

## Space Charging Model: A Comparative Study on Cost Elements in Institutions of Higher Education

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**Abstract**—The optimisation of space management contributes to the efficiency and success of most organisations. Research for space management plays an important role to ensure the related organisation will achieve the target of its business goal. A study on space management is vital, in view of the fact that premises (spaces) expenditure represents the second highest area of spending resources in most organisations. It is therefore one of the more important ways to secure value for money in the area of property management. A more efficient use of space will reduce the need to secure capital funding. Subsequently, a study on space management especially in higher educational institutions is highly critical. This study focuses on the elements of cost that will be used in the space charging model in Universiti Tun Hussein Onn Malaysia (UTHM) as a case study. Space charging is defined as a program which combines an allocation and charge-back mechanisms. The space charging technique will foster awareness of the costs of space and eradicate a culture which sees space as a free good. While the study focuses on developing an appropriate Space Charging model for UTHM, the different elements of each higher educational institution are compared and considered with the most suitable elements to be adopted in UTHM. This is because each university has different cost elements. The study serves as an initial effort towards developing a new Space Charging model that can be applied in UTHM. Hopefully, this research may contribute to enhancing awareness among users in using space effectively.

**Keyword:** *Space management, cost elements, waste of space, space charging model.*

### I. INTRODUCTION

Facilities management exists in all physical and non physical organisations. Facilities are also required by all organisations to conduct business activities. Both of these facilities should be managed according to the suitability of organisations. Because of differences in organisational goals, it follows that facilities are also to be managed in a different way. However, facilities for each organisation have specific characteristics [1]. To achieve the organisation's objective, space must be managed effectively. Space management is very important for all organisations especially for higher educational institutions. Efficient and effective space usage will control expenditure cost and level of productivity [2].

According to a National Audit Office (NAO) study, space management in higher educational institutions are more critical compared to other institutions [2]. Physical cost is a valuable asset which can generate income to an organisation if effectively managed [3]. The cost related to the physical sources is the second most important budget after staff salary in higher educational institutions [4]. Therefore no space in the university and other organisation should be treated as free [3]. But until now, most of the administrative institutions of higher learning and public sector organisations, particularly from other Asian countries have yet to understand the role and contribution of these physical resources to their organisations. Physical resources are valuable assets and an organisation can generate revenue if it is managed effectively [3].

Space management is very important not only for the optimisation but also related to maintenance cost of the respective property. To put simply, operation cost and maintenance cost will be higher if more space were used. As stated in Lawrence [5] and Williams [6] statements, the space is the catalyst for the cost of other operation. However, space wastage happens in all higher educational institutions including University Tun Hussein Onn Malaysia (UTHM). On average, monthly electricity cost for UTHM is RM700,000.00 or RM8.5 million a year. According to a case study in Universiti Teknologi Malaysia (UTM) Skudai, buildings operational cost accounted for a staggering RM56 million a year for the whole of UTM. With reference to Williams [6], 15% is the cost of electricity from the overall costs totalling RM 8.4 million a year [3]. Other costs include building operating costs but are relatively cheaper energy costs compared to Western countries, and possibly the cost of energy is less than 15% of the total operating cost of the building. If this assumption is taken into consideration, the total cost of operating the building will be more than RM60 million per year [3]. Presently, there are now more than 20 public institutions of higher learning (universities, colleges universities, polytechnics) in Malaysia, with an estimated annual operating expenditure incurred by the Ministry of Higher Education reaching RM1 billion. If the resources are not managed efficiently, they will become problematic and pose a burden to the organisation to continue the course of fulfilling the organisation's mission and objectives.

## II. RELATED WORKS

### A. Facilities Management Concept

There are many definitions given to describe facilities management where each group or individual tries to interpret the meaning of facilities with their own understanding and professionalism [1]. According to Bernard William Associate [7], facilities management is a process where an organisation provides and maintains services in a great quality environment by using the appropriate cost to meet the needs of the organisation. It means the costs incurred in the organisation need to be adjusted to actual needs. These efforts to offset the total cost should be earnestly considered by each facilities manager to ensure resources of the organisation are not wasted. According to the Centre of Facilities Management [8], facilities management is a process with the organisation providing and maintaining quality support services to meet the objectives of the organisation at the greatest cost. The quality means that requirements of shareholders, employees, consumers, customers, organisations and other parties are met. The greatest cost means the lowest spending level that enables the achievement of quality performance facilities management for the benefit of all parties associated with that organisation. Therefore, Facilities Management can be defined as the integrated management of the workplace to enhance the performance of an organisation [9].

### B. Space Management in Higher Education

In big organisations such as higher education providers, space management plays an important role to control space effectively without wasting space that could occur indirectly resulting in an adverse impact on the cost of that organisation. The space management is a proactive management of the research and best practice initiatives to support the strategic planning goals and also respond to legal requirements [10]. The NAO says that there are four factors of effectiveness in the area of management, namely a leader, objectives, information, communication and practical tools [2]. Efficiency in space management will contribute to the production of quality products to achieve the objectives of an organisation. The organisation itself has a central objective of integrating people, property and technology for a more productive environment to achieve the vision, mission, goals and perfection of the organisation.

### C. Space Charging Concept

To overcome the problem of wasted space, an effective approach must be taken. Thus, one of the best ways to overcome the wasted space is to use the Space Charging Model. Space Charging Model is a method in which the costs will be imposed on the space in a building that is not fully utilised. Some institutions believe that effective methods of space charging can minimise the demand for the use of space and can be used in the best way without a valid waste [11].

Besides that, space charging can be used as a base for space rental charging. Space charging can also be used as a basis for internal rental to make sure that space usage will

cover operational and maintenance costs [12]. Four elements in the space charging concept is space to be charged, amount to be charged, mechanism for cost and the source of payment for the charge. All these elements are subject to procedures according to the university's rules and regulations. The benefits of Space Charging Model are: it makes the cost of space more transparent, helps overcome a culture of seeing space as a free good, encourages close examination of how much space is actually needed, enables faculties and departments to take responsibility and make their own decisions regarding how much space is needed and affordable and enables rooms realised to be used for other purposes [13]. Cock and French identified two charges based on operational asset and financial asset [14]. Many institutions believe that the effectiveness of a space charging model can minimise the requirement of space usage and many spaces will be fully utilised without any wastage [14]. Many facilities experts say that this method is the best management tool. This method was supported by NAO and has been certified as the best method in 1996 [2].

## III. THEORETICAL FRAMEWORK

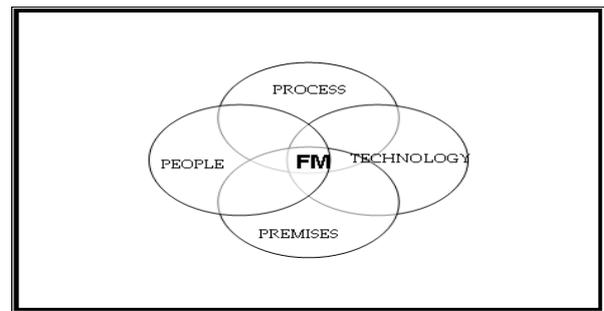
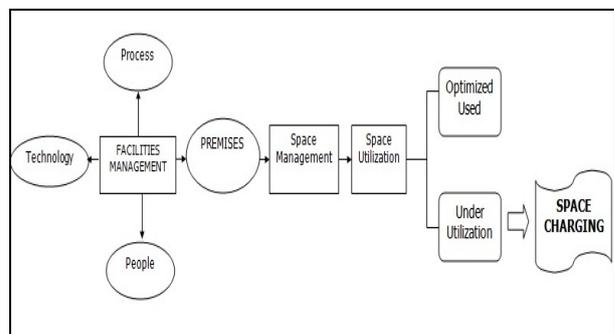


Figure 1. Theoretical Framework

According to IFMA (2005), facilities management is a profession that includes the integration of activities of different disciplines to ensure functionality of the environment with the integration of people, places, processes and technology. The dimension and scope of facilities management form a conducive and productive work place. This statement will be used as basis in the foundation of the theoretical framework for this study [15].

## IV. CONCEPTUAL FRAMEWORK

Figure 2. Conceptual Framework



The dimension and scope of facilities management cover all types of discipline to make sure the work environment can be performed accordingly through human resources, work place, process and technology [15]. According to Archibus [16], space management is the effective way of managing space and to minimise wastage cost and optimise space usage. Efficient space management will increase space usage and reduce operational cost, and ensure that the exact space can be utilised optimally with facilities provided. This definition is adopted as a basis to for developing the conceptual framework for this study. There are four aspects in facilities management viz. process, technology, people and premises. This study, however, is focussed only on one aspect which is premises, since space management would inexorably come under premises. The usage of space must be identified whether it is optimised or not. If space usage is under utilised, a charge will be imposed under the Space Charging Model.

#### V. VANALYSIS

No.	Cost Elements	Birmingham	King's College	Keele	Sheffield Hallam	Massey University	New Castle University
1.	Insurance	✓			✓	✓	✓
2.	Rental or Lease	✓			✓		✓
3.	Planning and Administration	✓				✓	
4.	Security	✓			✓	✓	✓
5.	Cleaning	✓			✓	✓	✓
6.	Utility	✓			✓	✓	✓
7.	Repair and maintenance	✓			✓	✓	✓
8.	Development and Division	✓					
9.	All department in the scheduling of learning provided			✓			
10.	The use of computers by students and computer lab			✓			
11.	Charge of all space			✓			
12.	The number of students and staff		✓				
13.	The different of size		✓				
14.	All cost involved in building				✓		
15.	All central departments				✓		
16.	Based on the actual space used				✓		
17.	Based on the learning space				✓		
18.	Salary						✓
19.	Depreciation				✓	✓	
20.	Environment					✓	
21.	Pottering				✓	✓	✓
22.	Property management services				✓	✓	
23.	Outsourcing				✓		
24.	Transportation				✓		

TABLE I. COST ELEMENTS

The table above shows the cost elements contained in the six universities that use Space Charging Model such as Birmingham, King's College, Keele, Sheffield Hallam, Massey University and the University of New Castle. Based on the above table, the cost elements most widely used in the production of Space Charging Model are insurance, security, cleaning, utilities, and repair and maintenance. Each university has different cost elements depending on the respective university's rules and regulations [13].

These cost elements are used in the proposed Space Charging Model for UTHM because there are wastages of space in lecture rooms in buildings used for teaching and learning. An initial study for actual lecture rooms which were compared against the time table provided by the Academic Management Office for the study showed that there was a waste of space used for academic purpose. The graph as per Appendix 1 shows the rate of wastage of space that occurs in the G3 building block, UTHM. For occupancy, the waste of space occurs when the rate is under 70% and for utilisation, waste of space occurs when it is under 50%. The teaching and learning space was used because this is the core business for UTHM. The lecture rooms in block G3 were used in the study to determine the charges to be imposed on the use of space.

From the analysis in the table, there are some elements of the cost of the appropriate use for UTHM. The elements that are suitable for UTHM are electrical maintenance cost such as telecommunication system, PA system, and electric system (not including High Tension system), mechanical maintenance cost such as fire fighting system, air-conditioning system, cool water pump system and sewerage and air compressor system, civil maintenance cost such as building cleaning, building maintenance, hygiene maintenance, and pest control maintenance, landscape maintenance and utility such as water, electricity and telephone. According to Auburn University space management (2006), "The operation and maintenance space function is for use in conducting activities supporting the administration, operation, maintenance, preservation and protection of the university plant. These activities include janitorial and utility services, repairs and ordinary or normal alterations of buildings, furniture and equipment, care of grounds, environmental safety, hazardous waste disposal, central receiving, security, facility planning and management". According to Frank (2006), there are two types of maintenance: first is planned (programmed, preventative and cyclical) and second is unplanned (reactive, normal response and emergency response). All the elements above are included in the category of planned and unplanned. Besides that, elements of landscape will be considered in the Space Charging Model. Figure 3 below shows the important elements in developing the Space Charging Model in UTHM.

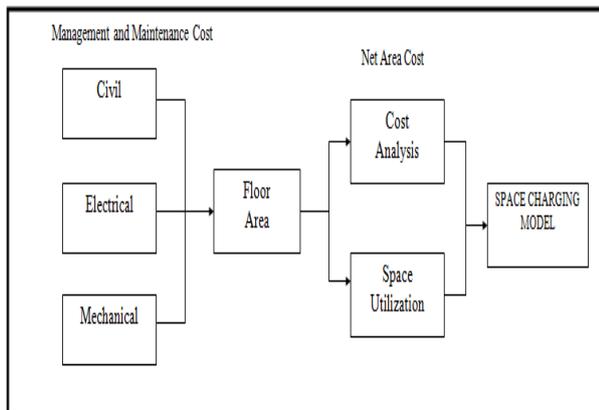


Figure 3. Space Charging Model at UTHM

## VI. CONCLUSION

In conclusion, there are three important components in determining the cost elements to develop a Space Charging Model which are civil maintenance, electrical maintenance and mechanical maintenance. Utility bills and maintenance of landscape elements are also important components in the development of a Space Charging Model. To develop this model, all the elements of these costs should be divided into area lecture rooms to impose a charge for each lecture room. The resulting charge is the actual use of the lecture room. The resulting amount may also be used as the basis for rental for the use of a lecture room. This study is focused on how to solve space wastage problems and not to determine who is liable to a fine or surcharge. The university will therefore have to decide as to who should pay for the charges. The generation of cost through cost elements will be described in a further research. Thus, the analysis expounded in this paper is confined to an initial effort to develop a Space Charging Model from UTHM's perspective.

## VII. RESEARCH SIGNIFICANT

This research is conducted in the interest of various parties such as the management of UTHM to help overcome the problem of space waste management. Similarly, the cost elements of other higher educational institutions can be analysed according to the needs of the respective university. In addition, it can be of interest to the student as a guide and reference material related to this model to solve the space problem. The organisation can also apply this model in the

management of their space by considering appropriate elements.

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## APPENDIX 1

