

# **Space Charging Model: As an Effective Space Management Tool in Higher Education Institutions**

**Ihfasuziella Ibrahim<sup>1</sup>, Wan Zahari Wan Yusoff<sup>2</sup> and Kamalludin Bilal<sup>3</sup>**

## **Abstract**

In the field of facility management, there are four main factors such as people, process, technology and also premises. In this study, factors of premise emphasized where the management of its space is to be managed efficiently and effectively. It is a regularly discussed topic as space management problems occur in any organization especially in higher education institutions. Implications of related cost in physical resources in large organizations such as Higher Education Institutions (HEIs) are very large. The purpose of this paper is to identify the use of space for teaching and learning of the university and develop a space management model towards an optimal space management. The paper aims to show a way on how to solve the space problem by using space charging model. This paper takes Lecture Rooms at the actual usage against the students' time table which was made available by the Academic Management Office of the university (audit). In order to overcome this problem, a space charging model will be implemented where the imposed cost will be charged on the utilized space. The maintenance cost will be determined to get the space tenancy cost from the analysis, level of space usage will be determined whether it was optimum or not. The paper contains a solution to the problem of wasted space by using space charging model which is measured by the use of space in the university. This information is valuable for helping the particular organization especially in Higher Education Institutions to manage space effectively without any wastage of space.

---

<sup>1</sup> e-mail: ihfaibrahim@ymail.com:

<sup>2</sup> e-mail: zahari@uthm.edu.:

<sup>3</sup> e-mail: Kamalludinla67@gmail.com:

It provides a meaningful way for facilities managers to facilitate the decision-making related to space management which can minimize the cost to be borne by the organization.

**JEL classification numbers:** D20

**Keywords:** Space charging model, space management, space wastage, Higher Education Institutions

## 1 Introduction

Space management is a very practical skill. This is because space management covers many aspects such as the formulation of a space strategy or policy, consideration of the impact of structure and services on space use, preparing briefs for office layouts, managing changes in accommodation, keeping abreast of legislation, and new developments in the way space can be used to support an organisation and their employees. (Jane M, 2010). However, the study of the physical resources of Higher education institutions is not a popular subject among researchers and information related to this resource is scarce. We must realize that higher education institutions such as universities, polytechnics and further education colleges (colleges) are a major source of economic activity. The size of this resource inventory, the cost of providing, maintaining, operating and technical complexities had grown rapidly. (Ahmad Fauzi, 2005). Inefficient space management can lead the organization to bear the high cost. Costs are for maintenance and annual operation. According to the National Audit Office (1996) in their study found that space management for Higher Education institutions is more critical than other organizations.

Thus, space and facilities management in an organization, especially in Higher Education institutions should be emphasized that it is recommended to achieve the government's prudent management of public property management. Kenny and Foster (1985) states that the costs relate with physical resources budget is the second most important after the cost of staff salaries at Higher Education institutions. According to the Polytechnics and Colleges Funding Council & University Funding Council (PCFC & UFC), (1992) and Hammer (1988), the costs estimated to reach 20-30% of the cost of the organization's annual budget. Interest costs to build and acquire, maintain and use should not be taken lightly. Marsh and Griffith (1985) states the cost of academic space per student is about U.S. \$ 2,000.00 per year. Such information indicates this cost equals the cost of space per worker in the corporate organization (Hammer, 1988).

In the 1980s investment of physical resources of higher education in the USA reached U.S. \$ 300 billion (Middleton, 1989). This trend also involves higher education institutions in Malaysia such as University Tun Hussein Onn Malaysia itself which has reached an average of RM 700, 000 or RM 8.6 million a year for

the cost of electricity consumption while the average use of the building operation and maintenance costs for the year of 2009 was RM25 million. Similarly, University Technology Malaysia has reached the cost of building operations of RM 56 million per year. These costs could be saved through prudent management (Ahmad Fauzi, 2005). However, based on 2002 utilization factor in Higher Education Institutions in Malaysia, teaching and learning space was used only at the level of 54 percent every week. The changes such as the increased number of students make it difficult to be signed by the facility manager.

The space usage if not properly managed can systematically contribute to wasted space. Space management is considered important not only in terms of optimization, but also related to the cost of operations maintenance. If more space is used, more energy will be used, operations, cleaning and repair work would also be required. With the rapid changes such as increased number of students from time to time, followed by the increase in staff and other facilities to create an effective and optimal space management is crucial. Therefore, this study aims to propose a method or model that can be used for effective space management and optimal.

## **2 Preliminary Notes**

### **2.1 Success of space management**

According to Jane M, 2010, key to successful space management is the organisational policy for space. The policy should include:

- A strategy for space which reflects the organisational culture and which will help to support the achievement of organisational objectives.
- Guidelines for the optimum use of buildings and the space in them, based on current knowledge and best practice.
- Proper provision for space costs in the organisational business plan.
- Proper provision for efficient and effective space management components, such as AUTOCAD, in the computer aided facilities management system (CAFM).

### **2.2 Importance of space in higher education institutions**

Space management is one of the key components in facility management. Space management is also vital in ensuring the success of the organization in achieving its goals and objectives of the organization (Abdul Hakim Mohammed,

2006). In a large organization like Higher education Institutions, space management plays an important role to effectively control the space without any waste of space which in turn gives an adverse effect on management costs in an institution. Space management is also important for learning whether during office hours or not and this awareness has arisen since 1960's. There are three important things that need to be stressed out in the management of space, first is to set up the committee members for the management of space, secondly, build a model and techniques to manage the space and the third one is to make sure employees know and understand the space management policy to produce clear guidelines on how the space management operate (NAO, 1996). These three factors are important in order to perform an effective and efficient space management.

Besides that, space is expensive to buy, costly to maintain, slow to dispose off and can easily become ineffectively utilized. In today's competitive world, people work in variety of ways and locations. FM has to balance the needs of the user with the amount of space available. Space can also be a valuable source of income (such as conference and accommodation), it is a key resource for an organization which can provide a creative stimulus to the occupants and it will provide a tangible identity for the organization (Jane M, 2010). However, the physical resources in Higher Education Institutions were seen as a "necessary burden". – management of physical resources approach has been implemented in developing countries like USA and United Kingdom which revealed that physical resources are no longer regarded as a burden but also serve as a strategic resource that can help higher education institutions either in terms of finance, performance improvement and the importance of learning in order to be able to support achieving the desired goals (Ahmad Fauzi, 2005). For that, the management of physical resources is to help institutions meet the mission or strategic objectives (Keiser, 1989; Dickeson, 1999). The operational level of management approaches should be based on economic principles, which is more pro-active and non-technical or reactive.

### **2.3 Effective use of space**

To manage space effectively, it is necessary to understand the nature of organisations. The term “organisational culture” is often described as: ‘The way we do things around here’ or ‘it’s what makes the organisation tick’.

The first step in managing space is to understand how the business uses it, and what it requires to support its business objectives and needs. (Jane M, 2005). Given the traditional financing of higher education institutions borne by the government or specific agencies, then this organization is slow to accept change and corporate culture. Thus, optimizing the received resources or applied too late. In other organizations, there is no space should be free. Although the university claims to have a shortage of learning space but Wamer and Leonard (1992) explained that most institutions of higher education institutions is not optimizing

the use of physical resources at particular times, such as lower consumption during the learning session, was not used in the evenings, nights, holidays and semester leave. Physical resources available at higher education institutions can actually be used by outside parties for the time being by way of rent for the purpose of research, teaching and social interaction and community. To overcome the problem of space management, an approach to consider is the application of space charging models. By this method, charges will be imposed on the space utilized. This method can overcome the problem of users who look space as a free thing. Figure 1 below shows the conceptual framework for this study.

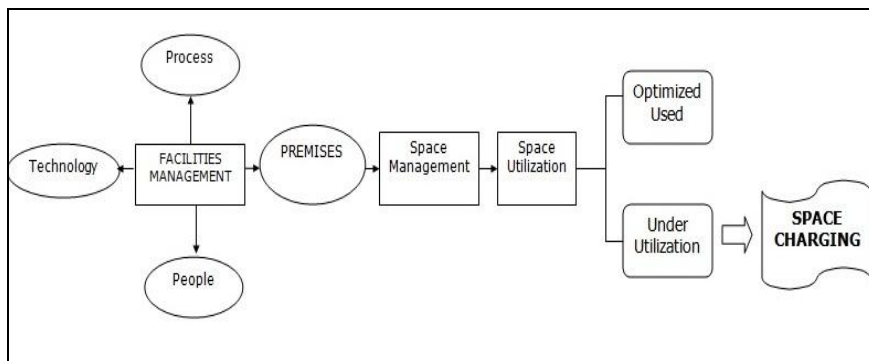


Figure 1: Conceptual Framework

## 2.4 Space Charging Model

Figure 2 shows the Space Charging model that will be developed. There are five important cost elements in this model such as civil maintenance costs, electrical, mechanical, landscape and utilities. Civil maintenance costs, electrical and mechanical cost which consists of two periodic costs and the cost of ad-hoc. Regular cost is the cost to be maintained on a monthly basis while the cost of ad-hoc basis is the cost of damage that occurs without planned. Utilities consist of water, electricity, telephone and other services. All of these costs will be divided into the floor area of building's space.

Next, create a cost analysis where the cost of use per square meter for each available lecture room. Utilization rate was measured using the audit review. Audit study is designed to examine the activities of the organization to determine the issues that are likely to be a crisis (Narimah and Saodah, 2002). This is done by comparing the actual usage of space in the classroom in the Building Complex of G3 with a tabulation prepared by the Academic Management. When the audit review is done, the charges will be calculated based on the use of booked classroom space but not used.

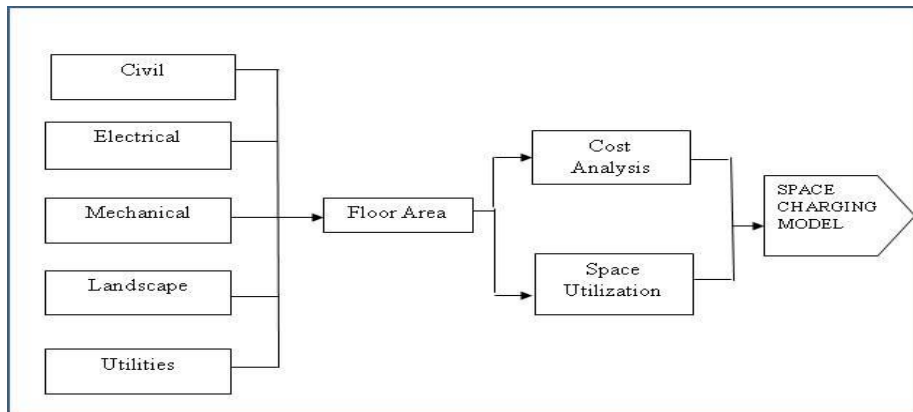


Figure 2: Space Charging Model

### 3 Research Methodology

#### 3.1 Audit

The method used in this study is quantitative method which is using the audits of the space for teaching and learning of the university. Through the audit, the actual room usage against the students' time table which was made available by the Academic Management Office of the university. The number of hours booked and can be booked are for 43 hours of classrooms use beginning at 8 am to 6 pm during the week excluding breaks. There are six measured factors such as frequency used, frequency booked, utilization, occupancy, booked but not used and used but not booked. Formula and the purpose of measuring the level of use of space for teaching and learning are shown as follows:

##### 3.1.1 Frequency used

Frequency used factor is to measure the number of usage of a space based on the number of hours compared with the number of hours that can be booked. The number of hours used is based on the number of actual space usage compared to the scheduling of classes provided by the Academic Management Office. Percentage rate of more than 75 percent is designated as the optimal use in terms of frequency used factor.

##### 3.1.2 Frequency booked

Frequency Booked is to measure the frequency of the number of hours booked against the number of hours that can be booked. The number of hours booked are

based on conducted studies examining the use of class as provided by the Academic Management Office. Percentage rate of more than 75 percent is designated as the optimal use of terms frequency booked factor.

### 3.1.3 Occupancy

Occupancy factor is to measure the capacity of students in a classroom. Percentage rate of more than 75 percent is designated as the optimal use of terms occupancy factor.

### 3.1.4 Utilization

Optimization is to measure the total time spent by students for lecture time. Percentage rate of more than 56 percent is designated as the optimal use of the optimization factor.

### 3.1.5 Used but not booked

Used but not booked is to measure the use of used classroom space with no reservations in advance.

### 3.1.6 Booked but not used

Booked but not used is to measure the number of reserved classroom but not used. Waste of space management is measured based on this factor.

Table 1: Usage Indicator

No	Item	Formula
1.	Frequency Booked	$\frac{\text{Hours booked}}{\text{Available Hours Book}} \times 100\%$
2.	Frequency Used	$\frac{\text{Hours used}}{\text{Hours Available}} \times 100\%$
3.	Occupancy	$\frac{\sum \text{Total Students}}{\text{Capacity Room} \times \text{Hours Usage}} \times 100\%$
4.	Utilization	$\frac{\text{Room Used Frequency} \times \text{Room Occupancy}}{100}$
5.	Used but not Booked	$\frac{\text{Hours Used Not Booked}}{\text{Available Hours Booked}} \times 100\%$
6.	Booked but not Used	$\frac{\text{Hours Book not Used}}{\text{Book Hours}} \times 100\%$

Source: Adapted from The National Audit Office’s (NAO) Space Management in Higher Education: A Good Practice Guide (1996)

Table 2 below shows the level of effectiveness for frequency used, frequency booked and occupancy of more than 75 percent which is an optimal level in term of these factors, this is because if the utilization exceeds 56 percent and above, it is on optimal level of utilization factor.

Table 2: Effectiveness Level

Usage	Effective Level (%)
Frequency Booked	75
Frequency Used	75
Occupancy	75
Utilization	56

### 3.2 Cost Analysis

By this method, each elements of cost will be analyzed. The data was obtained from the office of property development, UTHM. Each university has different elements. Therefore, the elements of cost being used in the maintenance of the G3 Building complex, UTHM are utility bills, maintenance, landscaping, civil maintenance, electrical maintenance and mechanical maintenance. Civil maintenance, mechanical and electrical is periodic and ad hoc. Regular maintenance means maintenance that needs to be done once a month while ad-hoc is the maintenance have to be done immediately in the event of problems. The figure below shows the space charging model developed for the University. The formula below is used to analyze the element of cost.

$$\frac{\text{Total Cost}}{\text{Floor Area Used}} = \$/\text{m}^2$$

## 4 Main Result

### 4.1 Audit

Based on the audit, the following is the analysis of teaching and learning space in the G3 Building Complex, UTHM:



### 4.1.1 Frequency Booked

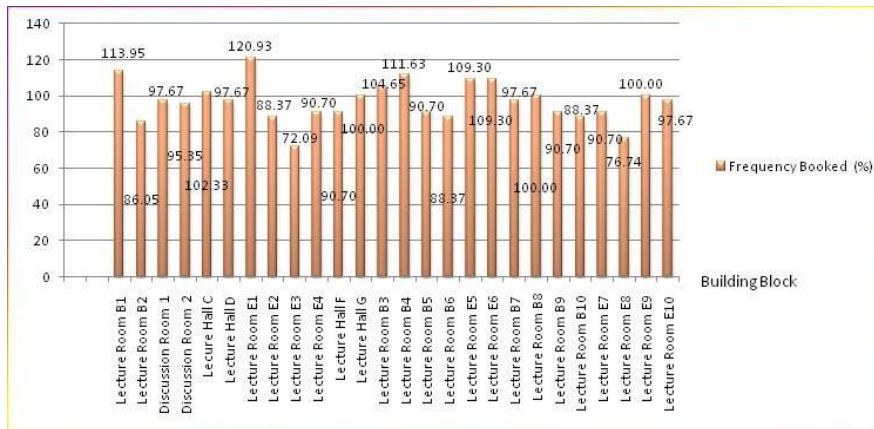


Figure 3: Frequency Booked

### 4.1.2 Frequency used

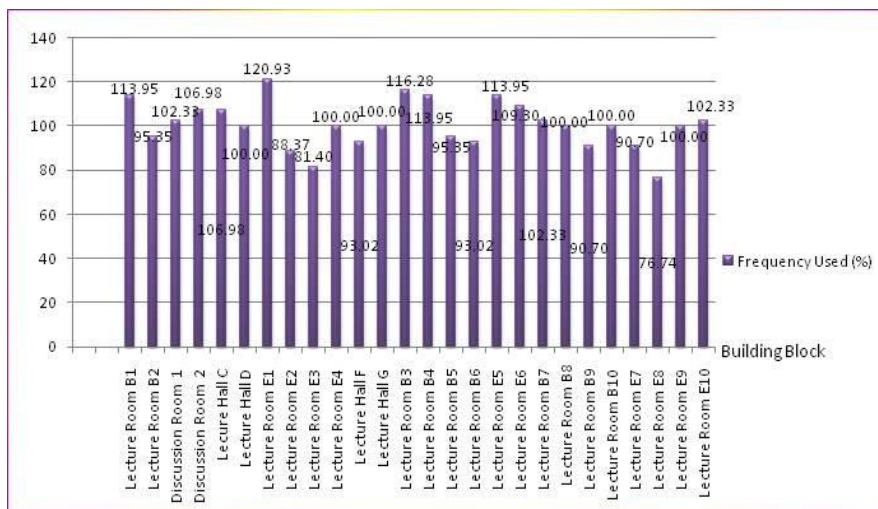


Figure 4: Frequency Used

### 4.1.3 Occupancy

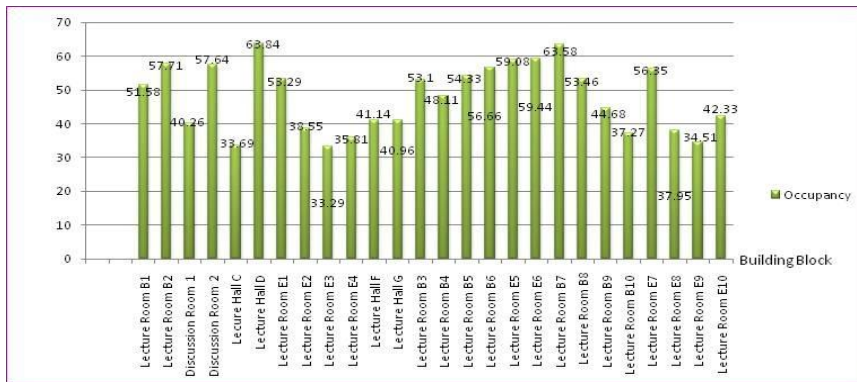


Figure 5: Occupancy

### 4.1.4 Utilization

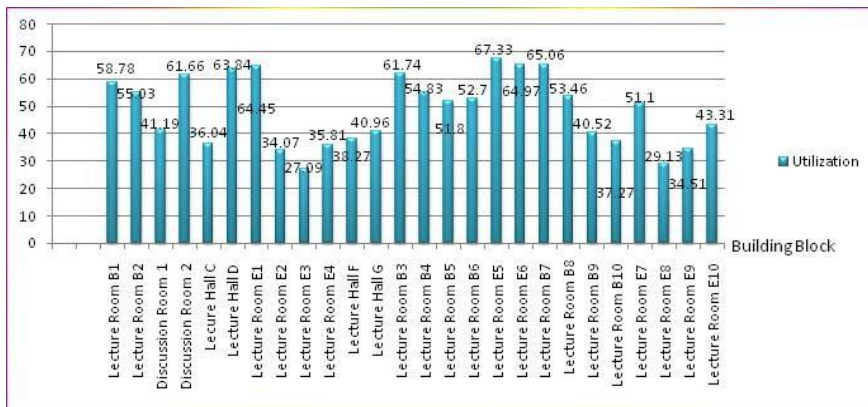


Figure 6: Utilization

### 4.1.5 Used but not booked

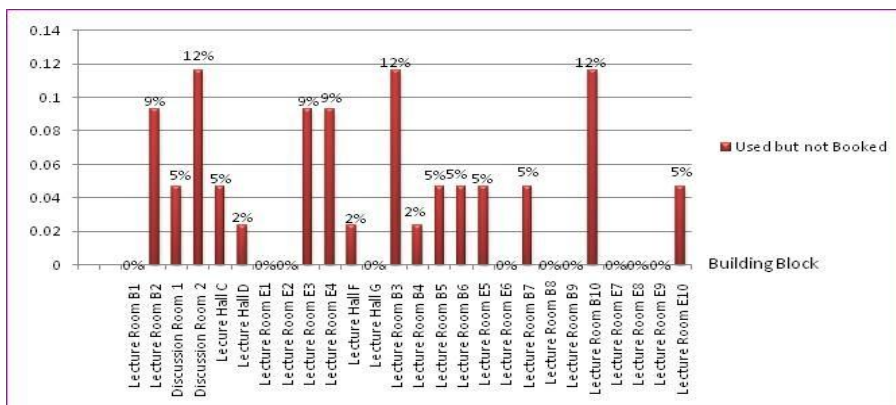


Figure 7: Used but not booked

**4.1. 6 Booked but not Used**

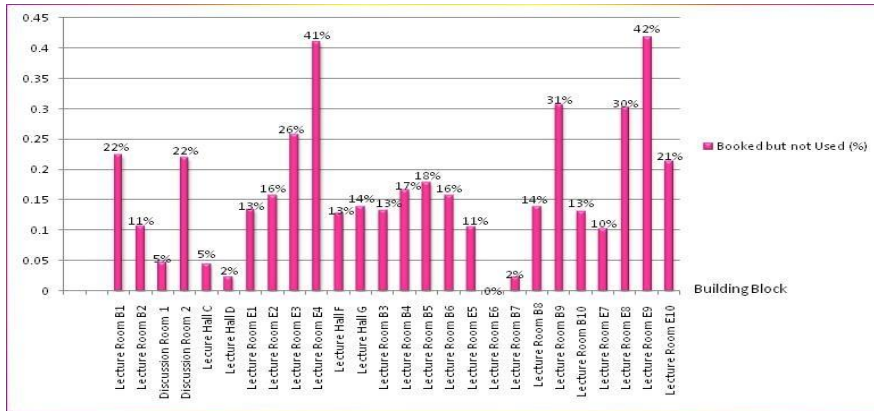


Figure 8: Booked but not used

**4.2 Space Charging Calculation**

RM633,370.27 (1)

(Overall elements cost)

$RM\ 633,370.27 / 8716.25\ m^2 = RM\ 72.67$  (2)

(Overall elements of cost/ Area of G3)

$RM\ 72.67 / 157\ (\text{Total day of lecture in one year}) = RM\ 0.46$  (3)

(cost per day /square feet)

$RM\ 0.46 / 9\ \text{hours} = \mathbf{RM\ 0.05}$  (4)

(cost per hour / square feet)

Cost to share:

$$\begin{aligned}
 G3\ \text{Area} - \text{Total area of classrooms} &= 8716.25 - 3264.071 \\
 &= 5452.179 \times 0.05 \\
 &= 272.61 / 3264.071 \\
 &= \mathbf{RM\ 0.08}
 \end{aligned}$$

$RM\ 0.05 + RM\ 0.08 = RM\ 0.13 / \text{hour} / \text{square feet}$  (5)

For example: Lecture Hall A area = 624.075 m<sup>2</sup>

$RM\ 0.13 \times 624.075\ m^2 = RM\ 81.13\ \text{per hour}$  (6)

$RM\ 81.13 \times 9\ \text{jam} = RM\ 730.17\ \text{per day}$  (7)

$RM\ 730.17 \times 157 = RM\ 114,636.69\ \text{per year}$

#### 4.2.1 Space Charge for G3 Building Complex

The table shows the use of space per hour, per day and per year. Charges will be based on the number of days of use. Space utilization rate is calculated based on the audit which had been done. However, the audit is not conducted on a lecture hall A because the hall is not used for teaching and learning. Charge per hour is obtained by multiplying the hourly charge rate of RM0.13 per square feet with an area for each classroom. If the entire classroom is not used for one hour, this means the loss cost and waste of space is RM505.35. While the charge for daily use is obtained by multiplying the total hours of lecture hour per day which is 9 hour. The use of 9 hour is based on the lecture time which began at 8 am until 6 pm not including recess for one hour. The resulting amount is the charge for everyday use of the classroom. However, if the entire classroom is not used for a day, the amount of loss and waste of space cost is RM4,548.24. To obtain usage charges per year, the daily usage charge is multiplied by the number of days of 157 days of lecture time which is the number of days not including semester breaks, weekends and public holidays. The total amount of use the classroom is RM599, 440.89.

#### 4.2.2 Total penalty

Table 3 shows the rate of penalty imposed on classrooms which not used. Wastage rate measured by the method of audit has been done by doing inspections on each chamber based on the scheduling of classes provided by the Academic Management Office compared with the actual usage. Booked but not used factor was used to measure the waste. The booked but not used classroom will be subjected to charges or penalties. The reserved space means space which has been determined by the Academic management Office for the use of a classroom. The total penalty imposed in a week based on our audit is RM 2, 694.89. The university has to bear the cost of a RM 2, 694.86 for wastage of space. However, use of the Space Charging model can make space being released for other purposes.

As stated by Griffit and David (1999), Space Charging is an effective method which can minimize space usage and demand which can be used in the best way without any wastage. In addition, the utilization rate per hour can be used as a rental basis as described by Weatherhead (1997). However, the resulting charge is not only used for the purpose of penalty but it is also can serve as the basis of internal rent for parties intending to use the space available in an institution of higher education institutions.

Table 3: Space charge per hour, per day and per year

No	Classroom	Rate per meter square (RM)	Total of Lecture hours per day	Number of Lecture per year	Area (m <sup>2</sup> )	Charge per hour (RM)	Charge per day (RM)	Charge per year (RM)
1	Lecture Room B1	0.13	9	157	112.413	14.61	131.52	20,647.14
2	Lecture Room B2	0.13	9	157	112.377	14.61	131.48	20,642.53
3	Lecture Room B3	0.13	9	157	111.761	14.53	130.76	20,529.38
4	Lecture Room B4	0.13	9	157	112.499	14.62	131.62	20,664.94
5	Lecture Room B5	0.13	9	157	112.399	14.60	131.44	20,635.55
6	Lecture Room B6	0.13	9	157	111.8	14.53	130.81	20,536.54
7	Lecture Room B7	0.13	9	157	111.795	14.53	130.80	20,535.62
8	Lecture Room B8	0.13	9	157	112.481	14.62	131.58	20,658.33
9	Lecture Room B9	0.13	9	157	112.566	14.63	131.70	20,677.25
10	Lecture Room B10	0.13	9	157	111.779	14.53	130.78	20,532.68
11	Discussion Room 1	0.13	9	157	111.755	14.53	130.75	20,528.28
12	Discussion Room 2	0.13	9	157	111.807	14.53	130.81	20,537.83
13	Lecture Room E1	0.13	9	157	111.755	14.53	130.75	20,528.28
14	Lecture Room E2	0.13	9	157	112.397	14.61	131.50	20,646.20
15	Lecture Room E3	0.13	9	157	112.375	14.61	131.48	20,642.16
16	Lecture Room E4	0.13	9	157	111.809	14.54	130.82	20,538.20
17	Lecture Room E5	0.13	9	157	111.739	14.53	130.73	20,525.34
18	Lecture Room B1	0.13	9	157	111.718	14.52	130.71	20,521.48
19	Lecture Room E9	0.13	9	157	111.75	14.53	130.75	20,527.36
20	Lecture Room E10	0.13	9	157	112.463	14.53	130.73	20,525.34
21	Lecture Room B1	0.13	9	157	112.342	14.60	131.44	20,636.10
22	Lecture Room B1	0.13	9	157	111.767	14.53	130.77	20,530.28
23	Lecture Hall C	0.13	9	157	241.613	31.41	282.69	44,381.89
24	Lecture Hall D	0.13	9	157	157.619	20.50	184.48	28,964.06
25	Lecture Hall F	0.13	9	157	241.613	31.41	282.69	44,381.89
26	Lecture Hall G	0.13	9	157	157.619	20.50	184.48	28,964.06

Table 4: Total of penalty

No	Classrooms	Charge per hour (RM)	Number of booked but not used	Penalty (RM)
1	Lecture Room B1	14.61	11	160.71
2	Lecture Room B2	14.61	4	58.44
3	Lecture Room B3	14.53	6	87.18
4	Lecture Room B4	14.62	8	116.96
5	Lecture Room B5	14.60	7	102.20
6	Lecture Room B6	14.53	6	87.18
7	Lecture Room B7	14.53	1	14.53
8	Lecture Room B8	14.62	6	87.72
9	Lecture Room B9	14.63	12	175.56
10	Lecture Room B10	14.53	5	72.65
11	Discussion Room 1	14.53	2	29.06
12	Discussion Room 2	14.53	9	130.77
13	Lecture Room E1	14.53	7	101.71
14	Lecture Room E2	14.61	6	87.66
15	Lecture Room E3	14.61	8	116.88
16	Lecture Room E4	14.54	16	232.64
17	Lecture Room E5	14.53	5	72.65
18	Lecture Room B1	14.52	0	0
19	Lecture Room E9	14.53	4	58.12
20	Lecture Room E10	14.53	10	145.30
21	Lecture Room B1	14.60	18	262.80
22	Lecture Room B1	14.53	9	130.77
23	Lecture Hall C	31.41	2	62.82
24	Lecture Hall D	20.50	1	20.50
25	Lecture Hall F	31.41	5	157.05
26	Lecture Hall G	20.50	6	123
	<b>Total</b>	<b>424.22</b>	<b>174</b>	<b>2,694.86</b>

### 4.2.3 Space Charging Formula

Space Charging model can be summarized as the following formula:

$$\text{Space Charging} = \left[ \frac{\frac{K}{L}/H}{J} \right] + n$$

$$\text{Model } n = \left[ \frac{\frac{K}{L}/H}{J} \right] \left[ \frac{L-D}{D} \right]$$

where:

$n$  = Cost per Share

$K$  = Overall Cost

$L$  = Total Floor Area

$H$  = Number of Lecture per Year

$J$  = Total of Lecture Hours per Day

$D$  = Lecture Room Area

## 5 Conclusion

This study has resulted in space management model for higher education institutions. Space charging model through cost analysis is a form of innovation in teaching and learning space management. By using this space management model, one can produce the actual use of a classroom at Higher Education Institutions. Rate per square feet for each lecture room can be the basis for the charge counted to those who have booked but do not use it. In this way, it can control the waste of unused space resulting from the negligence of users. Results from this study found a total of RM2, 694.86 has been wasted due to space has been reserved but not used by the user. The research also has shown that the Space Charging model can be used to overcome the problem of space as most individuals more susceptible to the fine. This method has also proved that space is not something free and everyone should appreciate the available space and ready to give space to others if not in use. In conclusion, it can be concluded that this space management model of Space Charging can also guide the facility manager to manage the available space and can make decisions related to the space efficiently as well as minimizing the use of space. This study provides awareness to the consumers to be cautious in the use of space. This research may be extended as a continuation to institutions of higher education in Malaysia. Therefore, the researchers hope that further research can continue to improve the efficient use of space, especially higher education institutions (HEIs) in the country to compete globally in a healthy way.

**Acknowledgments.** This work is supported partially by University Tun Hussein Onn Malaysia and the authors would like to thank the supervisor for his ideas and time and also all of the support received from relevant parties to the success of this research. Moreover, the authors are also grateful to the anonymous referees for helpful comments and numerous suggestions to improve the paper.

## References

- [1] Abdul Hakim Mohammed, *Maimunah Sapri dan Maizan Baba-Facilities Management*, Universiti Teknologi Malaysia, Skudai, Johor, Chapter 1, 2006.
- [2] Ahmad Fauzi A Wahab, *Space Management: Physical Resources Management in Higher Education*, Universiti Teknologi Malaysia, Skudai, Johor. *Dis, Technology Journal*, **43**(E), (2005).
- [3] R.C. Dickeson, *Prioritizing Academic Programs and Services: Reallocating Resources To Achieve Strategic Balance*, Jossey-Bass Higher and Adult Education Series, San Francisco, 1999.
- [4] G. Griffith, *Methods of Apportioning Space Related Costs in English Universities*. Higher Education Funding Council for England, Bristol, 1999.
- [5] J.M. Hamer, *Facility Management System, Organizing Data For Architectural Programmin*, (1st Ed), New York, Van Nostrand Reinhold Inc. 1989.
- [6] Wiggins M. Jane, *Facilities Manager's Desk Reference*, United Kingdom, Wiley- Blackwell, 2010.
- [7] H.H. Keiser, *Planning And Managing Higher Education Facilities*, Jossey Bass, San Francisco, 1989.
- [8] G. Kenny and K. Foster, *Managing Space in Colleges*, FE Staff College, 198.
- [9] D.C. Marsh and W.J. Griffith, *Management Of The Space Resource, Space Cost Budgeting*, *Council of Educational Facility Planners International Journal*. (September, 1985).
- [10] W.D. Middleton, *Comprehensive Facilities Management, New Directions for Institutional Research, Planning and Managing Higher Education Facilities*, **16**, (1989), 5-12.
- [11] *Space Charging Procedures*, Massey university policy guide, 2007.
- [12] NAO, *Space Management in Higher Education: a Good Practice Guide*, National Audit Office, London, pp. 1-11, 1996.
- [13] Narimah Ismail dan Saodah Wok, *Organizational Communication Course*, Bentong: PTS Publications and Distributor Sdn. Bhd., 2002.
- [14] Polytechnics and Colleges and College Funding Council & University Funding Council (PCFC), *Capital Funding and Estate Management In Higher Education*, UK, Northhavon House, Bristol, 1992.



- [15] Rozana Zakaria and Abdul Hakim Mohamed, *Performance Measurement for Management Government Organization Facilities*, Universiti Teknologi Malaysia, Johor, 2005.
- [16] University of Strathclyde Glasgow, *Space Management and Planning*, (1993), <http://www.strath.ac.uk/estates/space/>.
- [17] University of Salford, *Space Management Policy*, 2008.
- [18] D. Wamer and C. Leonard, *The Income Generation Handbook*. Buckingham: SRHE and Open University Press, 1992.
- [19] M. Weatherhead, *Real Estate in Corporate Strategy*, Macmillan, Basingstoke, 1997.