



## PRACTICES OF SUSTAINABLE ARCHITECTURAL KNOWLEDGE FOR HOSPITAL BUILDING MAINTENANCE

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**Abstract:** *Defect failures are the vital concern phenomena in hospital maintenance. The focusing on sustainable architectural maintenance activities for represent the knowledge practices in managing facilities of hospital. The research was to develop a sustainable knowledge procedures strategies for the hospital building maintenance development. Therefore, this study is aimed to extract features contribution to the hospital building maintenance. The information is collected from several method using observations, interviews and internal document exploration. The involvement of eight of building maintenance supervisors during the data collecting. The results of the case study point out that the practices have the potential to improve the existing procedures of maintenance practices. The sustainable architectural of hospital maintenance could provide insights to the knowledge in diagnose the hospital building defects.*

**Keywords:** Sustainable, architectural, knowledge maintenance, hospital

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### Introduction

The nature of building maintenance (BM) industry is of a project-based nature and request projects are described as the ideal form of learning and knowledge sharing, as problem solving often requires the creation of new knowledge (Hobday,2000). According to Damgaard and Hansen (2012) stated that BM activities in the hospital maintenance scenario can be seen as knowledge-intensive units with players with specialized skills, which must be used for the accomplishment of the project.

BM manager, technical knowledge and technical experience are important (Ogunlana et al, 2002; Tupenaite et al.2008).The lack of knowledge and knowledge sharing resulting in increased maintenance costs due to outsource the task. (Pemsel andBlomé,2012). Previous studies have identified the lack of knowledge, experience and best-practice examples as barriers in BM such as refurbishment activities (Itard and Meijer; 2008; Konstantinou and Ulrich Knaack, 2011).

### *Practise of BM operation*

BM operation was to generate prolonged to buildings' life span. As the concept of knowledge management application in BM were to improve performance in public asset maintenance and BM organizations (Fong and Lee 2009; Olomolaiye et al. 2004), According to Affendy et al. (2017) stated that the need to have green hospital operation focusing daily maintenance operation. Study by Hashim et al. (2012) stated that BM activities essential to keep a building facility in good condition and to maintain it in its original progress capability. Thus sustainable in BM will provide the building in wealth as the previous condition.

The effective BM will provide well manage environment but also contributes to upkeeping the green BM practicing hospital buildings. According to Azuin et al. (2013) stated that local Government Ministry initiative by the implementation of Uniform Building By laws towards sustainable development in Malaysia. Thus all the works in maintenance required to follow the standard of legislation due to avoid any pollution to the community. Study by Zainal et al.(2012) found that buildings face maintenance difficulties that need crucial attention sustainable in order to preserve them from further deterioration and decay.

### *The consideration of the sustainable knowledge in BM*

It defined as the maintenance which is required when an item has failed or worn out, to bring it back to working order. Corrective maintenance is the most commonly used maintenance approach but it depends on the situation of complaints. When BM fails, it often leads to delay on maintenance activities thus may causes increasing of damage to other building elements. In most cases this is costly activities. Also, if the facilities needs to be replaced, the cost of replacing it alone can be extensive. Therefore the BM department must consider the sustainable knowledge be in their maintenance task thus enhance the sustainability for workplace and green waste production. According to Awang et al.(2011) stated buildings need to maintained and interior refurbished to enhance the effectiveness in maintenance activities. This will enhance the sustainability wealth for community in running their activities.

### *The case study at sustainable practices knowledge at the public hospital.*

Routine maintenance was carried out daily as to ensure the cleanliness of the premise is under control. Below this highlighted that in hospital several types of waste being collected by the porter and house-keeping. The commercial waste on the routine maintenance whereby at every three hours, the cleaner will check out and change the new plastic bag in the basket. This is to prevent the garbage from spilled out from the plastic bag provided. Secondly was the clinical waste whereby at interval of an hour, the cleaner will collect the clinical waste from yellow basket. The waste is then being kept in the certain room which refrigerate as the waste may contain blood. Every Wednesday, the waste will be collected from the room by the waste porter. The rubbish collecting rubbish is collected by the cleaner every three hours or anytime necessary. The rubbish is then collected by outsource contractor.

House-keeping task such as cleaning. The cleaning process is a daily routine that will be done early in the morning before more people at the place. It is then repeated when necessary. Moping activities was comprising of the moping process is a daily routine that will be done

early in the morning before people with active activities at common area. The rapid of this task are repeated when necessary. Study by Anuar et al (2017) cited Nerminathan et al. (2014) stated that the need to consider the sustainability of operation cost in maintenance healthcare thus reducing waste for benefits of the sustainability of health organizations.

**Types of maintenance in BM practices**

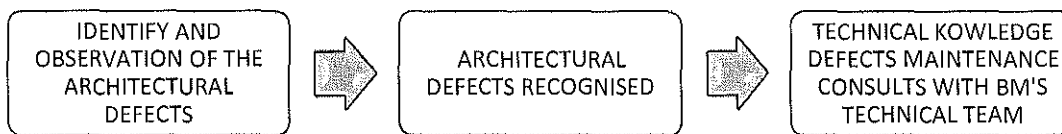
Corrective maintenance comprises of schedules activities. The activities were much on repairing activities such as lighting, air- conditioning, plumbing, appliances repairing, boiler maintenance and air-conditioning chiller. This maintenance are carry out when it is reported and wor korder being issues. It is done normally 1 to 3 times a year. The procedure or maintenance task issues that several equipment is faulty, the maintenance officer should fill the request form and send it to the BM maintenance department. The person in charge will send the job sheet to the administration. The investigation and site observation done, the administration is then making job order sheet and deliver it to the Chief Executive Operation (CEO).The CEO then produces an invoice for the payment. Usually the major maintenance will be outsourcing and monitoring by the BM department.

Annually maintenance. The activities such as repaint of the building elements structure. The activities are carry out once a year, all the building will be repainted to cover the existing paint It is to maintain and promote a clean ventilation for building occupants. In order to prevent from severe damage, the air conditioning was cleaned and service annually. It is also to ensure that the air conditioning well-functioning such at the inside wound care unit which the humidity and temperature must be under certain degree.

**Adhoc maintenance**

The problem during blackout of electricity could be one of problem and risk to the activities in the hospital building. The backup of generator activation set up to 5 seconds standby to provide support the electrical to all the building. It can be last until 3 days but usually the blackout will not take much time to be recovered.

**Methodology**



**Figure Framework of defect knowledge recognition in BM hospital building**

The figure shows the research data was collected through observations, guided interviews and documentation review. The consultation within the BM teams which was supervisors and the technical persons that are involved in BM hospital. Affendy et al. (2017) stated that the conceptual of defect identification could be integrate within architectural defect recognition thus enhance the sustainability actions for the repairing or refurbishment work.

## Results and Discussion

BM architectural defects inspection results

The types and most frequent causes of architectural defects that occurs are as follows:

Table 1. Types and frequent type of architectural defects.

Type of defects	BM responsibility	Technical knowledge application	
<b>A . WALL, FLOOR AND FINISHES</b>			
Dirty floor	Housekeeping department	Daily cleaning	
Floor mat and carpet interior	House keeping department	Daily cleaning	
Unevenness paint	Repair department	Repaint	
Water seepage		Resurface	
Peeling of paint		Repaint	
Untidy wall paint		Repaint	
Plaster crack		resurface	
Wall damaged		Hacking and resurface	
Floor tile crack		Replacement	
Fungus		Cleaning and ventilation	
Pebble wash not provide		House keeping cleaning	
Improper fixing of wall tie		Repairing	
<b>WINDOWS AND FITTINGS</b>			
Non-functional window			Replacement
Dirty window		House keeping department	Daily cleaning
Blind not provided	Repair department	Replacement	
Window corrode		Repair or replacement	
<b>DOOR AND FITTINGS</b>		Repair and replacement	
Door damaged		Schedule inspection	
Door knob damaged			
Peeling of paint at door			
Untidy door painting			
Door key missing			
Ironmongery damaged			
<b>CEILING FINISHES</b>			
Ceiling damaged	BM operation	Replacement	
Fungus	House keeping department	Cleaning and ventilation	
Leakage	Repair department	Sealant coverage	
Stain mark	House keeping department	Cleaning	

Table 1 shows the wall, floor and finishes are the major defective elements with the most type of defects occurred. Doors and Fittings are identified as the second most defective element. A most defects were observed with door damaged highlighted as the most defective works. Meanwhile, door knob damaged as the least defective element. While windows and fittings, and ceiling finishes are identified as the third most defective works. The common problem was being identified at private hospital whereby the highest such as follows the top defect was at the Internal Fixture (timber decay, faulty door & window operation, broken door handle, etc), Sanitary fitting (blocked closet, blocked waste pipe, leaking tap, etc, Roof (leaking, blocked rainwater pipes, sagging, etc), Lift (stuck), waterproofing Leakage. The another top common problem maintenance at public hospital such as internal fixture (timber decay, faulty door & window operation, broken door handle, etc); secondly plumbing system (leaks at joint, mall function ball valves, ect); thirdly sanitary fitting (blocked closet, blocked waste pipe, leaking tap, etc); fourth internal wall (plaster loose, faded, blistered decoration, etc); fifth problem at drainage system (blocked drains).

### Conclusions

As summary, the case study a hospital public and a private hospital was being assessed. Therefore, practicing BM must integrate with green maintenance for green activities and ensure BM environment could optimise BM performance and wealth for the occupancy activities.

### References

- Anuar, A., Saad, R., & Yusoff, R. Z. (2017). Operational Performance As A Mediator On The Relationship Between Lean Healthcare And Sustainability Among Private Hospitals In Malaysia Using PLS-SEM. *Journal of Information System and Technology Management*, 2(6), 84-104.
- Affendy, M., Yao, L., & Kamarudin, D. (2017). In-House Green Knowledge Practice for Hospital Building Maintenance. *Journal of Information System and Technology Management*, 2(6), 62-72.
- Azuin, R. Zainal, A., Mohd Idrus M (2013) Safety and Health Factors Influencing Performance of Malaysian Lo-Cost Housing: Structural Equation Modeling (SEM) Approach International Conference on Innovation, Management and Technology Research, Malaysia, *Procedia -Social and Behavioral Sciences*, pp1-8.
- Awang, M. B., Mohammed, A. H. B., Abdullah, S. I. B. and Abdul Shukur, F. S. B. (2011). Facilities Management Competency Imperatives to Realize Polytechnic Transformation Goals. *Proceeding of the International Conference On Management (ICM 2011)*, Skudai, Johor Bharu, Universiti Teknologi Malaysia, 480-496.
- Damgaard, T. And Hansen, A.P. (2012) Communities of Practice as a Learning Challenge in Construction Projects -How FM Knowledge can be integrated in the learning process. In Jensen, P.A & Nielsen, S.B. (eds.) *Facilities management research in the Nordic countries: past, present and future*. Polyteknisk forlag.
- Fong, P S and Lee, H F (2009) Acquisition, reuse and sharing of knowledge in property management firms. *Facilities*, 27(7/8), 291-314.
- Hashim, A. E., Samikon, S. A., Nasir, N. M., & Ismail, N. (2012). Assessing Factors Influencing Performance of Malaysian Low-Cost Public Housing in Sustainable Environment. *Procedia -Social and Behavioral Sciences*, 50(July), 920-927. doi:10.1016/j.sbspro.2012.08.093



Proceeding: International Research Conference on Social Sciences,  
(IRCSS, 2018) (ISBN: 978-967-14841-5-9)  
Bayview Hotel, Langkawi  
Kedah, Malaysia

- Laura Tupenaite, Loreta Kanapeckiene, Jurga Naimaviciene (2008) Knowledge Management Model For Construction Projects ,The 8th International Conference “Reliability And Statistics In Transportation And Communication - 2008
- Itard L and F Meijer (2008) Towards a sustainable Northern European housing stock. Sustainable urban areas 2008; 22:213. Amsterdam: IOS.
- Pemsel, S. And Blomé, G. (2012) Knowledge as a source of power in real estate organisations. In Jensen, P.A & Nielsen, S.B. (eds.) Facilities management research in the Nordic countries: past, present and future. pp. 253-266 Polyteknisk forlag.
- Thaleia Konstantinou and Ulrich Knaack (2011) Refurbishment of residential buildings: a design approach to energy-efficiency upgrades International Conference on Green Buildings and Sustainable Cities, Procedia Engineering 21 pp 666-674.
- Ogunlana, S., Siddiqui, Z., Yisa, S., Olomolaiye, P. Factors and procedures used in matching project managers to construction projects in Bangkok (2002) International Journal of Project Management, Vol. 20, pp. 385-400.
- Olomolaiye, A, Liyanage, C, Egbu, C O and Kashiwagi, D (2004) Knowledge management for improved performance in facilities management. In: Bell, R E (Ed.), Proceedings of Construction and Building Research (COBRA) Conference, 7-8 September 2004, Leeds Metropolitan University, UK. RICS Foundation.