

## OFFICE SPACE STUDY: A REVIEW FROM FACILITIES MANAGEMENT CONTEXT

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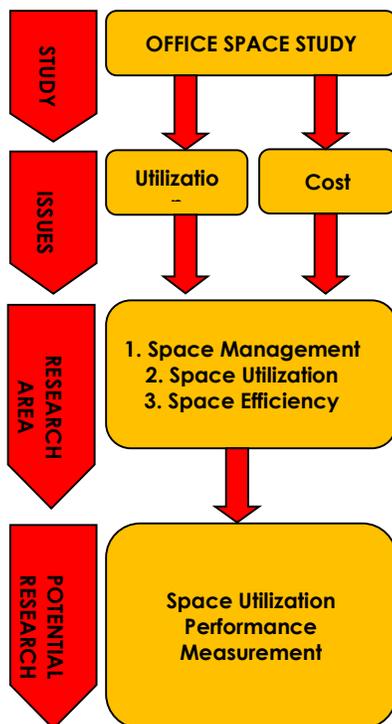
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### Graphical abstract



### Abstract

Office space is one of the critical factors in managing an organization. Without efficient management, the organization has to bear many problems such as high cost and inefficiency of space utilization. Hence, this paper aims to review the space studies in facilities management context as well as to identify the potential research in this area. The review was based on multiple electronic databases for published peer-reviewed articles. 70 articles were selected by using 'facilities management' as key word. Results show that office space studies can be divided into space management, space utilization and space efficiency. Additionally, the most frequent suggestion for future research is space utilization performance measurement which aims to evaluate the current level of management and utilization.

Keywords: Facilities management, performance management, physical space, space, space management

### Abstrak

Ruang pejabat adalah salah satu faktor kritikal dalam menguruskan organisasi. Tanpa pengurusan yang cekap, organisasi akan menanggung banyak masalah seperti kos yang tinggi dan ketidakcekapan penggunaan ruang. Oleh itu, tujuan kajian ini adalah untuk melihat kajian berkenaan ruang dalam konteks pengurusan fasiliti dan juga untuk mengenal pasti penyelidikan yang berpotensi dalam bidang ini. Kajian dijalankan melalui pelbagai pangkalan data elektronik yang menerbitkan artikel berwasit. 70 artikel telah dipilih dengan menggunakan 'pengurusan fasiliti' sebagai kata kunci. Hasil analisis menunjukkan kajian terhadap ruang pejabat boleh dibahagikan kepada pengurusan ruang, penggunaan ruang dan kecekapan ruang. Di samping itu, cadangan yang paling kerap untuk penyelidikan masa hadapan adalah pengukuran prestasi penggunaan ruang bagi tujuan untuk menilai tahap semasa pengurusan dan penggunaannya.

Kata kunci: Pengurusan fasiliti, pengukuran prestasi, ruang fizikal, ruang, pengurusan ruang

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## 1.0 INTRODUCTION

The world is currently witnessing a drastic increase in building development. The development of space or building aims to support various business activities as well as provide facilities for public [1, 2]. Allocation of different types of space for different kind of office activities, results in an organisational to seek for more

efficient use of space and facilities, better performance, higher user satisfaction, positive image, increased flexibility and better use of resources [3].

However, there are two main issues agreed by most researcher in office space studies, which are space utilization and cost. According to [4], effective use of office space is one of the main activity under the facility management activities. In fact, good space utilization

can reduce the costs incurred by an organization apart from to support the daily work activities [5]. However, office space utilization in the government sector differs greatly from that of a private sector. In certain circumstances, space is over utilized and sometimes it is underutilized due to changing pattern of current working environment [6]. In line with this, there is a need for optimum space utilization [7]. According to [8], the average utilization of office space within the public sector is 95 per cent, while for the private sector in the range of 80 per cent. However, these percentages do not reflect the real situation for both sectors for example the Public Works Department, Valuation and Property Services Department and Security Department in Malaysia have not fully utilized the space provided because majority of their workers spend more time outside their office compare to time spent in the office [9, 10]. This is proven by a study conducted by [11] where only 23% of space being utilized in closed office while only 40% of workstation provided is utilized. Research conducted by [12] also shows the same figures where only 35% to 50% of space is used for the entire duration of 8.00 am to 5.00 pm during working hours.

Increased operation costs and waste also have been identified as one of the major issues in office space study [1, 13-15]. The operation cost is the second highest cost after human resource costs to be paid by the organization [5, 12]. Indeed, providing space for an employee who is not always in the office can increase the cost of an organization [16]. Additionally, [17] has emphasized that the larger the space under use, the higher the costs, including cost of electricity, air-conditioning, maintenance and so on. In United States, the cost of office space is estimated between U.S. \$ 10,000 to U.S. \$ 15,000 per month, including the cost of work space, services, telecommunications, and furniture [14]. Where else, in United Kingdom, the costs incurred by the government to manage a public building is about \$1 billion a year [18].

In Malaysia, the costs of operation and maintenance including the cost of electricity for 60 federal buildings are almost RM5.9 million per month, whilst for educational institutions, the cost reaches to RM6 million per year [19, 20]. These figures are almost 50% higher

compared to the costs incurred in private buildings [18]. Therefore, [17] has stated that efficient use of space is vital to achieve reduced costs; identifying and getting rid of the empty space in an organization.

Thus, based on these two issues, this paper aims to critically review current literature on the office space related with facilities management as well as to identify potential research in the field of office space utilization management. In the following sections, research methodology and the analysis of literature review will be explained.

## 2.0 METHODOLOGY

Articles related with facilities management from various countries from 1957 till 2012 have been reviewed. The purpose was to understand current development in the field of office space management related studies. Several strategies have been employed to collect facilities management related articles from various resources, such as:

a) Searched in computerized databases - Web of Science, Elsevier, Scopus, ScienceDirect and Emerald.

b) Manually searched in selected journals which have been frequently encountered - Journal of Facilities Management, Journal of Facilities, Journal of Property Management, Journal of Building Appraisal, Journal of Corporate Real Estate, Business Process Management Journal, Journal of Property Investment & Finance, Journal of Building Performance, Building Science, European Journal of Operational Research, Production and Inventory Management Journal.

c) Facilities management is the main searching terms. (Early step, the articles was selected by reading the article abstract and title and if the articles related with this study then, further review will be done).

d) Next, the selected articles will be classified based on several key research components such as space, building, workplace and performance measurement. The selection of this key research components are because of they are consider in the group of physical resources.

The total number of papers identified within this study were tabulated below in Table 1.

Table 1 Paper analysis

Space Study from Facilities Management Context			
No.	Area	Researchers	Total
1	Space	(Abdul Wahab, 2005; Barnes, 2002; Fleming <i>et al.</i> , 2012; Fried <i>et al.</i> , 2001; I. Ibrahim, 2012; I. Ibrahim <i>et al.</i> , 2012a, 2012b; I. Ibrahim <i>et al.</i> , 2011; J. Ibrahim, 2005; Ilozor dan Oluwoye, 1998; Kamaruzzaman dan Ahmad Zawawi, 2010; Knapp <i>et al.</i> , 2009; Lindahl, 2004; McNamara <i>et al.</i> , 2012; Steiner, 2006; Virginia, 2000, 2003; Yusof <i>et al.</i> , 2012).	18
2	Building	(Amaratunga dan RDG, 2001; Brittain <i>et al.</i> , 2004; Carroll dan Swatman, 2000; Douglas, 1996; Eisenhardt, 1989; Eley dan Marmot, 1995; Khajehpour, 2001; Kim, 2004; Lavy, 2011; Lawrence, 1989; Markland, 1995; Sarrazin, 2011).	12

Space Study from Facilities Management Context			
No.	Area	Researchers	Total
3	Workplace	(Becker, 1992, 2002; Becker, 1990; Benevento, 2011; Best <i>et al.</i> , 2003; Brief dan Weiss, 2002; Brittain <i>et al.</i> , 2004; Butler <i>et al.</i> , 2009; Chaboki <i>et al.</i> , 2013; Chan <i>et al.</i> , 2007; Chilton dan Baldry, 1997; Croome, 1999; Fawcett, 2009; M. A. Hassanain, 2010; Mohammad A Hassanain dan Abdul Moied, 2011; Kalleberg, 2003; Markland, 1995; McGregor, 2000; Mokhtarian dan Bagley, 2000; Origo dan Pagani, 2008; Robertson, 2000; Salama, 2004; Virginia, 2000, 2003; Voordt, 2004; Voordt dan Theo, 2004).	26
4	Performance Measurement	(Amaratunga dan Baldry, 2000, 2002; Amaratunga dan RDG, 2001; Amaratunga <i>et al.</i> , 2000; Bon <i>et al.</i> , 1998; Brown dan Laverick, 1994; Douglas, 1996; Hwang, 2006; Kincaid, 1994; Sapri <i>et al.</i> , 2010; Toni dan Tonchia, 2001; Varcoe, 1996; Walters, 1999; Wang dan Gianakis, 1999).	14

### 3.0 FACILITIES MANAGEMENT

Property or facility is an important source to support activities in an organization. The question on how property or facility being used to facilitate activities in an organization has increased the attention of many researchers due to low level of building performance since 1980s [21]. This issue stems from the implementation of traditional management approach in which organization were not taken into account. The growth of facility management (FM) enables a new dimension in managing property and facility more comprehensively and effectively [21]. In fact, FM does not only plays an important role at the local level but also at the national level. At the national level, FM aims to provide better infrastructure and logistic to support business and public, whereas at the local level FM aims to provide effective management of facilities and services [22]. In line with this, FM has 4 main functions; to manage financial resources, to manage human resources, to manage physical resources, and to manage knowledge and information.

Facility management is the key in managing facilities, support services and work environment which aims to support the core business either for long-term or short-term [23, 24]. The International Facilities Management Association (IFMA) [25] defines facility management as a profession that encompasses multiple disciplines to ensure the ability of the built environment to function properly by integrating people, place, process and technology. The British Institute of Facilities Management (BIFM) [26] defines facility management as a process of integration within an organization to maintain and develop services to support and enhance the effectiveness of the organization's main activities. Additionally, [27, 28] defines facility management as a systematic management which involves a combination of property, human and a variety of processes such as planning, maintenance and evaluation of the physical condition of the space and services.

In Malaysia, facility management is defined as a management that combines places, people, processes and technology to ensure the functionality of the built environment [29]. According to [30], facility management is the integration of multi-disciplinary activities in shaping the environment and management that affect human and workplace. For the purpose of

this study, human comprised of workers, consumers, customers and visitors. While the workplace covers all the physical and non-physical elements of a building and premises. Based on this definition, it can be concluded that facility management is the integration of multiple disciplines and activities to establish a good environment for the well-being of human. Therefore, [31] summarizes facility management into three elements known as 3P model which can be seen in Figure 1.

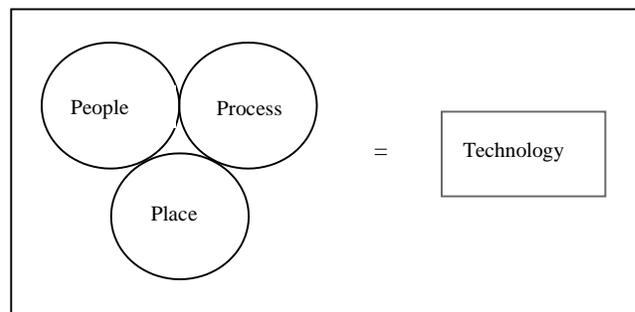


Figure 1 Facilities management elements

The 3P model represents human (people), process (process) and place (place) [23]. Technology elements are also needed in the facility management activities. Generally, efficient technologies will enhance the effectiveness and efficiency of facilities management, understanding the organizational environment, managing the business, managing the services provided, managing space and premises, managing the work environment and managing resources are among the important factors that need to be taken into account by the facilities management team [32].

Good facility management will result in a favorable environment and increased efficiency. Therefore, the combination of these four elements may increase the performance of an organization, especially in terms of management and the use of facility as well as cost efficiency and quality [32, 33].

### 3.0 SPACE IN FACILITIES MANAGEMENT CONTEXT

Space is an important resource to support activities in an organization. Space is defined by [34] and [1] as a segment of the entire facility consists of either space

that can be used or cannot be used. The importance of space is specifically outlined in the facility management definitions. The following table lists the definition of facility management used at present.

**Table 2** Space Element in Facilities Management Definition

Author	Space Element in Facilities Management
IFMA [25]	A profession that encompasses multiple disciplines to ensure functionality of the built environment by integrating people, place, process and technology.
BIFM [26]	The integration of multi-disciplinary activities within the built environment and the management of their impact upon people and the workplace.
Cotts et. al [35]	Coordinating the physical work space with human capital development and the profession itself in an organization.
Noor and Pitt [29]	The management of multi-disciplinary activities to ensure continuous functionality of the built environment by linking and integrating people, place, process and technology.
Then [28]	The practice of FM is concerned with the delivery of the enabling workplace environment. The optimum functional space that supports the business processes and human resources.
Hamer [36]	The process of planning, implementing, maintaining and accounting for appropriate physical spaces and services for an organization, while simultaneously seeking to reduce the associated total cost.
Alexander [23]	The scope of the discipline covers all aspects of property, space, environmental control, health and safety, and support services.
NHS Estates [37]	The practise of co-ordinating the physical workplace with the people and work of an organisation; integrates the principles of business administration, architecture, and the behavioural and engineering science
CFM [38]	The improved process of workplace management to inspire people to give their best, support their effectiveness and make positive contribution to economic growth and organisational success.

Based on Table 2 above, it is clear that space is an important element in facilities management to ensure the functionality of an organization's environment [25, 26, 29]. Space were defined from different angle by [35] and [37]; better coordination of space able to improve human capital and professionalism. However [28] in his study stated that human resources and business processes will be supported if space function optimally. Space optimization can be achieved through effective management of space [13]. Effective space planning and management will contribute to the success of an organization, efficiency, and reduce the cost [38]. To achieve effective space planning, an organization should consider the number of spatial planning and the implementation of comprehensive management system for efficient space management [39].

As a conclusion, space is one of the biggest component in facilities management. By leaving space without good planning and management can cause a loss to the organization. Because of that, many researcher agree that the roles of space manager is important to manage the space efficiently and effectively.

### 4.0 SPACE MANAGEMENT

Space management is one of the elements in asset and facilities management either for government or

private buildings [15]. According to [24] and [40], they classified space management as one of the key elements of facility management. Whereas [41] defined space management activities as property management which involves the management of activities for whole building. In fact, conflict arise between facilities management and property management regarding the roles of space management, yet, the roles of space management provided by these two management entities are similar which is to provide services to ensure the space provided meets the requirements of an organization's core objectives as well as to satisfy customers [13]. These management activities focus on the best use of existing physical resources and reduce the demand for space or asset [42]. Therefore [43] stated that appropriate work space and efficient management are the major factors which contribute to the increase in values of an organization.

Space management is the combination of two elements namely management and space; management refers to the best service provided to the organization, where else, space refers to the supports provided for the business activities undertaken by an organization. According to [44], management activities are referred as the space within a building or any civil structure. The aim is to promote the efficient use of space and equipment which are the important physical resources of an organization [45]. Hence, There is a critical need for effective management as it can bring success to an organization by optimizing space utilization and

reduced operation costs incurred by the organization [38]. According to [39] stated that there are several aspects of space management need to be given more attention, namely planning and efficient space management. Whereas [43] stated that the practices and activities carried out to achieve an effective space management are understanding the wants, needs and objectives of the organization. However [41] focused on the costs incurred by an organization, including responses to any changes in an organization in his research. The concept of open plan office space and renting unused space not only ensure the space, equipment and furniture are used efficiently and effectively but also reduce the costs of an organization.

According to [41], space management is a broad term which covers assessment on the need for space, space planning, process management and the use of

space to support the number of employees using a particular space. The rationale behind the management, planning and good utilization is to enable organizations to achieve their goals. Review from [33] and [46] also emphasized that the planning and management of space should include asset management, space management, space utilization, space utilization audit and project management. In fact, the management of space should be carried out parallel with the objectives of the organizations as well as taking into account the needs of employees using the space.

Space management activities can be divided into several stages, namely, identifying organizational structure, planning for allocation of space, allocating the space, collecting data and evaluating the space used [40]. The space management stages can be seen in Figure 2 [40].

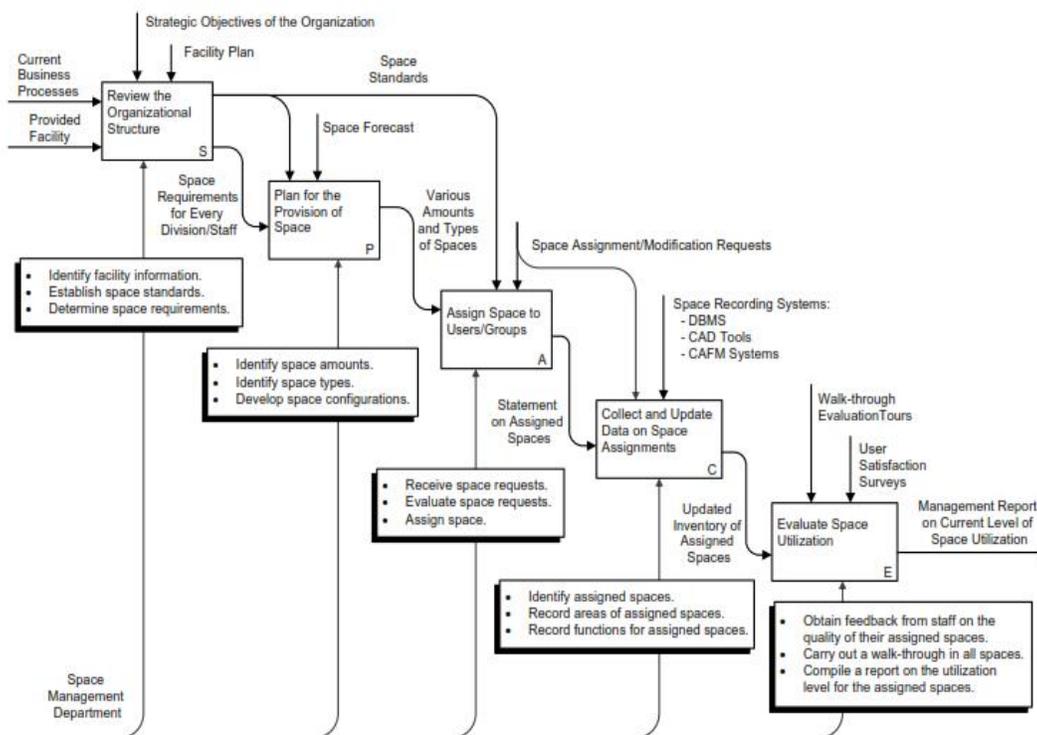


Figure 2 Space Management Stages

#### 4.1 Identifying Organizational Structure

At this stage space management will represent the corporate organization to identify the objectives, the needs of the departments and the number of employees in an organizational and plan space allocation for employees. According to [42], the need to review the requirements of an organization, its departments and employees as they will affect the space provided either in short-term or long-term. Results from this study provide information on the existing facilities, number of employees for each department and management system implemented. This activity can be divided into three major roles [40]:

- Identifying facility information: Among the activities involved are identifying building name and the name of each departments to ascertain the used space, unused space and the needs of employees to new work space [40].
- Establishing separate standards: The establishment of standards are established to provide guidance to the organization to improve the efficient use of the space provided to the workers. According to [34] defined standards as criteria or norms for allocating space. Whereas [47] defined space standard as the total area provided to employees with

regard to the space allocated for tables, chairs and work processes.

- c) Determining the need for space: The main purpose of this function is to determine the current need for space in order to understand current space requirements and future space requirements. It is important for an organization to identify the nature of today's work [40].

## 4.2 Space Planning

Space planning will ensure the space provided able to achieve the objectives of the organization. The information required in the planning stage is the space required for departments and employees which have been collected in the first stage. The results obtained at this stage reflects the need for space planning in an organization. The facility as a function of planning manager which includes several aspects, such as [23]:

- a) Space provided to improve the performance level of buildings, having the technical capability of building such as issues of safety and comfort, energy-related issues "green building", and other issues such as solar, structure and fabric [40].
- b) Space provided must be able to meet the technological environment such as the use of computer equipment, telephone, video conferencing and other network equipment. Technological environment, among others involves, looking at the cost of the transfer, whether the cost of wiring structure is easily installed and transport costs to be moved to a different place. Preparation of space must also have the flexibility to respond to any changes in the technical and operation side, for instance, changes from "open plan" to "cellular division" [40]. Changes usually will not only cause changes to space in building but also in the building systems such as air-conditioning system, power source, position lights, telephone and so on. Therefore, the best space planning should not incur high costs as there might be changes to be made in the future.
- c) The most important aspect of spatial planning is to meet customer satisfaction. Building performance is measured by the individual or employee in a building [40]. The measurements are made based on the perceptions of users of the facilities provided, the building and the safety and comfort of the space user.

The role of planning is divided into three parts, that is::

- a) Identifying the amount of space: the calculation includes interior and exterior space and the space bounded by walls. Some other alternatives should also be considered as to identify used and unused

space to ensure the actual level of used space [40].

- b) Identifying the types of space: space includes ceiling height, seminar rooms, open spaces, confined spaces and so on. Planning manager should determine the users' demands and requirements for space as it affects the type of space to be provided [40].
- c) Establishing the space plan: translating the space plan based on customer needs and space standards established by organizations [40].

## 4.3 Allocating Space

Assigning a room based on the space planning created by the organization. The process of providing space is divided into three sections as shown below [40]:

- a) Receiving applications for space: this includes the application of a new space or addition of a room due to expanding organization. Application of space should clearly include the reasons for space application, type, location and space needed [40].
- b) Evaluating the available space: assessment on the space is done by taking into account the space available, standards and policies of the organization [40].
- c) Allocating space: In allocating space, it is important to consider the work process of a department, effective communication and whether it is for short-term or long-term [40].

## 4.4 Collecting Data Use Space

Data collection will be carried out by gathering the space data for each department of an organization. Other resources such as information on equipment, devices and systems used should also be collected to have clear understanding on the usage level. The management's role is to identify the space provided, record the location of assets and facilities, and record the function of the space provided. This identification involves all the space that has been recorded for an organization. Among the information to be recorded are asset name, registration number and location of assets [40].

## 4.5 Assessing the level of space used

At this stage, the management must ensure the allocated space are in a good manner. This assessment can be carried out using the "post occupancy evaluation" as it can provide valuable information to planners and facility managers in order to conduct the operations of an organization. At this stage, it is vital to note the perceptions of consumers on the quality of space provided, followed by observation and preparation of reports on the current space utilization level in an organization [40].

### 5.0 SPACE UTILIZATION

Office space utilization is defined as the number of people using a particular space in a building [48]. The purpose of measuring the ratio is to identify the current and potential future use of space [43]. The characteristic of space utilization measurement as follow [49]:

- a) Determined by the number of activities carried out in a room.
- b) Established measurement standards must reflect the best standards for efficient use of space.
- c) Established standards may vary from one institution to another depending on the analysis performed.
- d) Measurement of these competencies can be used as guidelines to develop indicators for new space.

The rate of office space utilization is associated with the frequency (duration or frequency of use of a

room) and occupancy rates (the division between the use of space and the amount of space available) [50, 51]. In fact, there are two methods of measuring space utilization as discussed by [52];

- a) Estimating the number of people using the space comfortably provided sufficient equipment in the room based on the purpose it is to be used.
- b) Dividing the square feet of floor area with a specific number required for the floor area for each individual station. The result will reflect the capacity for each workstation provided.

Table 2 below shows the two different criteria of space utilization function. The first and the second function focus on the rate of space utilization, while the third function focuses of the amount of space allocated for the employee. Efficient use of space can be achieved through a strategic approach. This strategic approach starts from the beginning of space built. Important aspects of space utilization underlined by [43] is planning and space management.

**Table 2** Space Utilization Function

Functions	Explanation
$\frac{\text{Meeting Space Use (hours)}}{\text{Total Time Available (hours)}} \times 100 = \%$	This formula is a useful tool for calculating the number of meeting rooms needed in the space plan. Total time available should be the time the office is open for business e.g., 7.30 a.m. to 6 p.m., 5 days per week.
$\frac{\text{Time at Workpoint (hours)}}{\text{Total Time Available (hours)}} \times 100 = \%$	This formula is useful to calculate hot desking and hotelling space management, and should be calculated on the total time the office is open, up to 24 hour/7days operation.
$\frac{\text{Net Lettable Area (m}^2\text{)}}{\text{Number of Employees}} = \text{m}^2 \text{ per employee}$	This formula is useful to calculate the space utilization rate by considering the usable space only e.g. work area, social area, etc.

According to [50], they stressed that a strategic approach can be achieved by setting clear guidelines about the use of space. These guidelines will be the benchmark for every organization to ensure efficient and effective implementation of the space management and planning. There are several aspects that need to be addressed in the planning and management of space, namely [43, 53]:

- a) The size and space shape;
- b) Existing facilities usage patterns;
- c) The number of employees using the space;
- d) Equipment and furniture required;
- e) Culture and work processes;
- f) Convenience and needs of employees; and
- g) Attractive working environment.

### 6.0 SPACE EFFICIENCY

Efficiency is a very broad concept. This term is used widely to indicate the level of energy efficiency, water use efficiency, cost efficiency, space efficiency and others. The purpose of efficiency is to achieve maximum function and usually requires creative planning and management. In the manufacturing sector. Efficiency is defined as guidance for all aspects of the production process with regard to price indicators [54]. In other words, efficiency is the ratio of a firm as a whole, including the technical efficiency and price efficiency. The efficiency of a body can be measured by the efficiency of the production unit of each individual, as well as the allocation of resources among individuals [55]. In the development sector, efficiency is defined as the value and cost of the best development. If these two aspects are achieved (increase in value and at the same time manageable cost) efficiency will be achieved. Efficiency is also defined in terms of optimization. Optimization is

defined by Sharpe as the optimal use of a building for various activities of the organization with regard to the costs and benefits of use [56]. To determine the

efficiency of a building, [43] have established four functions as shown in Table 3.

**Table 3** Space Efficiency Function

Functions	Explanation
$\frac{\text{Workpoint (m}^2\text{)}}{\text{Number of Employees}} = \text{net m}^2/\text{employee}$	This calculation measures the total occupied by work points (enclosed offices and workstation) and divides by it by the number of employees. The result is a net area per employee in square meter, which exclude any other facilities. This should not be below 4m <sup>2</sup> to be efficient and includes tertiary circulation space.
$\frac{\text{Workpoint (m}^2\text{)}}{\text{Circulation Space (m}^2\text{)}} \times 100 = \% \text{ circulation space}$	This calculation compares work-points, as above, in relation to primary and secondary circulation space, and should not be less than 30% to be efficient. Building codes will generally have an impact on this calculation by defining access and egress width.
$\frac{\text{Usable Floor Area (m}^2\text{)}}{\text{Net Lettable area (m}^2\text{)}} \times 100 = \%$	The higher the percentage, the more real space is used efficiently.
$\frac{\text{Usable Floor Area (m}^2\text{)}}{\text{Number of Employees}} = \text{m}^2 \text{ per employee}$	This calculation provides a measure of "real" square metres per employee rather than net lettable area per employee.

Effective use of office space can be defined as optimizing the use of space to maximize the amount of time of the building in use [57]. According to [50], they measured the efficiency of the office space through the use of floor area, but not including areas used for different functions such as building structures. However [58] measure the space to determine the efficiency and rate of the demand for space. Demand for office space should be consistent with the existing space to ensure the space is fully utilized. The percentage of space used is an indicator to measure the level of space used by dividing the space used with the amount of space available. Elements of a building such as the size of the building (to support the number of users and activities) and the time spent in a building (working hours) are two important factors when measuring the efficiency of the space. Based on [50], office space considered effective when the building:

- Provide a minimum space for the desired function and to be accommodated, and the area cannot be used is minimal between net internal area and gross internal area.
- Space provided to carry out any activity and minimum operations.
- A high level of space utilization.

Increased efficiency of office space will be an indication to the business performance, taking into account the actual work patterns [59]. Moreover, the efficiency of space also reflects the space provided meets the user's needs and at the same time the organization achieve its strategic role to use the space efficiently. Common strategies implemented by organizations to improve the efficiency of office

space utilization is by reducing the size of the space and introducing the "Hotelling" concept of teleworker employee [51].

### 6.1 Benefits of Space Efficiency

Efficient use of office space will have a profound impact to the organization, especially in achieving the core business. Among the benefits of efficient use of space are reduced operating costs, increased occupancy rate and deficiency in the demand for new space. Unutilized office space will increase the cost to be borne by the organization. Therefore identifying and reducing the levels of these vacancies will save a lot of costs [17]. according to [60] showed that the optimal use of office space would save \$ 460,000 of the total cost. Fawcett [61] also noted that improving the use of space will save from 40% to 80% of operating costs. The efficiency of space can be measured by the space needed. Reduced demand for new space reflects the space provided is used efficiently and effectively. However, [62] focused on the reduction of existing office space usage. He indicated in his study, that efficient use of existing space will establish space surplus. This surplus is a huge savings for an organization because existing space can be reduced for what is only needed. Additionally, [63] emphasized in his study that restructuring existing office space increasingly occur due to rising costs of real estate. Most of the organization reduced the amount of existing space through reducing space allocated for per employee from 20 to 14 per meter in 2005 and estimated savings are \$ 8.202 per employee per year [60, 63].

Based on [60], they stated that office space optimization can be achieved through effective use

of space without the need to rent additional space to carry out their activities. The benefits of office space optimization can be measured based on the savings used to pay for the operation costs of the organization itself. Whereas [59] focused on the overall work environment. Office space optimization can be achieved by taking into account the pattern of employees to perform work. It is important to note here that, efficient use of space does not only optimizes space usage but also enhances the performance and productivity of the organization.

## 7.0 POTENTIAL RESEARCH IN FUTURE

One solution to office space utilization and costing problems is through the use of performance measurement in an organization. Performance measurement aims to assess the current performance of an organization by periodically implementing specific techniques or methods to conduct measurement [64-66]. Previous studies related with performance measurement focused on the field of facility management as a whole for instance, study conducted [67] and [68]. Similarly, [66] in his study also focused on the needs of the principles and processes in the facility management performance measurement. Slightly different with [67], they were more concerned with the management indicators. However, [46] have emphasized the relationship between factors in their studies e.g. the influence of physical environment on the organizational efficiency. Similarly, [69] examined the relationship between property manager function and efficiency of the organization. Different with [70], he looked at the problem of performance measurement approach due to the difficulty to choose an effective and efficient approach. whereas, [67] focused on the methodology for conducting performance measurement.

Based on the critical review of current literature, there is no specific study conducted on performance measurement for office space utilization management except certain bodies like [6] and [50]. Their study focused on the public sector especially educational institutions and government buildings. Reports prepared by these bodies indirectly provide guidelines on space efficiency to be followed by an organization. For example, [12] give important attention to the space utilization and efficient space allocation to avoid wastage of government resources. However, the use of established guidelines are dependent on several factors such as needs and the constraints of different environment of an organization.

The important point outlined by [12] to conduct performance measurement is the use of performance measurement methods. Similarly, [71] also mention that the model or technique is one of the important things that need to be emphasized in the management of office space performance

measurement. There are various methods used to carry out performance measurement such as, Balance Score Card, Key Performance Indicators, Strategic Measurement Analysis and Reporting Technique, Benchmarking, Critical Success Factors, Performance Measurement Questionnaire, Performance Criteria System, Cambridge Performance Measurement Process Design, Integrated Performance Measurement Systems Reference Model. However, according to [72] diversity of this approach had led to difficulty in selecting the best approach that can be implemented. To cover the deficiencies, a model was created by [73], known as Cost Per Person Model (CPPM) for measuring and calculating the cost for the use of space based on the employee cost. However, CPPM only focused on some specific aspects such as the cost of property, the cost of telecommunications, information technology costs and the patterns of employment. Two main results obtained from this model are calculated cost for each employee and the potential savings that can be obtained based on several scenarios such as the restructuring of the office space. CPPM only focused on the current employment patterns without taking into consideration the overall cost.

An essential component in each approach was to establish measurement standards and specific indicators for each activity or management as well as to provide management and operation procedures or systems to help decision makers in an organization [67, 74]. The steps include the selection, definition and application of performance indicators to quantify the efficiency and effectiveness of service-delivery method [45]. According to [75], they stated that the financial and non-financial indicators must be balanced in the implementation of performance measurement. However, lack of performance measurement for specific criteria causes failure to achieve good performance [67]. Similarly, [4] mentioned that there is still lack of general indicators that can be used by any organization to conduct performance measurement. Additionally, the failure to see the indicator as a whole, including financial and non-financial aspects lead to the need to have clear performance measurement indicators [75]. Due to lack of specific measurement to analyze and verify the accuracy of the established indicators [67]. The concept of "trial and error" is still practiced to measure performance by matching the previous indicator. This approach is indirectly establish ambiguity in the validity of indicators as the indicators are established through observation only. Consequently, this results in misunderstanding between the parties engaged in the management of an organization.

## 8.0 CONCLUSION

This study highlights two major research areas related to office space study based on a critical review on the

current literature, particularly in the field of facilities management. First of all, this paper has identified three areas of space related studies, namely, space management, space utilization and space efficiency. These studies are inter related with each other and most of the time researchers consider them as similar issue when trying to solve them.

Secondly, this paper has focused on the performance measurement as a potential area for future study due to its significance in organization performance. The development of performance measurement framework should be specific for an organization as each organization have different missions and objectives. The development also should consider the performance measurement approach and analysis techniques to ensure the performance measurement is suitable for an organization. The

indicators selected also should be specific and according to the requirements and suitability of an organization.

These findings provide a clear understanding on the office space study and where we are heading now. Generally, this study is beneficial to academicians in terms of issues encountered in related field. For industrial practitioner, they may consider the suggestions provided here by introducing and implementing performance measurement in their organization. Undoubtedly, performance measurement will help the managers to understand the current performance as well as to encounter the underperformance aspects by providing a comprehensive performance measurement system.

Overall, this study can be outline as Figure 3 below.

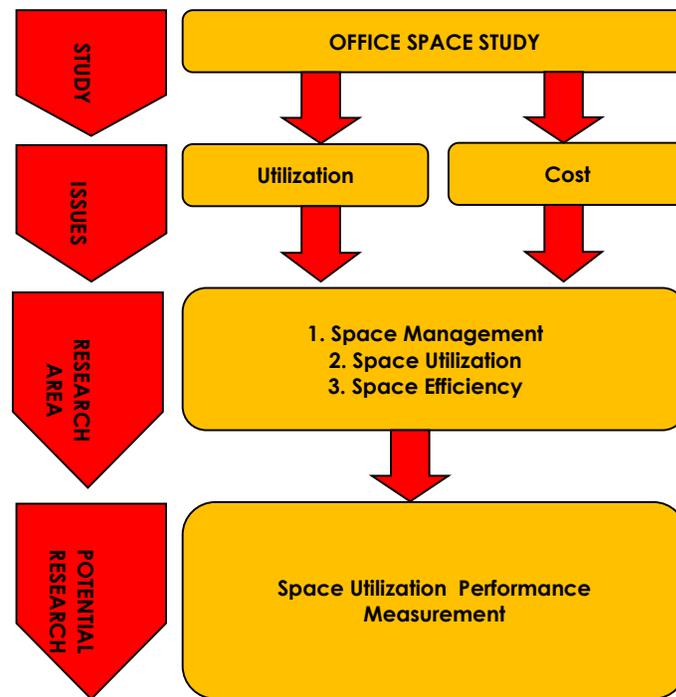


Figure 3 Study Outline

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