ASSESSING SPACE UTILISATION FOR TEACHING AND LEARNING FACILITIES AT THE HIGHER EDUCATION INSTITUTION: A CASE STUDY OF G3 BUILDING, UNIVERSITI TUN HUSSEIN ONN MALAYSIA

Rozilah Kasim [a], Haris Md Nor [b], Mohd Idrus Mohd Masirin [c]
[a, b, c] Faculty of Technology Management, Business,
University Tun Hussein Onn Malaysia, Parit Raja, Batu Pahat, Darul Ta'zim, Johor, Malaysia.
[a] Corresponding author: rozilah@uthm.edu.my

©Ontario International Development Agency ISSN: 1923-6654 (print)
ISSN 1923-6662 (online). Available at http://www.ssrn.com/link/OIDA-Intl-Journal-Sustainable-Dev.html

Abstract: This paper investigates space utilization for teaching and learning facilities at the higher education institutions (HEIs) in Malaysia. It explores the space utilization rate (U%), space frequency rate (F%) and space occupancy rate (O%) of teaching and learning facilities provisions which lead to the space requirements and improvement. The paper applies a qualitative research approach with interviews and document reviews as main source of data collection techniques. A G3 Building was chosen as a main case study for this research work as the building is a centralized teaching and learning facilities comprises of main lecture theatre, lecture rooms and tutorial rooms at Universiti Tun Hussein Onn Malaysia (UTHM). Rigorous data analysis using qualitative data analysis software was employed. Findings from the case study revealed that level of space utilization rate for teaching and learning at G3 Building, UTHM at a 'satisfied' level. This paper generates new knowledge about level of space utilizations for teaching and learning facilities provisions at HEIs in Malaysia. It can also lead to provide guidelines for future physical and infrastructure improvement and development in providing for teaching and learning facilities at HEIs in Malaysia.

Keywords*:* Facilities, Space utilization, Teaching and Learning, UTHM

INTRODUCTION

Education is one of the importance industries in Malaysia. Demand for the skilled and knowledge workers is increasing expanding. Malaysian government's agenda to promote Malaysia as an educational hub for the region will change the way of present practices and mindset of those HEIs, which are offering education as their main core business. These ambitious agenda by the Malaysia government can be found in its *National Higher* Education Strategic Plan Phase 1 and *Phase 2* (NHESP). One of its agendum is to have at least 100,000 foreign students in year 2015 studying in Malaysia. In realizing this objective, the present level of physical facilities provisions for teaching and learning at HEIs in Malaysia need to be reviewed and investigated. Moreover, these teaching and learning facilities need to be well managed, as these facilities are core supporting facilities and services to HEIs. It further supported by Kenny and Foster (1985) stated that operating costs for teaching and learning facilities provisions are a second largest after wages and salaries of the workers. At present, space management has become one professional that combines multiple disciplines including planning and other related space management (Mc Gregor, 2001). With an effective management of space, operating costs can be minimized. In Malaysia, operation costs per annum for public HEIs which are mainly funded by the Ministry of Higher Education (MoHE) almost reach to RM1 billion (Ahmad fauzi, 2005). Based ob budget 2010, Malaysian government has encouraged HEIs to manage effectively their physical space to align with the NHESP's agenda.

UTHM as one of public university in Malaysia is among other public HEIs has take incentive to

increase its number of students from 8000 students in 2009 to almost 13000 in 2011. In addition, UTHM has also increase its international students from 55 students in 2008 to more that 350 in 2011. These drastic increment of students' enrolled has required UTHM to provide more space for teaching and learning facilities and other related supporting facilities. As new leading public university, UTHM has to review and further investigate its teaching and learning facilities to cope with those changes.

Meanwhile previous studies on space utilization at HEIs in Malaysia were mainly focusing on the physical facilities such as laboratories. None of these previous studies focuses on teaching and learning facilities provisions in Malaysia (Ahmadfauzi and Kammaruddin, 2008; Ahmadfauzi, 2005). Thus, the objective of this paper is to: 1) investigate level of space utilization for teaching and learning facilities provided by UTHM and 2) determine rate of utilization (U %), rate of frequency (F %) and rate of occupancy (O %) for teaching and learning provision at UTHM.

LITERATURE REVIEW

Space utilization study in this paper is focusing on the process of space utilization determination and measurement for a space use for teaching and learning activities at the HEIs. Based on Mary (2005), previous study on space utilization is very little and in some case is very limited. Many administrators from Malaysian HEIs are not really seeing the significant role of space utilization may contribute to their organizations (Ahmadfauzi, 2005).

Wamer and Leonard (1992) highlighted that many HEIs are not fully optimized their physical resource utilization such as low utilization for teaching section in the evening, night or during the holiday and semester breaks seasons.

In the meantime, the HEIs has to borne the operational and maintenance costs either the space are fully utilized or not. Lawrence (1989) and Williams (1994) stated that space contributes among the biggest operational costs compares to other costs. The more you utilize the space the more cost of energy, cleaning and repairs works are generated. To reduce the operational costs, the HEIs need to manage their space for teaching and learning facilities effectively.

Space Management Group (SMG) (2006), level of space utilization was first studied and implemented in 1916 by University of Lowa, USA. Today, space utilization study from this university is still being used and referred as a guideline for future development planning in USA (Workgroup on Space Utilisation, 2008).

Space utilization study was first noted in UK as early as in 1960s. In 1996, the National Audit Office (NAO) in UK has introduced a standard for space utilization with main purpose to measure level of space utilized for the organizations. Since then, SMG was established for monitoring and supervising the management of space for the maximum utilization.

In Malaysia, space utilization study is still very little compares to other countries like UK and USA. However, awareness about this space utilization was first discussed in 1998 via academic study for space utilization by group of researcher specifically in teaching and learning space facilities at HEIs (Ahmadfauzi and Kamaruddin, 1998). Seven (7) years later, study on space utilization continued with focus and scope of study on physical resources for laboratories from six (6) public HEIs in Malaysia (Ahmadfauzi, 2005). The study focused on frequency rate (F%) of space utilization to determine level of space utilization for the laboratories. None of these space utilization studies focuses primarily for teaching and learning facilities provisions in the HEIs.

METHODOLOGY

The aim of this paper is to investigate level of space utilization for teaching and learning facilities provided by UTHM and determine rate of utilization (U%), rate of frequency (F%) and rate of occupancy (O%) for teaching and learning provision at UTHM.

G3 Building was chosen for a case study, as the Building is a centralized teaching and learning facilities for all students from five (5) faculties at UTHM. The building comprises of main lecture theatre hall, which, is able to cater for 500 students at one time; classrooms and tutorial rooms for teaching and learning activities. The respondents for this study were mainly students, lecturers, academic management office and faculties.

Three (3) data collection techniques were employed: Interviews, observations and reviewing time table schedules for the last 4 semesters: semester 2 session 2008/2009; semester 1 session 2009/2010; semester 2 session 2009/2010 and semester 1 session 2010/2011.

Meanwhile, to determine the level of space utilization for teaching and learning facilities at G3 Building, UTHM, this paper adopts space utilization rate by NAO (1996). According to NAO (1996), level of utilization rate is divided into three (3): not satisfied; satisfied and good. Detail interpretation for level of space utilization rate is further illustrated in Table 1.

Table 1: Level of utilization rate (NAO, 1996)

Level of rate achieved	Rate %	Interpretation
	<25%	Not satisfied
	25% - 35%	satisfied
	>35%	Good

$$U\% = \frac{F\% \times O\%}{100}$$

Figure 1: Utilization rate (NAO, 1996)

$$F\% = \frac{\text{Total hours used for a week}}{\text{Total maximum hours allocated for a week}} \times 100$$

Figure 2: Frequency rate (NAO, 1996)

$$O\% = \frac{\text{Total capacity used for week}}{\text{Total maximum capacity for a week}} \times 100$$

Figure 3: Occupancy rate (NAO, 1996)

Table 2: Total maximum hours and total maximum capacity for a week

Type of rate	Calculation method
Utilisation rate U%	U% is referred to percentage of F% multiplied by O% Calculation: F% = 50% O% = 70% U% = (50% x 70%) / 100
Frequency rate F%	F% is percentage of total hours used for a week compared to total maximum hours allocated for a week Calculation: Total hours used for a week = 17.5 hours Total maximum hours allocated for a week = 35 hours F% = (17.5 / 35) x 100 = 50%
Occupancy rate O%	O% is percentage of total occupants used for a week compared to total maximum occupants for a week Calculation: Total occupant used for a week = 735 students Space capacity per hours = 30 occupants Total maximum hours useds for a week = 35 hours O% = (735 / (30x35) x 100 = 70%

Table 3: Details on blocks and function of G3 Building

Block	Location	Function
A	Theatre Hall A	Offical events
B	Lecture rooms B1, B2, B3, B4, B5, B6, B7, B8, B9, B10, discussion room1, discussion room 2	Lecturing
C	Lecture Hall C	Lecturing
D	Lecture Hall D	Lecturing
E	Lecture rooms E1, E2, E3, E4, E5, E6, E7, E8, E9, E10, Multimedia room	Lecturing
F	Lecture Hall F	Lecturing
G	Lecture Hall G	Lecturing
Cafetaria	Cafetaria	F & B

Table 4: Capacity for each blocks of G3 Building

Nos	Space allcoated	Capacity
1	Lecture Hall C (DK C)	250 occupants
2	Lecture Hall D (DK D)	150 occupants
3	Lecture Hall F (DK F)	250 occupants
4	Lecture Hall G (DK G)	150 occupants
5	Discussion Room 1 (BP 1)	80 occupants
6	Discussion Room 2 (BP 2)	80 occupants
7	Lecture Room B1 (BK B1)	80 occupants
8	Lecture Room B2 (BK B2)	80 occupants
9	Lecture Room B3 (BK B3)	80 occupants
10	Lecture Room B4 (BK B4)	80 occupants
11	Lecture Room B5 (BK B5)	80 occupants
12	Lecture Room B6 (BK B6)	80 occupants
13	Lecture Room B7 (BK B7)	80 occupants
14	Lecture Room B8 (BK B8)	80 occupants
15	Lecture Room B9 (BK B9)	80 occupants
16	Lecture Room B10 (BK B10)	80 occupants
17	Lecture Room E1 (BK E1)	80 occupants
18	Lecture Room E2 (BK E2)	80 occupants
19	Lecture Room E3 (BK E3)	80 occupants
20	Lecture Room E4 (BK E4)	80 occupants
21	Lecture Room E5 (BK E5)	80 occupants
22	Lecture Room E6 (BK E6)	80 occupants
23	Lecture Room E7 (BK E7)	80 occupants
24	Lecture Room E8 (BK E8)	80 occupants
25	Lecture Room E9 (BK E9)	80 occupants
26	Lecture Room E10 (BK E10)	80 occupants

Table 5: Total maximum hours and total maximum capacity for a week

Nos	Spce allocated	Total maximum hours for a week	Total maximum capacity for a week
1	Lecture Hall C (DK C)	65 hours	16250 occupants
2	Lecture Hall D (DK D)	65 hours	9750 occupants
3	Lecture Hall F (DK F)	65 hours	16250 occupants
4	Lecture Hall G (DK G)	65 hours	9750 occupants
5	Discussion Room 1 (BP 1)	65 hours	5200 occupants
6	Discussion Room 2 (BP 2)	65 hours	5200 occupants
7	Lecture Room B1 (BK B1)	65 hours	5200 occupants
8	Lecture Room B2 (BK B2)	65 hours	5200 occupants
9	Lecture Room B3 (BK B3)	65 hours	5200 occupants
10	Lecture Room B4 (BK	65 hours	5200 occupants

	B4)		
11	Lecture Room B5 (BK B5)	65 hours	5200 occupants
12	Lecture Room B6 (BK B6)	65 hours	5200 occupants
13	Lecture Room B7 (BK B7)	65 hours	5200 occupants
14	Lecture Room B8 (BK B8)	65 hours	5200 occupants
15	Lecture Room B9 (BK B9)	65 hours	5200 occupants
16	Lecture Room B10 (BK B10)	65 hours	5200 occupants
17	Lecture Room E1 (BK E1)	65 hours	5200 occupants
18	Lecture Room E2 (BK E2)	65 hours	5200 occupants
19	Lecture Room E3 (BK E3)	65 hours	5200 occupants
20	Lecture Room E4 (BK E4)	65 hours	5200 occupants
21	Lecture Room E5 (BK E5)	65 hours	5200 occupants
22	Lecture Room E6 (BK E6)	65 hours	5200 occupants
23	Lecture Room E7 (BK E7)	65 hours	5200 occupants
24	Lecture Room E8 (BK E8)	65 hours	5200 occupants
25	Lecture Room E9 (BK E9)	65 hours	5200 occupants
26	Lecture Room E10 (BK E10)	65 hours	5200 occupants

Table 6: Pattern of U %, F % and O % of G3 Building

Space	Semesters	U%	F%	O%
DK C	0809/2	21.95	63.08	34.79
	0910/1	31.68	75.38	42.02
	0910/2	28.19	70.77	39.83
	1011/1	29.92	72.31	41.38
DK D	0809/2	27.53	63.08	43.64
	0910/1	28.69	67.69	42.38
	0910/2	34.44	72.31	47.63
	1011/1	37.54	75.38	49.79
DK F	0809/2	24.65	60.00	41.08
	0910/1	31.53	73.85	42.70
	0910/2	23.14	61.54	37.60
	1011/1	19.53	55.38	35.26
DK G	0809/2	29.22	66.15	44.16
	0910/1	17.24	49.23	35.03
	0910/2	24.06	58.46	41.16
	1011/1	38.53	75.38	51.11
BP 1	0809/2	27.25	64.62	42.17
	0910/1	42.90	83.08	51.63
	0910/2	30.10	67.69	44.46

	1011/1	22.71	56.92	39.90
BP 2	0809/2	27.66	63.08	43.85
	0910/1	40.33	78.46	51.40
	0910/2	34.36	72.31	47.52
	1011/1	19.21	52.31	36.73
BK B1	0809/2	35.00	75.38	46.42
	0910/1	29.59	67.69	43.71
	0910/2	28.56	61.54	46.40
	1011/1	26.84	63.08	42.56
BK B2	0809/2	21.37	56.92	37.54
	0910/1	31.65	73.85	42.87
	0910/2	26.61	63.08	42.19
	1011/1	27.15	61.54	44.12
BK B3	0809/2	30.97	69.23	44.73
	0910/1	48.66	86.15	56.48
	0910/2	35.01	72.31	48.42
	1011/1	22.45	56.92	39.44
BK B4	0809/2	36.58	73.85	49.54
	0910/1	52.46	89.23	58.79
	0910/2	31.24	67.69	46.15
	1011/1	25.32	60.00	42.19
BK B5	0809/2	26.03	60.00	43.38
	0910/1	31.51	70.77	44.52
	0910/2	24.38	61.54	39.62
	1011/1	22.31	56.92	39.19
BK B6	0809/2	22.31	56.92	39.19
	0910/1	37.53	76.92	48.79
	0910/2	32.48	72.31	44.92
	1011/1	24.42	60.00	40.69
BK B7	0809/2	28.41	64.62	43.69
	0910/1	35.66	75.38	47.31
	0910/2	35.84	73.85	48.54
	1011/1	18.87	52.31	36.08
BK B8	0809/2	30.97	66.15	46.81
	0910/1	47.11	84.62	55.67
	0910/2	34.12	70.77	48.21
	1011/1	20.91	55.38	37.75
BK B9	0809/2	25.35	60.00	42.25
	0910/1	33.17	70.77	46.87
	0910/2	39.02	76.92	50.73
	1011/1	22.75	56.92	39.96
BK B10	0809/2	24.28	60.00	40.46
	0910/1	29.54	67.69	43.63
	0910/2	34.36	72.31	47.52
	1011/1	22.18	56.92	38.96
BK E1	0809/2	42.32	80.00	52.90
	0910/1	23.84	63.08	37.79
	0910/2	48.08	86.15	55.81
	1011/1	27.14	61.54	44.10
BK E2	0809/2	19.87	56.92	34.90
	0910/1	35.01	72.31	48.42
	0910/2	33.53	70.77	47.38
	1011/1	30.70	67.69	45.35
BK E3	0809/2	14.15	47.69	29.67
	0910/1	20.74	58.46	35.48

	0910/2	28.68	67.69	42.37
	1011/1	50.83	89.23	56.96
BK E4	0809/2	18.83	58.46	32.21
	0910/1	20.36	53.85	37.81
	0910/2	27.81	67.69	41.08
	1011/1	20.36	55.38	36.77
BK E5	0809/2	34.81	72.31	48.13
	0910/1	48.61	86.15	56.42
	0910/2	36.65	75.38	48.62
	1011/1	29.92	66.15	45.23
BK E6	0809/2	31.75	72.31	43.90
	0910/1	29.85	66.15	45.12
	0910/2	32.21	70.77	45.52
	1011/1	21.33	55.38	38.52
BK E7	0809/2	22.30	60.00	37.17
	0910/1	39.16	78.46	49.90
	0910/2	22.63	58.46	38.71
	1011/1	24.34	58.46	41.63
BK E8	0809/2	15.10	49.23	30.67
	0910/1	18.65	58.46	31.90
	0910/2	30.67	67.69	45.31
	1011/1	27.77	63.08	44.02
BK E9	0809/2	27.66	67.69	40.87
	0910/1	24.85	61.54	40.38
	0910/2	30.92	69.23	43.75
	1011/1	17.34	49.23	35.23
BK E10	0809/2	24.43	63.08	38.73
	0910/1	19.36	55.38	34.69
	0910/2	24.41	61.54	39.67
	1011/1	20.57	53.85	37.89

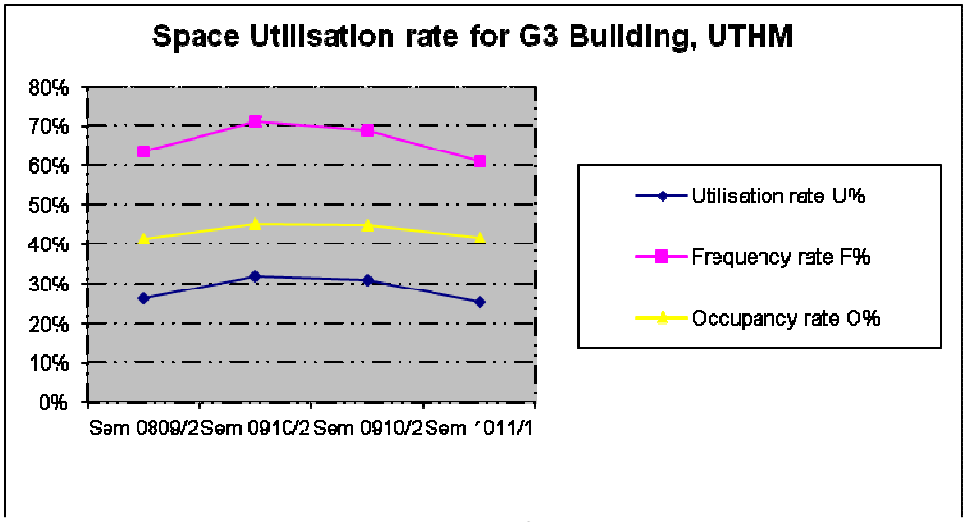

Figure 4: Space utilization rate for G3 Building, UTHM

Table 7: Level of space utilization for G3 Building, UTHM

Utilisation rate (U%)	Frequency rate (F%)	Occupancy rate (O%)
28.58%	66.10%	43.23%

The utilization rate (U %) is a percentage of space utilization calculated from frequency rate (F %) and occupancy rate (O %) divided by 100 (Figure 1).

Meanwhile, frequency rate (F%) and occupancy rate (O%) can be derived by using the formula as shown in Figure 2 and Figure 3.

U % is a rate obtained via a calculated formula of F % and O %. Thus, utilization rate achievable is very much relative to the achievement of F % and O %. If F % is more dominant compared to O %, it is assumed that F % is strongly and positively influence to U % and vice versa.

Unlike U%, F% and O% is relatively influenced by factors such as the management of HEIs, clients and space. The management of HEIs may play a role in determining total hours used for an allocated space. Whilst, clients are more keen to be at their more favorable space with fully equipped facilities provided.

Calculation for total maximum hours and total maximum capacity for a week can be summarized and shown in Table 2.

DISCUSSIONS ON FINDINGS

Details background of G3 Building

G3 Building is divided into 8 blocks which details on location, function and capacity for each are illustrated in Table 3 and Table 4.

Total maximum hours and total maximum capacity per a week for G3 Building is as shown in Table 5.

Analysis of U%, F% and O% to space allocated for G3 Building

Analysis on U %, F % and O % for each space allocated for teaching and learning activities G3 Building is as shown in Table 6 below. The analysis was based on academic and lecturing timetable activities for last four (4) academic semesters.

Based on the analysis above, space utilization rate for G3 Building has been determined by taking all the findings into an average rate to determine level of space utilization. Space utilization rate is further summarized in Figure 4.

Level of space utilization for G3 Building, UTHM

Based on Table 7 above, it concludes that utilization rate for G3 Building, UTHM is at 28.58% whilst the frequency rate and occupancy rate for the same building are 66.10% and 43.23% respectively. The results was gained as an average of rate achieved for the last four (4) semesters; semester 2 session 08/09, semester 1 session 09/10, semester 2 session 09/10 and semester 1 session 10/11.

The findings demonstrate that the overall level of space utilization rate achieved for G3 Building, UTHM is 28.58% which falls within a “satisfied” level of rate between 25% to 35% (refer to Table 1).

CONCLUSIONS

This paper demonstrates the significance of the HEIs to examine their level of space utilization for teaching and learning activities. The results from this study can be a guideline on helping the administrators of the Malaysian HEIs to decide on providing for future teaching and learning facilities development provisions for their organizations. As space is among the largest contributes to the operational and maintenance costs to the HEIs, an effective space management and utilization may in a way helping to reduce these unnecessary costs. Lessons drawn from this study indicate that the HEIs need a mechanism to ensure that their space for teaching and learning facilities provisions shall be effectively managed for maximum utilization.

ACKNOWLEDGEMENT

The authors would like to thank Sim Su Kiat for his effort and assistance in data collection and analysis for this study.

REFERENCES

[1] Ahmadfauzi A. Wahab. 2005. Pengurusan Sumber Fizikal Di IPT: Pengurusan Ruang. Jurnal Teknologi. 43 (E) Dis 2005: 15-28. UTM

[2] Ahmadfauzi A. Wahab dan Kamaruddin Bin Mohd. Ali. 1998. Facilities Audit In Higher Education Institution (HEI): Space Utilisation. RMC Vot71128

[3] Best, R, Langston, C, and De Valence, G. 2003. Workplace strategies And Facilities Management. Butterworth Heinemann Publications. UK

[4] John, C. Wood, and Michael, C. Wood. 2002. Henri Fayol: Critical Evaluation In Business And Management. Volume 2. Taylor and Franels

[5] John, D. R, and James I. Doi. 1957. Mannual For Studies Of Space Utilization In Colleges And Universities. American Association Of Collegiate Registrars And Admissions Officers

[6] Kenny, G, and K, Foster. 1985. Managing Space In Colleges. FE Staff College

[7] Lawrence, P. 1989. Building Design: More Than Meets The Eye. The Journal Of Business Strategy. 10: 15-19

[8] Mary Lou Downie. 2005. Efficiency Outcomes From Space Changing In UK Higher Education Estate, Property Management. Vol 23, No. 1 2005, pp. 33-42. Emerald Group Publishing Limited

[9] Mc Gregor, Wes, and Then, Danny S.S. 2001. Facilities Management And The Business Of Space. Butterworth Heinemann, UK

[10] National Audit Office (NAO). 1996. Space Management In Higher Education- A Good Practice.

[11] Space Management Group. 2006. Space Utilisation: Practice, Guidelines And Performance. Space Management Group, UK

[12] Wamer, D, and C, Leonard. 1992. The Income Ggeneration Handbook. Buckingham: SRHE and Open University Press

[13] Williams, B. 1994. FacilitiesManagement. Building Economics Bureau Ltd, UK

[14] Workgroup Of Space Utilization. 2008. Maryland Community College Space Utilization Report. Volume 1. Maryland Higher Education Commission.