are included in the factor analysis to find out whether their subjective measurements in the Likert Scale of 1 – 5 are actually converging on their respective constructs. Of the 61 questions associated with six constructs, the

questions with factor loading value bellow 0.5 were dropped while the rest of the questions retained for further data analysis. The reliability analysis of Cronbach's Alpha was used to measure the internal consistency of the data and in further determining whether the measurements of the six constructs were consistent (Kline, 1999; George and Mallery, 2003). Cronbach's alpha of each factor was used to assess the instrument's reliability and values above 0.70 were considered acceptable, as proposed by Terwee *et al.* (2007). Cronbac's Alpha values range 0.80 to 0.91 categorized as good for the six constructs that indicates consistency of the data.

In the factor determination, variances, eigenvalue minimum 1.0 and alpha cronbach were taken. Further, the factors being developed link to categorize into the level of conduciveness based on the Pearson correlation or mean of correlation coefficient in each resultant factor. The application of the Pearson correlation coefficient has been adopted in develop the Swiscow criteria of four level of correlations (Swiscow 1997). The development of scale measurement based on Pearson correlation coefficient were applied widely in health measurement and psychosomatic research (Constantin *et al.* 2000; Deon, 2011).

3.0 RESULT AND DISCUSSION

3.1 Result of the Study

Profile of the respondents consisted of 47% male and 53% female, 59.1% undergraduate and 40.9 % postgraduate students. About 62.7 % of respondents were 22 to 24 years old, followed by 23.4% between19 and 21, 12.1 % 25to 27, 1.2 % 28 to 30 and 0.6 % 31 and above. About 83.9 % have stayed on campus from 1 to 5 years, 14.8 % have been on campus less than one year and 1.2 % have been here 5 to 10 years.

After the rotation matrix, the result of the factor analysis conducted displayed in Table 1. Variances, eigenvalue and alpha cronbach were taken into account during the number of factor determination.

Table 1 Indoor environment

FACTOR 1 : INDOOR ENVIRONMENT	FACTOR LOADING VALUE
Lecture room floors are always clean.	0.82
Lecture rooms are always clean and comfortable	0.80
Chairs and tables are always comfortable.	0.77
Teaching equipment is functioning well	0.76
Air conditioning is functioning well.	0.75
Chairs and tables are always clean.	0.72
Encouraging lecture rooms / Halls Facilities	0.71
There is no odour in the duration of the learning process.	0.71
There is no outside noise disturbance during teaching and learning.	0.65
Windows can be opened to allow air circulation when air conditioner is not functioning.	0.62
Comfortable lighting to encourage teaching and learning activities.	0.59
There is no outside noise disturbance from air conditioning system.	0.59
There is no specific noise disturbance (acoustic, machinery, apparatus).	0.56
There is no outside noise disturbance from lighting.	0.53
The number of chairs and tables are suitable with the number of students in the Lecture Rooms/Halls.	0.52
The size and area of Lecture Rooms are comfortable.	0.51
Total Correlation	10.58
Mean Item-Total Correlation Coefficient	**0.66**
Eigenvalues	12.90
Percentages of Variance	21.15
Cronbach's Alpha	0.93

Factor analysis conducted on 74 variables and the KMO (Keiser-Meyer-Olkin) Measure of Sampling Adequacy (MSA) produced is 0.86 which is categorized as a very good adequacy distribution value. The Bartlett's Test of Sphericity requirement is significant < 0.05, where the correlation matrix is not an identity matrix (Tabachnik and Fidel, 2001). There are seven factors identified and retained by using the minimum value of Eigenvalues 1.0, the seven are: Indoor Environment, Natural/Outdoor Environment, Food & Beverages Outlet, Inter-Building Connectivity, Library, Laboratory and Exam rooms, Sport Facilities and Campus Transportation. The seven are retained with total cumulative variance explained are 55.49 %.

3.2 Indoor Environment

The study has identified the Indoor Environment of classroom/lecture room with the high percentage of variance of 21.151 %, the Eigenvalue of 12.9 (> 1) and cronbach alpha 0.93. The mean item-total correlation coefficient was high 0.66 categorized as Moderately Conducive. The result shows that Indoor 'classroom' environment consisting of physical facilities such as room design, cleanliness of the floor, the quality of furniture and indoor air quality, noise control and ambience are at the moderate level of conduciveness. These factors need to be upgraded into Conducive levels as the highest level of physical indoor environments in CCE measurement. From the

environmental aspect of sustainability, these indoor facilities need to be bearable in order to provide a place to support a direct teaching and learning environment between the students and the lecturers (Table 2). Moderate conduciveness of Indoor Environment will directly affect student comfort, control, attention, access and enjoyment that further affect student motivations, concentration and performance (Abdul Hadi, 2008). In contrast, uncomfortable room temperature, ergonomically incorrect furniture and poor aesthetics and lighting create discomfort and a feeling of helplessness (Miller *et al*. 2001). Conducive indoor environment will increase the productivity or performance with a significant relationship between environment and productivity (Gifford, 1976; Krogh and Roos, 1996). In this case, the conducive physical environment provided through quality educational facilities will support the outcomes of learning.

4.3 Natural/Outdoor Environment

The second factor identified in this study is the natural or outdoor environment. It is the second highest in internal consistency on Cronbach Alpha 0.92 with Eigenvalues 12.9 (> 1) and high percentage of variances explained 21.15 %. The mean item-total correlation coefficient was 0.77 thus it classifies as Moderately Conducive. The second factor consists of eight item variables such as the safety and health of natural environment, natural environment effects on reduced stress, stimulates healthy social environment and lifestyle, stimulates creativity and innovation and the natural beauty of the landscape and surroundings (Table 3). The result shows that the outdoor environment of UTM is Moderately Conducive and needs to upgrade to the level of Conducive in order to contribute to the maximum teaching and learning efficiency and improve the overall quality of life. In detail, McCurdy *et al*. (2010) found that natural environment improves the social capacity for attention, mental health, physical well-being, positive mood, and reduced stress.

The conducive natural environment in education has been associated more frequently with learning-related behaviour such as attention and communication skills (Flom *et al*. 2011). The result also reflects the ability to take care of the natural environment that will support the three basic infrastructural functions of higher learning institutions hence a combination of learning, social interactions and living as part of societal development (Cleveland and Garry, 1999, Krogh and Roos (1996). The identification of environmental variables are the important components that link physical environment and social aspect of campus sustainability.

4.4 Food and Beverages Outlets

The factor of Food Arcade has eigenvalue 4.7, Eigenvalues 4.73, Percentages of Variance 7.8, Cronbach's Alpha 0.88 (Table 4). The value of mean item-total correlation coefficient 0.77, categorized the Food & Beverages Outlet as *Moderately Conducive* to the students. This factor has been recognized as the third important factor for the students. It is part of the basic services and facilities consisting of general arcade facilities, eating and drinking utensils, cleanliness of the vendors, food price and services provided by the food vendors. This result provides a link between the ability of food vendor facilities provided with the students' perceptions in terms of the level of conduciveness. The measurement at the same time values the level of services provided by the arcade management even though more detail measurement need to be conducted to cover issues on health, water used and waste generated (Nilsson *et al*. 1998). This factor needs to be upgraded into a level of conducive.

As part of the sustainable campus initiatives, the *Sustainable Arcade Campaign* was launched to educate the consumers on the Healthy, Clean and Green lifestyle. The Meranti Arcade was chosen as the model of Sustainable Arcade consisting of several characteristics such as Cleaning Station with special food waste bins, Reminder Stickers at each table for reminding emptying the table after eating, recycle bins and the use of biodegradable food utensils as part of the Zero Polystyrene campaign. The campaign is part of the food waste composting project managed by Landscape Unit and Service Department, under the OAD and facilitate by Office of Campus Sustainability, (OCS).

Table 3 Natural/outdoor environment

FACTOR 2 : NATURAL ENVIRONMENT	FACTOR LOADING VALUE
UTM's natural environment is safe and healthy.	0.82
UTM's natural environment contributes to a healthy social environment and lifestyle.	0.79
UTM's natural environment help reduces stress.	0.79
The beautiful natural environment and diversity is one of UTM's major attractions.	0.79
UTM's natural environment stimulates creativity and innovation.	0.76
Existing landscapes are well taken care of.	0.75
UTM's natural beauties are well taken care of..	0.73
UTM lake's natural beauty indicates satisfactory treatment and preservation of lake and its surrounding.	0.71
Total Correlation	6.13
Mean Item-Total Correlation Coefficient	**0.77**
Eigenvalues	6.17
Percentages of Variance	10.11
Cronbach's Alpha	0.92

Table 4 Food and beverages outlets

FACTOR 3 : FOOD AND BEVERAGE OUTLETS	FACTOR LOADING VALUE
Eating and drinking utensils are always clean and safe.	0.81
Vendors are always clean.	0.80
General arcade/cafeteria facilities are satisfactory.	0.78
Food is tasty, healthy and balanced.	0.75
Price set for food and drinks are reasonable.	0.74
Services given by vendors are ethical and satisfactory.	0.74
Total Correlation	4.62
Mean Item-Total Correlation Coefficient	**0.77**
Eigenvalues	4.73
Percentages of Variance	7.75
Cronbach's Alpha	0.88

4.5 Inter-Building Connectivity

The fourth factor identified is inter-building connectivity, with an eigenvalue of 3.11, percentages of variance of 5.09 and cronbach's alpha of 0.89. Based on mean item-total correlation coefficient of 0.80, this factor is categorized as *Conducive* (Table 5). This factor describes the physical environment of the campus covering buildings, roads, accessibility and linkage between zones, inside the Inner Circle, pedestrian pathways that link to the administration zone, commercial zone and academic buildings. As discovered by Abd-Razak *et al*. (2011) the compact building settings in the Inner Circle do not have the accessibility problems found in other campuses in Malaysia.

The measurement is essential because it ensures the safety, security and comfort of the campus infrastructures for the society. Connectivity is important for establishing a multifunctional campus that provides not only for teaching and learning but also for the live and play concept. Covered pedestrian walkways whether artificially or naturally -by means of trees- and the revival of the existing bicycle lane will help encourage green transport initiatives and develop the campus greenway to link with Outer Circle of the core zone. This research provides another link to the campus planning aspect while most of the existing researches emphasize on landscape analysis (Marsh, 1998; Leitmann, 1999; Steiner, 2000; White, 2003).

Table 5 Inter-building connectivity

FACTOR 4 : INTER-BUILDINGS CONNECTIVITY	FACTOR LOADING VALUE
Linkages between buildings/faculties in the Inner Circle are comfortable for pedestrians.	0.83
Pedestrian pathways linking academic building (faculties) zone to administration building zone and commercial buildings zone are comfortable.	0.81
Faculty and other buildings possess good accessibility.	0.80
Building arrangement encourages learning process.	0.78
Directions around academic zone, administration zone, commercial zone and pedestrian zone are clear.	0.76
Total Correlation	3.97
Mean Item-Total Correlation Coefficient	**0.80**
Eigenvalues	3.11
Percentages of Variance	5.09
Cronbach's Alpha	0.89

4.6 Others: Library, Laboratory and Exam rooms

The fifth factor 'Others: Library, Laboratory and Examination Rooms has an eigenvalue of 2.884, percentage of variance of 4.73 and cronbach alpha of 0.85 (Table 6). The mean item-total correlation coefficient of 0.60 item variables for examination consists of several item variables listed below that correlate with each other to form one factor.

Table 6 Others-library, laboratory & exam rooms

FACTOR 5 : OTHERS-LIBRARY, LAB & EXAM ROOMS	FACTOR LOADING VALUE
Chairs and tables during examination are comfortable.	0.71
Lighting at the library is adequate.	0.68
Chairs and tables at the library are comfortable.	0.64
Examination areas are comfortable.	0.64
Chairs and tables in the laboratories are comfortable.	0.50
The interior environment of laboratories is clean and comfortable.	0.50
Existing laboratory facilities are well-equipped and updated.	0.50
Total Correlation	4.17
Mean Item-Total Correlation Coefficient	**0.60**
Eigenvalues	2.88
Percentages of Variance	4.73
Cronbach's Alpha	0.85

4.7 Sports Facilities

The sixth factor 'Sports Facilities' has a mean item-total correlation coefficient of 0.81, eigenvalue of 2.10, percentage of variance 3.44 and cronbach alpha of 0.89 (Table 7). The result implies the importance to balance the learning activity by developing the psychological and physical health. The function of outdoor activities in educational institutions such as sports have recorded cognitive, social, physical and emotional benefits (Barros *et al.* 2009). These are embedded in the social component of sustainability and societal development (Stephens and Graham, 2010).

Table 7 Sport facilities

FACTOR 6 : SPORT FACILITIES	FACTOR LOADING VALUE
Sports facilities are adequate.	0.87
Sports facilities are sufficient.	0.86
Sports facilities provided help increase my fitness.	0.80
Sports facilities provided help reduce my stress.	0.71
Total Correlation	3.23
Mean Item-Total Correlation Coefficient	**0.81**
Eigenvalues	2.10
Percentages of Variance	3.44
Cronbach's Alpha	0.90

4.8 Campus Transportation

The seventh factor 'Campus Transportation' has mean item-total correlation coefficient of 0.58, eigenvalue of 1.74, percentage of variance 2.90 and cronbach alpha of 0.58 (Table 8). Referring to the mean item-total correlation coefficient value 0.58, the four item variables listed that form the Campus Transportation was classified as Non-Conducive. It was indicated that the feeder busses provided was not on scheduled, less satisfactory in the frequency of feeder busses picking up and dropping off passengers and the sizes of the bus are not comfortable.

This result proves that Campus transportation facilities need improvement in order to cater to the mix-mode development of UTM that consists of compact, wide and disperses development.

Table 8 Campus transportation

FACTOR 7 : CAMPUS'S TRANSPORTATION	FACTOR LOADING VALUE
The feeder buses provided are on scheduled.	0.77
The frequency of Feeder Buses picking up and dropping off passengers in a day is satisfactory.	0.75
Sizes of the feeder bus are comfortable.	0.42
The feeder buses are not comfortable because they do not have two exits.	0.38
Total Correlation	2.31
Mean Item-Total Correlation Coefficient	**0.58**
Eigenvalues	1.74
Percentages of Variance	2.86
Cronbach's Alpha	0.88

4.9 The Conduciveness Level

The four level conduciveness scale was developed based on Pearson correlation coefficient (ρ) (Table 9). It was inspired by the study of Swiscow (1997) which utilizes the Pearson correlation coefficient in developing the Swisco criteria. This study however, develops the four level conduciveness measures of the CCE namely; Not Conducive, Less Conducive, Moderate Conducive and Conducive by using the mean item total correlation coefficient of each factor (Table 9).

Finally, the summary of the mean item total correlation coefficient as present in the value of conduciveness has been presented in Table 10. Two factors are classified as *Conducive*, Factor 4. Inter Building Connectivity and Factor 6. Sport Facility. Three are classified as *Moderately Conducive*, Factor 1. Indoor Environment, Factor 2. Outdoor/Natural Environment; and Factor 3. Food & Beverage Outlets. Two factors have been identified as *Non-Conducive*: Factor 5. Others – Laboratory, Library & Examination Hall & Factor 7. Campus Transportation. The factors categorized as *Not Conducive* will be prioritized by the higher management of OAD and university as a whole to upgrade and improve the facilities in order to achieve the conduciveness level of the services, facilities provided and the physical and infrastructures of the physical campus environment.

5.0 CONCLUSION

This research demonstrates on how the CCE is developed and applied as a tool in campus sustainability helping the higher learning institution to prioritize and monitor the quality of facilities, infrastructures and environmental performance settings. The improvement in conduciveness will improve likewise the quality of teaching and learning while including theaspect of social sustainability on the campus. From the perspective of UTM campus organization, this study will contribute to the development of Sustainable Balance Score Card (SBSC) as an innovation to the conventional BSC organization. This measurement can be applied to measure CCE in other campus organizations.

Table 9 The level of conduciveness

Pearson correlation coefficient (ρ)	Pearson Category	Swiscow criteria (1997)	Level of Conduciveness
0 – 0.39	Weak	Weak correlation	Not Conducive
0.40 – 0.59	Moderate	Moderate correlation	Less Conducive
0.60 – 0.79	Strong	Strong correlation	Moderate Conducive
0.80 – 1.0	Very Strong	Very Strong correlation	Conducive

Table 10 Summary of the conducive campus environment

Main Factor	Value Level of Conducive	Level of Conducive
Factor 1 : Indoor Environment	0.66	Moderately Conducive
Factor 2 : Outdoor/ Natural Environment	0.77	Moderately Conducive
Factor 3 : Food & Beverage Outlets	0.77	Moderately Conducive
Factor 4 : Inter Building Connectivity	0.80	Conducive
Factor 5 : Others – Laboratory, Library & Examination Hall	0.60	Not Conducive
Factor 6 : Sport Facility	0.81	Conducive
Factor 7 : Campus Transportation	0.58	Not Conducive
Level of Conducive (Percentage)	0.71 (71 %)	Moderately Conducive

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Table 2 Principles factor analysia : rotated component matrix[a]

	Component						
	1	2	3	4	5	6	7
Lecture Room Floors are always clean.	0.817						
Lecture Rooms are always clean and comfortable during use	0.795						
Chairs and tables are always comfortable.	0.766						
Teaching Aids are functioning well	0.758						
Air conditioning is functioning well.	0.747						
Chairs and tables are always clean.	0.722						
Encouraging Lecture Rooms / Halls Facilities	0.708						
There is no foul odour in the duration of the learning process.	0.708						
There is no outside noise disturbance during teaching and learning.	0.646						
Windows can be opened to allow air circulation when air conditioner is not functioning.	0.622						
Comfortable lighting to encourage teaching and learning activities.	0.588						
There is no outside noise disturbance from air conditioning system.	0.586						
There is no specific noise disturbance (acoustic, machinery, apparatus)	0.560						
There is no outside noise disturbance from lighting.	0.532						
The number of chairs and tables are suitable with the number of students in the Lecture Rooms/Halls.	0.517						
The size and area of Lecture Rooms are comfortable.	0.509						
UTM's natural environment is safe and healthy.		0.822					
UTM's natural environment contributes to a healthy social environment and lifestyle.		0.793					
UTM's natural environment help reduces stress.		0.788					
The beautiful natural environment and nature's diversity is one of the major attractions.		0.786					
UTM's natural environment stimulates creativity and innovation.		0.757					
Existing landscapes are well taken care of.		0.746					
UTM's natural beauties are well taken care of..		0.730					
UTM Lake's natural beauty indicates satisfactory treatment and preservation of the lake and its surrounding.		0.705					
Eating and drinking utensils are always clean and safe.			0.814				
Vendors and always clean.			0.800				
General arcade/cafeteria facilities are satisfactory.			0.775				
Choice of food available is tasty, healthy and balanced.			0.752				
Price set for food and drinks are reasonable.			0.744				
Services given by vendors are ethical and satisfactory.			0.738				

	Component						
	1	2	3	4	5	6	7
Linkages between buildings/faculties in the Inner Circle (Lingkaran Dalam) are comfortable for pedestrians.				0.825			
Pedestrian pathways linking academic buildings (faculties) zone to administration building zone and commercial buildings zone are comfortable.				0.807			
Faculty and other buildings possess good accessibility.				0.803			
Building arrangement encourages learning process.				0.777			
Directions around academic zone, administration zone, commercial zone and pedestrian zone are clear.				0.761			
Chairs and tables during examination are comfortable.					0.712		
Lighting at the library is adequate.					0.680		
Chairs and tables at the library are comfortable.					0.642		
Examination areas are comfortable.					0.637		
Chairs and tables in the laboratories are comfortable.					0.499		
The interior environment of laboratories is clean and comfortable.					0.498		
Existing laboratory facilities are well-equipped and updated.					0.497		
Sports facilities are adequate.						0.867	
Sports facilities are sufficient.						0.859	
Sports facilities provided help increase my fitness.						0.797	
Sports facilities provided help reduce my stress.						0.706	
The Feeder Buses are provided according to a scheduled time.							0.766
The frequency of Feeder Buses picking up and dropping off passengers in a day is satisfactory.							0.752
Sizes of Feeder Bus are comfortable.							0.415
Feeder Buses are not comfortable because they do not have two exits.							0.376

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.