Hostel Facility Maintenance Preliminary Finding of Higher Education Institution in Malaysia

Yuseni Ab Wahab [1], Abd Samad Hasan Basari [2]

[1] Faculty of Business Innovation and Accounting, Kolej Universiti Islam Melaka (KUIM), Kuala Sungai Baru 78200, Masjid Tanah, Melaka, yuseni@kuim.edu.my
[2] Centre for Advanced Computing Technology (C-ACT), Faculty of Information & Communication Technology, UTeM, Hang Tuah Jaya, 76100, Durian Tunggal, Melaka, abdsamad@utem.edu.my

Abstract- Hostel Facility Maintenance (HFM) is essential to prolong the hostel building life cycle and reduce the company loss. When hostel buildings are neglected, defects can occur which may result in extensive and unavoidable damage to the building fabric or structure. The objective of this study is to identify Higher Education Institution in Malaysia (HEIM), case study Kolej Universiti Islam Melaka (KUIM**)** focus on preliminary finding in hostel facility maintenance problems. As such, the chosen facility maintenance building needs to be identified before the research start. The defect and the problem face will be collected and noted in a check list. This will be done by questionnaires and distributed to all service users in KUIM building maintenance management office and student hostel. Interview sessions and site visit are also conducted to understand the problem encounter. Hence, this paper is focusing on the maintenance management system which the aim is to reduce the downtime of plant items taking into account the possible impact of a failure in terms of cost. The analysis shows that the Hostel Facility Maintenance contributed to the most problematic area in KUIM. Based on the preliminary finding, it shows that there is a need to propose a systematic in Hostel Facility Maintenance.

Index Terms- Hostel Facility Maintenance; Analyse of breakdown, downtime and cost

I. Introduction

Maintenance is defined as a combination of technical in addition to administrative activities causing the actual safety in addition to satisfactory function regarding tool repair involves many methods from standard cleaning in order to fixes in addition to substitutions. . It can be as small as changing a washer to stop a leaking tap, or as large as repainting an entire building. Beneficial repair allows retain the value of the building and makes the property more enjoyable to occupy. Forget about regarding repair also can be a hearth in addition to safety risk to safety that could cause becoming officially chargeable for just about any accidents[1],[2].

II. TYPE OF MAINTENANCE

Maintenance may be labeled according to why and when it happens, and also consists of:-

a) Corrective maintenance - to keep the building at an acceptable standard. This includes cleaning gutters and changing light bulbs. Corrective maintenance would normally be carried out by the occupant.
b) Predictable (planned) maintenance - to prevent predictable failure of building infrastructure or capital items. This includes repainting surfaces or replacing roof cladding at the times specified by product manufacturers.
c) Emergency corrective maintenance - must happen immediately for health and safety or security reasons. This includes work that may result in the rapid deterioration of the structure or fabric if unattended to immediately. Such includes roof repairs after cyclones, graffiti removal or repair of broken glass.

A repetitive process is needed in order to provide adequate maintenance. A maintenance plan will ensure the correct approach is carried out and any shortfalls are discovered and corrected in a timely manner. Maintenance includes the required processes and services carried out to preserve, repair, protect and care for the building's fabric and engineering services after completion, repair, refurbishment or replacement to current standards to enable it to serve its intended functions throughout its entire lifespan without drastically upsetting its basic features and use [3],[4].

The premise for this study is the move from the building and its management as the main focus for the maintenance management process towards the value chain (enhance productivity and user satisfaction) as the main focus. The value chain is the focus for more effective and efficient strategy of creating value to maintenance organization and building users. Value creation is increasingly viewed as a process of facilitating a network of relationships within which organizations are positioned [1, 5]. The deficiencies in the practices could be due to the way the policies are framed, how they are being understood or how they are enforced. Good maintenance management should be simple, dynamic, and capable of periodic review as the need arises to accommodate technological advancements and the clients' and users' value systems [3]. When developing a maintenance management system, users (and client-occupiers) must be involved to ensure that their satisfaction is proactively taken into account while formulating the maintenance policy. In addition, the current proposals depend on the physical conditions of the building to establish the maintenance need and, therefore, are conditional based. Conditionally based maintenance is not a proactive maintenance policy. At best, all that a condition-based maintenance policy does is to provide a snapshot of the physical condition of the

building at the specific time that the survey was conducted. Conditionally based maintenance policy is not explicitly linked to the ability of a building to support organization performance [5],[6]. The physical condition of a building is just a symptom of defects, deterioration, or decay, or their combination. Under the current approaches to buildings maintenance, maintenance is not factored as a factor of production, which also leads to the fragmentation of the building management processes [7].

III. PROBLEM STATEMENT

There is an evident that a part of maintenance records coming from complaint and demand from user. Several drawbacks are listed below:

a) Maintenance schedule that not properly made for building maintenance.
b) There is lack of study and prediction to overcome building maintenance.
c) Unsystematic plan to reduce downtime of building items or reducing maintenance and inspection costs, taking into account the possible impact of a failure in terms of cost to the company.
d) Improve study is conducted on subjective measure of the consequences of such a failure in terms of cost, in monetary value to the company and the damaging effect to the company.

IV. RESEARCH OBJECTIVES

The main objectives of this research are as follows:

1) To investigate the problem of hostel facility maintenance in KUIM.
2) To analyze the number of breakdown, downtime and cost in KUIM facility maintenance.

V. SCOPE

University buildings usually are one of several components to make a top quality student. The actual buildings usually are procured to make a acceptable, conducive in addition to ample environment which helps, induces in addition to encourages learning, educating in addition to innovative developments. A failure within the availability of these kinds of vital products and services can be a reduction throughout importance towards university institution, the community, the particular University students, staff members as well as other stakeholders. Naturally simply by making brand-new buildings is usually helping to improve educational institutions and supply better top quality knowledge; however, it really is most important to maintain of the existing buildings to meet a satisfactory top quality standards which can handle facilitating the particular shift involving knowledge in addition to undertaking various other instructional things to do properly in addition to efficiently. This study is usually concentrating on KUIM constructing especially about KUIM hostel [7],[8].

VI. RESEARCH DESIGN

Figure 2.1 is a flowchart of the research design.

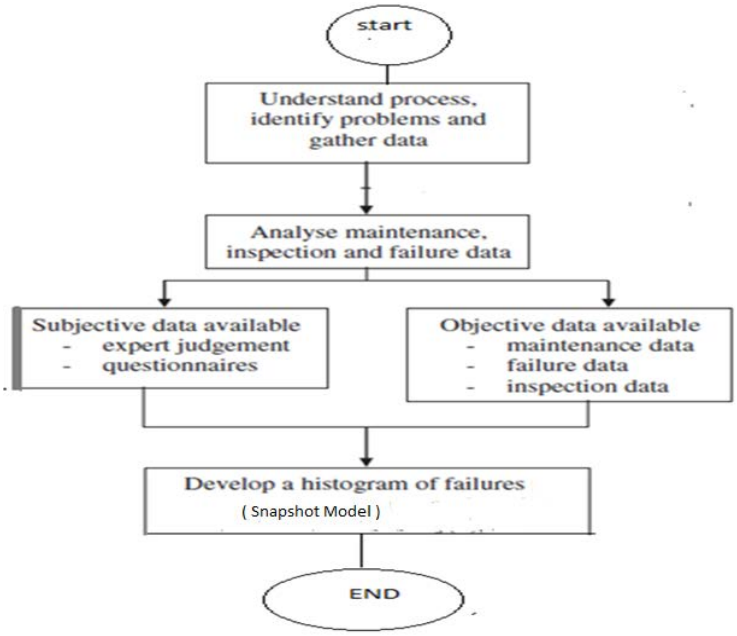

Figure 2.1. Flowchart of the research design

VII. UNDERSTAND THE PROCESS

Before the development of any maintenance model, a thorough understanding of the processes involved is essential. Insufficient or inadequate work in this area will almost certainly spell disaster in the task of understanding the problems of a company. When understanding a process it is equally important to consider the tasks carried out at inspection as well as during maintenance. It may be the case that there are several parts that fails regularly might be overlooked because it is inexpensive to correct.

VIII. IDENTIFY THE PROBLEMS

Many approaches applying risk-based research can be useful in this particular step in the review such as event tree analysis (ETA) or failure mode and effects analysis (FMEA) . Snapshot model [5, 8] is usually a kind of hierarchical research in which just about all feasible problems are categorized straight into distinct levels along with teams. ETA can be used to discover different feasible benefits, granted a commencing event. Certainly one of this is a portion declining, supplying indication to a part of products or maybe course of action pots even more research. FMEA may discover feasible failing modalities and also the outcomes about the method however could also provide a likely seriousness towards the influence, this particular being handiest when investigating environmentally friendly or maybe safety vital items. Obtaining verbal to upkeep professionals, manufacturing professionals along with crucial retail outlet ground workers, a comprehensive perception of the process really should now possibly be feasible. Difficulties including prolonged equipment failures, specifically when it comes to high-volume products really should just about all become

noticeable. Treatment must be consumed concerning whether a failure is often a upkeep concern instead of a anatomist concern or maybe agent concern. Certainly one of a anatomist concern may be attempting to a completely wrong illustrating or maybe method, a agent concern may be undertaking of your process applying completely wrong tooling or maybe using a device at a better charge in comparison with it turned out at first made to manage. Once the crucial place items are acknowledged in addition to a listing of predominant problems of this particular object, data will then possibly be compiled.

IX. ESTABLISH REQUIRED DATA

Data can come in many forms from maintenance departments and more often than not be extremely detailed; however, for the purposes of producing a maintenance model, this information is often unusable The majority of data gathered by maintenance departments are generally the name of the equipment or the part number to have failed, the repairs made including spare parts used and the time the repair or inspection has taken to return the equipment to production. Therefore, the type of data collected is important along with some basic assumptions for the equipment or component investigated. The types of data required for a maintenance model are as follows:

a) Average downtime due to inspection, *d*.
b) Average downtime for a breakdown repair, *db*.
c) Arrival rate of defects per unit time, *kf*.
d) Inspection period, *T*.
e) Failure rate l (1/MTBF).

Downtime due to inspection, d is the amount of time, on average, an inspection will take to complete and return the equipment to production. The average downtime due to a breakdown and subsequent repair of the equipment db is the time it takes on average to return the equipment to production. The units of both downtime inspection and breakdown repair downtime must be identical but can be measured in hours, days or months depending on the equipment under investigation. The arrival rate of a defect, *kf* is the average time a defect arises over a period of time, calculated by the number of defects divided by the total operating time of the equipment under investigation. The inspection period is simply the time interval between inspections. Failure rate l is the reciprocal of mean time between failures (MTBF), where MTBF is the mean operating time between failures of a component or piece of equipment. MTBF, however, should not be confused with the delay-time of a component or a piece of equipment. The delay-time is the time from an initial telltale sign of failure to actual failure, both being dependant on the inspection interval, T

X. GATHER DATA

The question as to whether a maintenance model is carried out using either subjective means or objective means is dependent on what data are available. If maintenance records of inspections carried out with details of failures encountered are available, then an objective maintenance model can be used to estimate the delay-time. If however these types of data are not available, then subjective maintenance model must be used. This can be achieved by gathering information from sources such as the maintenance team, operator personnel and management through the use of questionnaires. It has been previously suggested that the number of experts to use is in the region of 3–5 for subjective maintenance model. The consistency of the data is another aspect to consider when gathering data. There could be several sources of data available for a piece of equipment, giving different signals regarding completeness and accuracy of data, which could develop into a time-consuming activity to sort the valid data from the irrelevant data.

XI. OBJECTIVE DATA ANALYSIS

Objective maintenance model requires maintenance data as well as failure and inspection data in order to estimate the values of the parameters that will indicate the arrival rate of a defect l and the delay-time distribution.

XII. SUBJECTIVE DATA ANALYSIS

It has been documented that the delay-time concept as part of subjective data analysis to establish maintenance model is not as straightforward to understand by engineers and operators as first imagined during the study of equipment at a company. Therefore care needs to be taken when developing questionnaires or interrogating inspection data. To help avoid confusion when trying to implement a maintenance model to a manufacturing environment, the term ‘how long ago’ (HLA) and ‘how much longer’ (HML) can be used. The term HLA is a means of establishing from an engineer or a technician how long ago the fault could have been detected. The problem with asking for an estimate for HLA is that possible blame could be leveled at the individual for not identifying the hidden fault at an earlier inspection; therefore, care needs to be taken and trust gained when establishing HLA and HML figures. The delay-time, h can be calculated by adding the HLA and HML together.

XIII. ADVANTAGES AND DISADVANTAGES

There are several advantages and disadvantages for using the subjective maintenance model method for estimating a delay time for a plant or equipment establish maintenance model. The main advantage with subjective maintenance model is that limited failure data are required in order to establish a delay-time estimate, one simply relies on the expertise of the personnel involved with the running of the equipment; moreover, if the majority of maintenance and inspection data existing is unusable, then a means of establishing figures for the required parameters needs to be established even for objective maintenance model [11,12]. There are however some disadvantages with this method, one disadvantage being that if a lack of faults or failures of the equipment in question is infrequent, then it may take some time to gather enough data for subjective maintenance model to be viable. A second disadvantage is that it can be time consuming. The time to compile and issue the questionnaire to ensure that all staff involved in the process has an understanding

of the delay time concept. Understanding the delay-time concept has previously proved to be a tough challenge; therefore, the content of the questionnaire is of vital importance in order to avoid lengthy sessions with relevant experts explaining the questionnaire or gathering inaccurate data. In addition to establishing HLA and HML figures, there are other questions that need to be addressed, namely:

a) How many failures do you experience each working day/week/month?
b) What is the average downtime for each failure?
c) How many faults have been identified at each inspection?
d) Please give a brief description of the failure and fault.
e) Is the failure or fault preventable?
f) If the failure or fault is preventable, briefly describe how.

XIV. CASE STUDY

The case study is conducted at KUIM Hostel Building. The analysis is conducted by snapshoot model (Basari, ASH ,2009) The type of analysis includes :-

a.) Major fault analysis
b.) Downtime analysis
c) Cost analysis

XV. MAJOR FAULT ANALYSIS

Major fault analysis. - Major fault analysis is one of the main components of KUIM building analysis the critically of the components of the building can be assessed by looking at the frequency of the type of the faults occurred within the component. Details of the result could be seen in Table 3.1. The cause of fault analysis is really necessary and important in assessing the performance of the maintenance procedure and directions to which is needed to be completed. For example if the cause of fault is due to operator practice then the need of proper training and replace new component is likely reducing the number of faults or breakdowns[9],[10].

Table 3.1 Number of Faults by Cause of Faults and their Percentages for the Period from January 2012 to June 2012

		CAUSES OF FAULTS								TOTAL FAULT	PERCENT
		Jammed	Broken	Leak	Age	Poor design	Burn	clogged	Other		
TOTAL FAULT		24	126	55	0	23	0	13	5	8	100%
COMPONENT NAME/AREA OF FAULT	Door	16	102			2				120	48.8
	Water pipe			3		1		5	2	11	4.5
	Sliding door	4		11						15	6.1
	Toilet		15	7		7		8	3	40	16.3
	Ceiling		4	8		6				18	7.3
	Window	2	1	19		1				23	9.3
	Sink		3	7		6				16	6.5
	Table	2	1							3	1.2
PERCENT		9.8	51.2	22.4	0	9.3	0	5.3	2	246	100%

Figure 3.1 shows the total number of faults and detected faults. Details of the result could be seen in this figure and the result, Two worst components which are counted about 48.8% and 65.1% of the faults are Door and Lamp from other component . The major cause of faults that highly affected the maintenance in term of cost is broken for the both component.

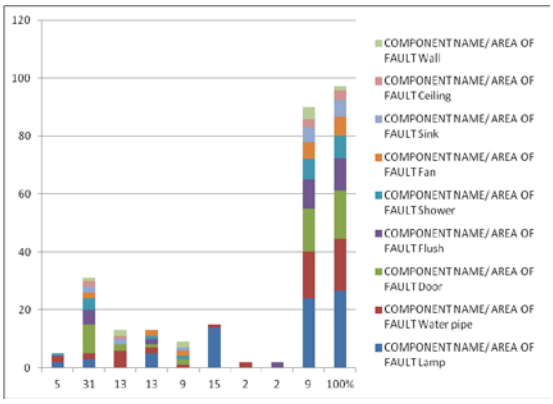

Figure 3.1 Numbers of Faults by Area and Cause of Faults for the Period from January 2012 to June 2012

3. 2 *Downtime analysis* - The term downtime means the time that an item of equipment is out of service, as a result of equipment failure. The downtime analysis aims to evaluate the performance of the equipment in term of its availability [13]. In this study the downtime is taken to be equal to the summation of the following times:

- The diagnosis time
- The repair time
- The waiting time for the technicians if there are no technicians at the time of the equipment failure
- The waiting time for the materials if there are no spare parts at the repair time.

Table 3.2 Estimated Total Downtime by Area and their Percentages for the Period from January 2012 to June 2012

		CAUSES OF DOWN TIME								TOTAL FAULT	PERCENT
		Jammed	Broken	Leak	Age	Poor design	Burn	clogged	Other		
TOTAL FAULT		600	2 400	336	0	312	0	408	0	8	100%
COMPONENT NAME/ AREA OF FAULT	Door	336	1 800			120				2 256	55.6
	Water pipe	192	72	144				24		432	10.7
	Sliding doo	72	24							96	2.4
	Toilet		336	48		120		336		840	20.7
	Ceiling		72	24		48				144	3.5
	Window		24	72						96	2.4
	Sink		72	48		24		48		192	4.7
	Table										
PERCENT		14.8	59.2	8.3	0	7.7	0	10	0	4 056	100%

Figure 3.2 depicts the estimated downtime by area and cause of faults. Table 3.2 shows the estimated downtime by area and their percentages. From the result, three worst components according to their cause of faults and associated downtime are Wall and Shower. The following observations can be concluded:

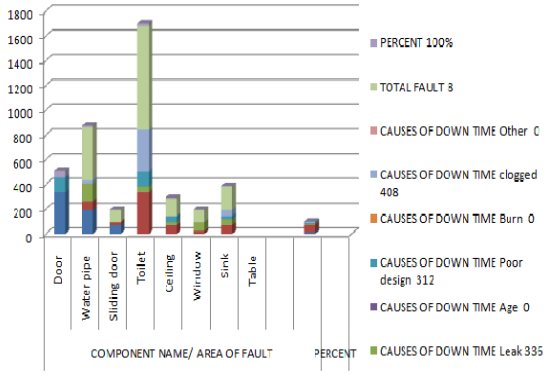

Figure3.2Total Downtime by Area and Percentages for the Period from January 2012 to June 2012

The aim of this analysis is to assess the severity of the faults that have occurred in term of downtime and the cost incurred. In this study the cost is taken to be equal to the cost of the technicians or contractors who carried out the diagnosis and repair of the building plus the cost of the materials if spare parts are used, and plus the production lost cost due to the disruption of the work. Table 3.3 shows the total estimated cost by area and cause of faults.

Table 3.3 Estimated Total Cost by Area and their Percentages for the Period fromJanuary 2012 to June 2012

	CAUSES OF FAULTS								TOTAL FAULTS	PERCENT
	Jammed	Broken	Leak	Age	Poor design	Burn	clogged	Other		
TOTAL FAULT	RM125	RM13 171	RM218	0	RM1 575	0	RM90	0	8	100%
COMPONENT NAME/ AREA OF FAULT: Door	RM70	RM10 125			RM675				RM10 870	71.42
Water pipe	RM40	RM63	RM174				RM5		RM284	1.86
Sliding door	RM13	RM120							RM170	1.12
Toilet		RM2 340	RM42		RM900		RM70		RM3 400	22.39
Ceiling		RM60	RM0		RM60				RM60	0.4
Window		RM10	RM0						RM10	0.06
Sink		RM240	RM0		RM80		RM15		RM345	2.27
Table										
PERCENT	0.82	86.77	1.44	0	10.38	0	0.59	0	15 178	100%

Table 3.3 show the total estimated cost by area and cause of faults. From the result, two worst components according to their cause of faults and associated cost are Door and Fan. The major cause of faults that highly affected the maintenance in term of cost is broken. For Door, the decreasing rate are from RM 13 770 to RM 10 125. As for Fan, the decreasing rate are from RM 1 755 to RM 675.

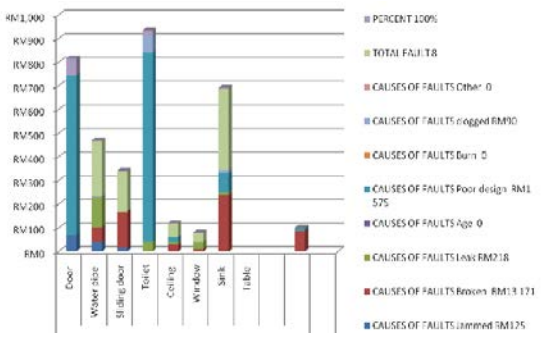

Figure 3.3 Estimated Total Cost by Area and Cause of Faults for the Period from January 2012 to June 2012

XVI. CONCLUSION AND DISCUSSION

Building Maintenance management for KUIM consists of managing, planning and also controlling the building maintenance. In spite of that there are four supporting factors that need to be considered in making KUIM building maintenance management more effective and efficient when it is executed.The Organization structure and general responsibilities of maintenance management.

a) The maintenance policies and standard for maintenance.
b) The maintenance management planning and scheduling.
c) The maintenance management for budgeting and cost controlling.[4]

Therefore, there is a deficiency in the ways in which building's maintenance procedures are being managed. Various attempts have been made to improve the performance of buildings through maintenance. While such schedule procedures offer the potential to improve the performance of maintenance management systems, the systems have, however, been reactive, hypothetical, and conditionally based. It is these substantial weaknesses in the proposed schedule procedures that have created the fundamental problems with the existing and proposed building maintenance management schedule procedure, causing their inability to improve the existing systems. Maintenance cannot be circumvented, but what is possible is that expenditure on building maintenance can be optimized through a proactive maintenance management system based on the concept of value[11],[12].Users measure the performance of their building in terms of various criteria that are consistent with their value systems. Maintenance management procedures must be based on the user's value systems. A significant impetus of value-based maintenance management is the progressive realization that maintenance must be viewed from engineering, scientific, technological,political, and commercial perspectives. [13],[14].The proposed research to KUIM maintenance management is focusing on the field inspection and condition assessment for educational buildings. KUIM can develop an approach that uses the available maintenance data and resources to predict the condition of components and prioritize them for inspection purposes which identify and investigate the defects, symptoms, and interrelationships among top building components [11].

ACKNOWLEDGEMENTS

This research is part of Degree of Doctor of Philosophy (PhD) in the Faculty Information and Communication Technology, Universiti Teknikal Malaysia Melaka (UTeM).

REFERENCES

[1] Olanrewaju, A. (2010) Case for alternative approach to building maintenance management of public universities. Journal of Building Appraisal 5: 201–212.

[2] Basari , ASH (2009). Maintenance Modeling Tools with special to Incomplete Data, Phd Thesis, Universiti Teknikal Malaysia Melaka (UTeM), Malaysia

[3] Y. Ab Wahab and A.S.H. Basari, "Analysis of down time and reliability estimation in hostel building maintenance-a case study," Middle-East Journal of Scientific Research, vol. 17, no. 9, pp. 1260-1268, 2013.

[4] Y Ab Wahab, ASH Basari, A Samad, "Building Maintenance Management Preliminary Finding of a Case Study in Icym," Middle-East Journal of Scientific Research 17 (9): 1260-1268, 2013

[5] Masood Bamadi, "A Review on Education of Dentistry," Middle-East Journal of Scientific Research 18 (7): 878-886, 2013

[6] Sharkul Taubaeva, Ajgul Bulatbaeva,Yuri Bogatyrev, Alexander Dementyev and Bakhit Barsay, "Study of the Educational Space of a Higher Military Educational Establishment," Middle-East Journal of Scientific Research 21 (1): 51-55, 2014

[7] Amaechi Udefi, "The Trouble with Nigerian Universities, the Menace of Bogus Policy and Speculative Ideology" Middle-East Journal of Scientific Research 21 (5): 855-869, 2014

[8] B. Jones, I. Jenkinson, and J. Wang, "Methodology of using delay time analysis for a manufacturing industry," Reliability Engineering & System Safety, vol. 94, no. 1, pp. 111–124, 2009.

[9] W. B. Wang, D. Banjevic, and M. Pecht, "A multi-component and multi-failure mode inspection model based on the delay time concept," Reliability Engineering & System Safety, vol. 95, no. 8, pp. 912–920, 2010.

[10] W. B. Wang, "Delay time modeling," in Murthy DNP, Kobbacy AKS, Ed. Complex system maintenance handbook, Amsterdam: Springer; pp. 345–70, 2008.

[11] Yuseni Ab Wahab, Abd Samad Hasan Basari ,'Replacement Model for Higher Education Institution Hostel Building Maintenance in Malaysia' International Journal of Trade, Economics and Finance, IJTEF 2014 Vol.5(5): 449-453 ISSN: 2010-023X October 2014

[12] Y Ab Wahab, ASH Basari, B Hussin Replacement Model for Hostel Building Case Study: ICYM, Middle-East Journal of Scientific Research 21 (11): 1977-1981, 2014 ISSN 1990-9233 © IDOSI Publications, 2014

[13] Y Ab Wahab, ASH Basari "Identifying the Best Parameter Distribution for University Hostel Building Maintenance" Middle-East Journal of Scientific Research 22 (8): 1145-1149, 2014 ISSN 1990-9233 © IDOSI Publications, 2014

[14] Yuseni Ab Wahab , Abd Samad Hasan Basari."Best Parameter of the Hostel Building Component Maintenance" International Journal of Computer Applications 110(15):17-20, 2015 © IJCA January 2015

AUTHORS

First Author – Yuseni Ab Wahab, Faculty of Business Innovation and Accounting, Kolej Universiti Islam Melaka (KUIM), Kuala Sungai Baru 78200, Masjid Tanah, Melaka, Email: yuseni@kuim.edu.my

Second Author – Abd Samad Hasan Basari, Centre for Advanced Computing Technology (C-ACT), Faculty of Information & Communication Technology, UTeM, Hang Tuah Jaya, 76100, Durian Tunggal, Melaka, Email: abdsamad@utem.edu.my