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IMPROVED SNAPSHOT MODEL FOR MAINTENANCE MANAGEMENT PRACTICES (CASE STUDY: ISLAMIC UNIVERSITY INSTITUTIONS HOSTEL IN MALAYSIA)

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Abstract

Islamic University Institutions hostel maintenance management is essential to prolong the building life cycle and reduce the company loss. When University hostel 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 Islamic University Institutions hostel in Malaysia to find the maintenance problems used the snapshot model is to determine the major dominant fault, cause of fault, prevention and consequence analysis. 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 Islamic University Institutions hostel management student hostel. Hence, this paper is focusing on the Islamic University Institutions hostel management used snapshot model is to identify and determine the major dominant fault, cause of fault, prevention and consequence analysis 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 building contributed to the most problematic area in Islamic University Institutions hostel based on snapshot model is a kind of hierarchical analysis where all possible failures are classified into different levels and conclude the major dominant fault, cause of fault, prevention and consequence analysis.

Keywords: Snapshot Model; Defect and Failure

1.0 Introduction

Snapshot model is a kind of hierarchical analysis where all possible failures are classified into different levels. The snapshot model is to identify and determine the major dominant fault, cause of fault, prevention and consequence analysis.

The type of data required to conduct snapshot analysis include type or area of faults/ failures, causes of the faults/failures, consequences of faults/failures (such as downtime or cost), and possible means of preventing the occurrence of the faults (Basari, 2009). Snapshot model also used to identify and define the problem and identify the daily inspection maintenance problem (Onyenanu, 2010).

By using the model, a suggestion to improve the inspection policy has been presented to engineers in order to reduce the downtime occurs during operations as well as the availability. It also presents some component replacement policy that might be improved. Further investigation has been conducted by Olanrewaju et al., (2010) to check the improvement when the suggestion on previous study being implemented. They indicate that the number of breakdowns during operations has reduced and the proper maintenance approach has also been implemented by following to the previous study suggestions.

1.1 Snapshot Modelling Process

This section discussed the analysis and design of the data collection module and also discusses the analysis and design of the snapshot analysis module. The main process of the snapshot analysis is broken into several detail processes.The process of snapshot model (Basari, 2009) passes through three major stages which are the collection of the data, the analysis of the data, and the presentation of the results to the users (maintenance engineers)[1]. The snapshot modelling requires specific type of data and information that are used in the process of maintenance problem identification. Such types of data include: (Meng and Minogue, 2011;Adcroft and Willis, 2008; Sims et al., 2007;Raynal and Stainer, 2012)

1. Cause of fault: This could be attributed to operator error, poor maintenance, wearing and ageing and others. Data of this type could be used to establish the nature of the source of the problem within the plant.
2. Consequences of fault: Data of this type may include the time lost or the downtime due to waiting for repair crews, waiting for or collecting spares, and repair itself, and also the cost incurred. This data could be used in identifying the factors that constitute the downtime and the cost and
3. Prevention action: It is often possible to identify the viable means or procedures for preventing or delaying the fault or failure from recurring. Such procedures could be some form of preventive maintenance or replacement, redesigning or operator training.

However, the data specified above are difficult to be found i.e. incomplete data in any organisation and also very tedious to be collected on a dynamic basis if the maintenance management information system is supposed to be used. For this reason, Basari (2009) suggested the usage of a survey form for collecting such type of data on a periodic basis [2].

The survey form will be designed with the collaborations of maintenance engineers and operational research analysts. The designed survey form then will be delivered to the maintenance engineers responsible for the repair of the hostel building component [3]. At each failure or maintenance intervention, the engineer registers the data related to the snapshot model in a survey form. After obtaining a satisfactory sample of the data, operational research analyst collects back the survey form and starts the analysis process. The results of the analysis, which is either in a graphical or tabular form, then will be reported back to the maintenance engineers. The results obtained are expected to reveal the true status of the hostel maintenance under the study[4]

1.2 Problem statement

The most critical component in hostel facilities maintenance in Higher Education Institutions (HEI's) is still a lack of accuracy and misleading. According to Lind et al., 2012, maintenance problem identification based on the snapshot model in the case of failure data is essential for maintenance engineers to analyse the maintenance problems. In the current snapshot model, there is an analysis of the major fault type where each component is listed with the number of faults. For instance, if a component that develops the highest number of faults is identified, it will disrupt the maintenance work of the hostel facilities and this will incur cost and downtime. Thus, ranking such a component as the most critical one is misleading. Even though the ranking is established and proper analyses are conducted, an overall ranking based on all the criteria is not considered. This could have no meaning to the users (maintenance staff) and lead to wrong decisions (Burhanuddin et al., 2015). Deeper analysis also needs to be considered to increase the accuracy of maintenance problem identification which could affect the whole building component (Swallow, 2007).

1.3 Research Objectives and Scope

The main objectives of this research are as follows:

- To identify the problem of building maintenance management in Islamic University Institutions hostel in Malaysia
- to increase the snapshot model in identifying and ranking the most critical components in hostel facilities maintenance
- To analyze the number of breakdown, downtime and cost in in Islamic University Institutions hostel maintenance management a using snapshot model.

1.3.2 Scope

Islamic University Institution, are one of the factors to produce good student. The Islamic University Institution are procured to create a suitable, conducive and adequate environment that supports, stimulates and encourages learning, teaching and innovations[5]. A failure in the supply of these essential services is a loss in value to the Islamic University Institution, the community, the students, staff and other stakeholders. Constructing new buildings helps to upgrade educational facilities and provide better quality education; however, it is of utmost importance to maintain the existing buildings to acceptable performance standards that are capable of facilitating the transfer of knowledge and carrying out other academic activities effectively and efficiently. This research is focusing on Islamic University Institutions hostel especially on KUIM hostel[6].

1.0 Research Design

The snapshot analysis process is the major snapshot analysis module. The main process of the snapshot analysis is decomposed into several detail processes. The new detail conceptual flow diagram is given in Figure 4.3

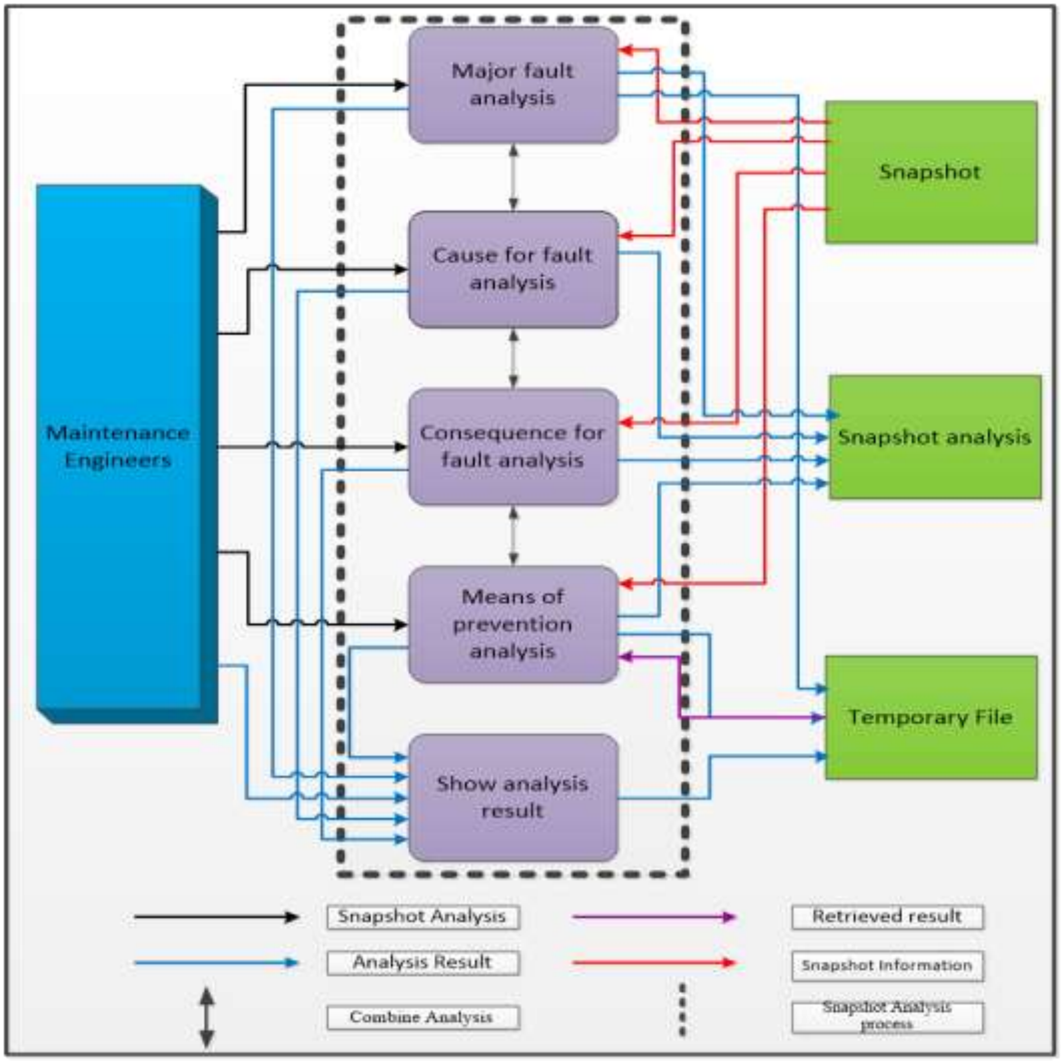


Figure 4.3 Details Conceptual Flow Diagram for Snapshot Analysis Process

As shown in Figure 4.3, it is recognised that the snapshot model is a collection of different types of analysis. The common types of snapshot analysis include:

1. Major fault analysis.
2. Cause of fault analysis,
3. Consequence of fault analysis
4. Prevention action analysis.

Extra analyses have been added that aim to augment and enhance the current snapshot model. The additional analyses include:

1. Combined Major Fault with the cost analysis.
2. Combined Major Fault with the Downtime analysis.
3. Combined Major Fault with the fault mode analysis.

4. Combined Major Fault with the fault effect analysis.
5. Combined Major Fault with the number of faults, cost and downtime

The major fault analysis is a type of analysis that lists all the components of a HFM with their frequencies classified as fault type which are inspection, breakdown or corrective. The analysis aims to assess the severity of the faults in term of their frequencies. The analysis assumes that the component, which developed the highest frequency of fault, is the most critical and need to give more attention.

The cause of fault analysis displays the components of the HFM associated with their frequency of faults and each number of faults are divided into their cause of faults. For instance, consider a component of a HFM that developed 10 faults classified according to their cause as 3 caused by wear and tear, 5 caused by end of expired, and 2 caused by the human error, and then the component will be listed according to this classification. This kind of analysis aims to identify the most potential cause of faults. The importance of such kind of analysis stems from the fact that it can prevent solving the wrong problem. For instance, if the frequent cause of the fault is the main problem, then the training of the personnel on the operation of the HFM is likely to solve the problem than conducting preventative maintenance or increasing its interval [7].

The cost analysis aims to assess the severity of the faults in term of the cost incurred. For the cost analysis, the components of the building will be listed and associated with their corresponding cost. Similarly for the downtime analysis, the components of the HFM will be displayed along with their corresponding cost. The assessment of the analysis is perceived as the component which incurred the highest cost is the most critical part [8].

The consequence of downtime analysis aims to assess the severity of the faults in term of the incurred. In the downtime analysis, the components of the building will be listed and associated with their corresponding downtime[9]. Similarly for the downtime analysis, the components of the HFM will be displayed along with their corresponding downtime. The assessment of the analysis is perceived as the component which incurred the highest downtime is the most critical part[10].

The prevention action analysis is a kind of analysis that lists the components of the building or subsystem with their number of faults which is associated with their corresponding prevention action. The analysis aims to identify the viable means of preventing the fault from occurring[11].

The combined major Fault with the cost analysis is consisting of an analysis that lists the components of the HFM with their major fault and cost analysis. The aim of the analysis is to augment the assessment of the severity of the faults by comparing the frequency of faults with cost analysis.

The combined major fault and downtime analysis consist of an analysis that lists the components of the HFM with their major fault and downtime analysis. The aim of the analysis is to augment the assessment of the severity of the faults by comparing the frequency of faults with downtime analysis.

The combined major fault and fault mode analysis consists of an analysis that lists the components of the HFM with their frequencies classified as fault mode. The aim of the analysis is to augment the assessment of the severity of the faults by adding the fault mode factor.

Similarly, the combined major fault and fault effect analysis consists of an analysis that lists the components of the HFM with their frequencies classified as fault effect. The aim of the analysis is to augment the assessment of the severity of the faults by adding the fault effect factor [12].

The enhanced consequence analysis is also an additional analysis that aims to rank the critical components of the machine taking into consideration the frequency of faults, cost and downtime. In the case of combined major fault and cost analysis, it consists of an analysis that lists the components of the HFM with their major fault and cost analysis. The aim of the analysis is to augment the assessment of the severity of the faults by comparing the frequency of faults with cost analysis [13].

The combined of all analysis consists of an analysis that lists the components of the HFM with their Major Fault with the number of faults, cost and downtime analysis.

The aim of the analysis is to augment the assessment of the severity of the all possible analysis provided by the enhanced snapshot analysis.

Major fault analysis is one of the main components of snapshot analysis. By this kind of analysis, the criticality of the components of the HFM can be assessed by looking at the frequency of the type of the faults occurred within the component [14]

5.2 Enhanced Snapshot Model

By using the enhanced snapshot model, nine types of analysis are developed. The four analyses are Major fault analysis, Cost analysis, Downtime Analysis and Prevention Action Analysis which is adapted from the current snapshot model. Then, an additional analysis offered five analyses, namely Combined Major Fault with the Cost Analysis, Combined Major Fault with the Downtime Analysis, Combined Major Fault with the Fault Mode Analysis, Combined Major Fault with the Fault Effect Analysis and Combined Major Fault with the Number of Faults, Cost and Downtime. In the following paragraph, detail description about each type of analysis is given[15].

Major fault analysis.

Major fault analysis is one of the main components of snapshot analysis. By this kind of analysis, the criticality of the components of the hostel facility maintenance is 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 5.1. From the result, three worst components which are counted about 77 % of the faults are Lamp, Door and window calculated about 28.1%, 27.5% and 21.3% came from other components.

Table 5.1 Total number of faults Area and Types of Faults for the period from 1 July 2012 to 30 Dec 2012 (KUIM)

		July	August	Sept	Oct	Nov	Dec	TOTAL FAULT	PERCENT
	Component	Jammed	Broken	Leak	Age	Poor Design	Other		
COMPONENT NAME/ AREA OF FAULT	Lamp	35	35	25	15	14	11	135	28.1
	Door	43	37	21	16	10	5	132	27.5
	Window	30	27		15	12	18	102	21.3
	Shower	7	6		7	10	4	34	7.1
	Sink	7	11		3	4	4	29	6
	Pipe		7	10	7		3	27	5.6
	Toilet	6				9	4	19	4
	Bed		1		1			2	0.4
PERCENT		128	124	56	64	59	49	480	100 %

As shown in Figure 5.2 it shows the total number of fault area and the type of faults for the period from 1 July 2012 to 30 Dec 2012. The Door has the highest percentage among all of the others faults, while the lowest percentage of the number of faults are bed.

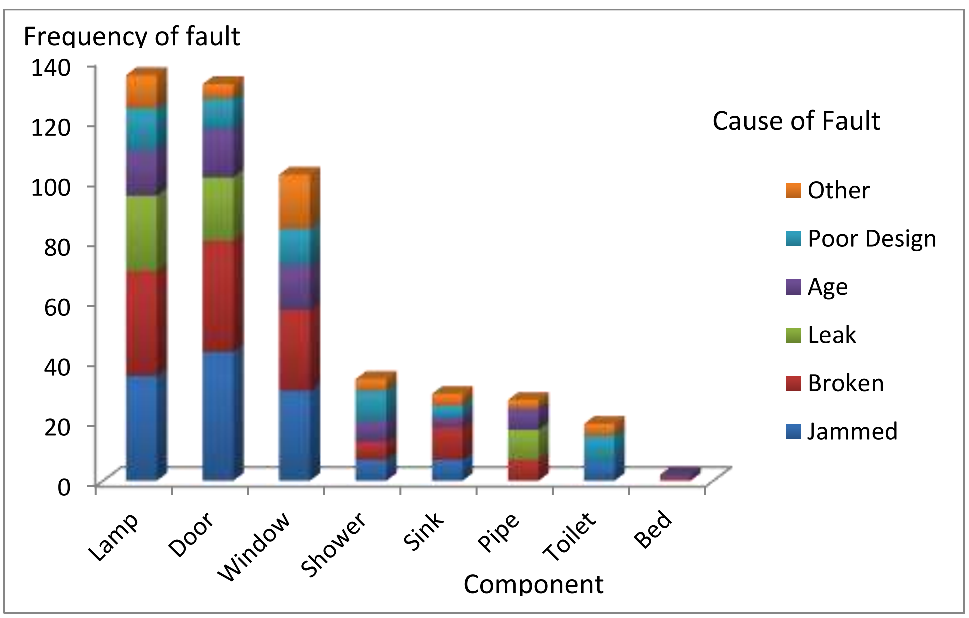


Figure 5.2 Total number of faults Area and Types of Faults for the Period from 1 July 2012 to 30 Dec 2012

Cost analysis

The Table 5.2 below shows the estimated total cost of fault by area and their percentages for the causes of cost of facilities for the period from 1 July 2012 to 30 Dec 2012. The component name/area of cost including door, window, lamp, pipe, shower, sink, toilet and bed. Calculation is made according the month start with 1 July to 30 Dec 2012.

Table 5.2 Estimated Total Cost by Area and their Percentages for the

Period from 1 July 2012 to 30 Dec 2012 (KUIM)

CAUSES OF COST									
		July	August	Sept	Oct	Nov	Dec	TOTAL FAULT	PERCENT
	Component	Jammed	Broken	Leak	Age	Poor Design	Other		
COMPONENT NAME/ AREA OF FAULT	Door	4300	1850	2100	1600	1000	500	11,350.00	32.4
	Window	3000	2700		1500	1200	1800	10,200.00	29.2
	Lamp	1400	1400	1000	600	560	440	5,400.00	15.4
	Pipe		560	800	560	1120	880	3,920.00	11.2
	Shower	350	300		350	500	200	1,700.00	4.9
	Sink	350	550		150	200	200	1,450.00	4.1
	Toilet	180				270	120	570	1.6
	Bed		200		200			400	1.1
Total/component		25.96	24.7	8.65	15.6	12.42	12.56	34,990.00	100%

As shown in Figure 5.3, it shows the estimated total cost of faults by area and the cause of faults for the period from 1 July 2012 to 30 Dec 2012. In July, door is the highest percentage compared among all of the others faults and the other months, while the lowest percentage compared to the other entire fault is in September. Lower cost component is Toilet and bed with 1.6% and 1.1 % in HFM.

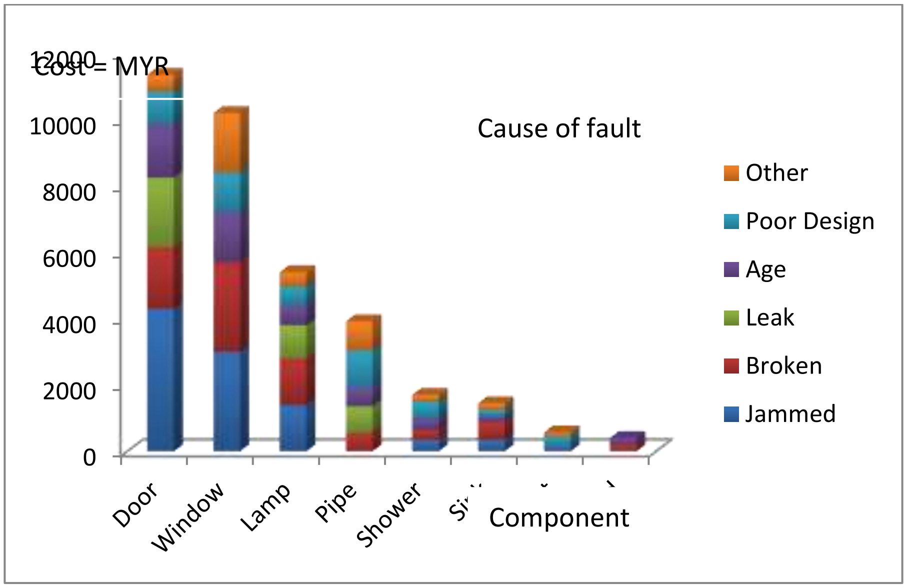


Figure 5.3 Estimated Total Cost by Area and Cause of Faults for the Period from 1 July 2012 to 30 Dec 2012

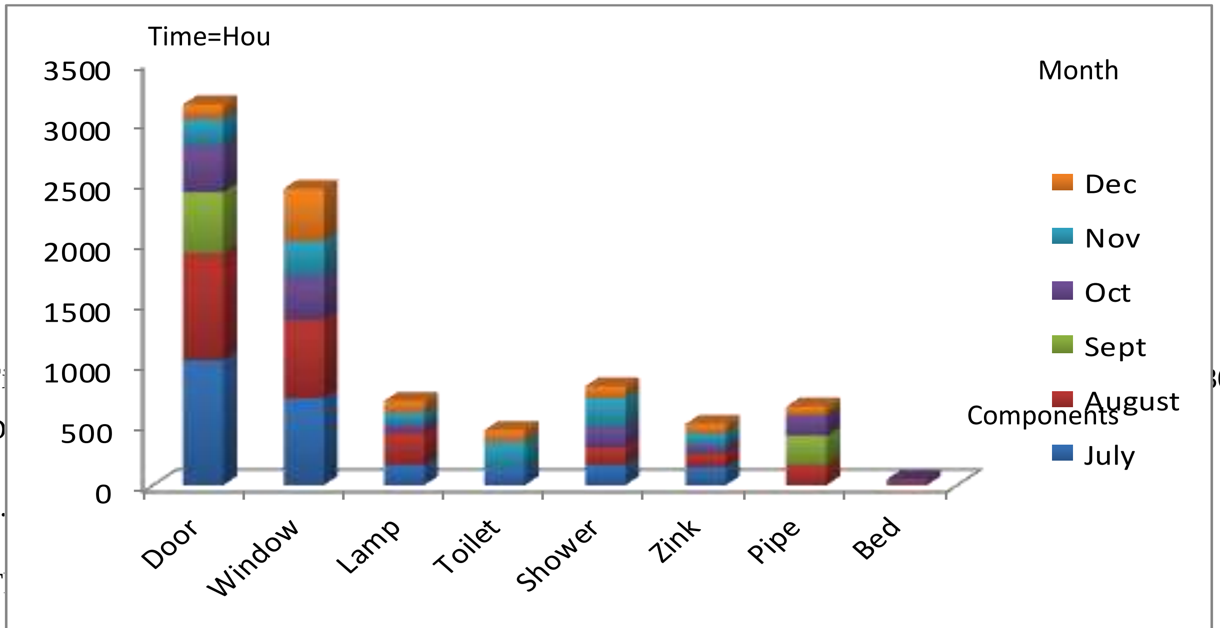
Downtime Analysis

The Table 5.3 below shows the estimated total downtime of fault by area and their percentages for the causes of downtime of facilities for the period from 1 July 2012 to 30 Dec 2012. The component name /area of downtime is including lamp, door, window, shower, sink, pipe, toilet and bed.

Table 5.3 Estimated Total Downtime by Area and their Percentages for the Period from 1 July 2012 to 30 Dec 2012 (KUIM)

		DOWNTIME CALCULATION						TOTAL TIME	PERCENT
		July	August	Sept	Oct	Nov	Dec		
COMPONENT NAME/ AREA OF FAULT	Door	1035	881	504	382	222	120	3144	36
	Window	720	648		360	288	432	2448	27.4
	Lamp	168	264		72	96	96	696	8
	Toilet	144				216	96	456	5
	Shower	168	144		168	240	96	816	10
	Zinc	150	110		72	96	78	506	6
	Pipe		168	240	168		72	648	7
	Bed		24		24			48	0.6
	Percet (100%)	27	25	8	14	13	22	8762	100

As shown in Figure 5.4 it shows the estimated total downtime by area and the cause of faults for the period from 1 July 2012 to 30 Dec 2012.The Door has the highest percentage among all of the others faults followed by Window and Lamp, while the lowest percentage of the number of faults are bed.



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July 2012 to 30 Dec 2012. The component name/area of fault including door, window, lamp, pipe, shower, sink, toilet and bed. The prevention action that it takes is a components (Redesign, detection based, operate to failure, inspection, and also the preventive maintenance).

Table 5.4 Number of Faults by Prevention Actions and their Percentages for the period from July 2012 to 30 Dec 2012

			Prevention Action			TOTAL FAULT	PERCENT
	Redesign	Detection	Operate to failure	Inspection	Preventive Maintenance		
Lamp					135	135	28.1
Door	5	10	2	2	80	132	27.5
Window	10	5		5	82	102	21.3
Shower					34	34	7.1
Sink					29	29	6
Pipe					27	27	5.6
Toilet	7		5		7	19	4
Bed	1				1	2	0.4
					Percent/Total	480	100%

As shown in Figure 5.5 it shows the number of faults by prevention actions and their percentages for the period from 1 July 2012 to 30 Dec 2012. From the Figure 5.5 the lamp the higher percentage among the other due to the preventive maintenance. The lowest is a bed, while the sink and pipe almost have the same percentage of preventive maintenance.

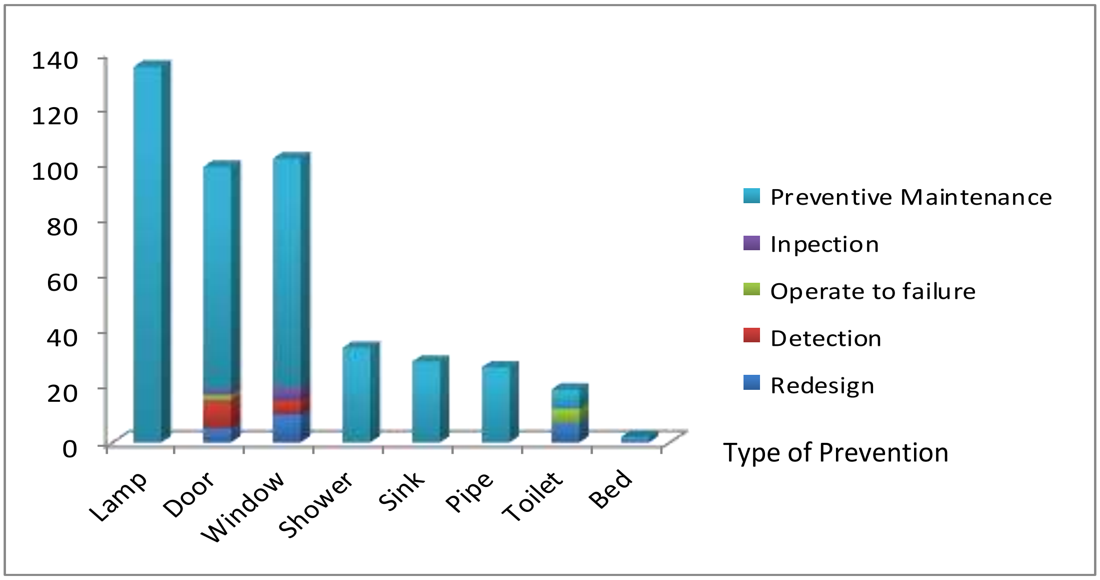

Figure 5.5 Numbers of Faults by Prevention Actions and their Percentages for the Period from 1 July 2012 to 30 Dec 2012.

Combined Major Fault with the Cost Analysis

The Table 5.5 shows the combination of major fault with the cost analysis for the period from 1 July 2012 to 30 Dec 2012. The component name/area of fault including lamp, door, window, shower, sink, pipe, toilet and bed.

Table 5.5 Combined Major Fault with the Cost Analysis for the

Period from 1 July 2012 to 30 Dec 2012 (KUIM)

	Component	Fault	%	Cost	%
COMPONENT NAME/ AREA OF FAULT	Lamp	135	28.1	11,350.00	32.4
	Door	132	27.5	10,200.00	29,2
	Window	102	21.3	5,400.00	15.4
	Shower	34	7.1	3,920.00	11.2
	Toilet	29	6	1,700.00	4.9
	Sink	27	5.6	1,450.00	4.1
	Pipe	19	4	570	1.6
	Bed	2	0.4	400	1.1
	Total/Percent	480	100%	34990	100%

Figure 5.6 shows the combination of major fault with the cost analysis for the period from 1 July 2012 to 30 Dec 2012. The top three high component cost is lamp, door and window and the lowest is sink, pipe and bed

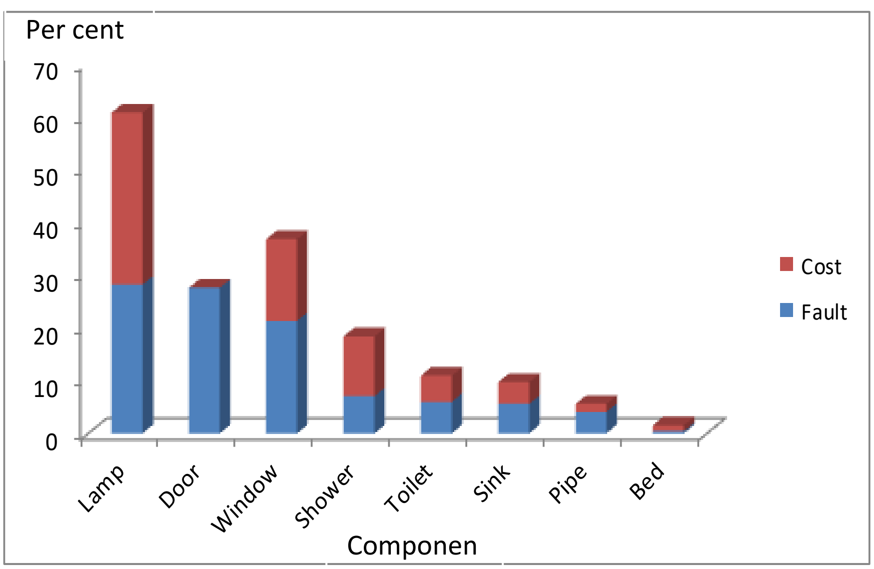

Figure 5.6 Number of Faults and the Associated Cost by Area for the Period from 1 July 2012 to 30 Dec 2012

Combined Major Fault with the Downtime Analysis

The Table 5.6 shows the combination of major fault with the downtime analysis for the period from 1 July 2012 to 30 Dec 2012. The component name/area of fault including lamp, door, window, shower, sink, pipe, toilet and bed.

Table 5.6 Combined Major Fault with the Downtime Analysis for the Period from 1 July 2012 to 30 Dec 2012 (KUIM)

	Component	Fault	%	Downtime	%
COMPONENT NAME/ AREA OF FAULT	Lamp	135	28.1	136	9
	Door	132	27.5	560	35.5
	Window	102	21.3	248	16
	Shower	34	7.1	160	10
	Toilet	29	6	200	12.5
	Sink	27	5.6	112	7
	Pipe	19	4	136	9
	Bed	2	0.4	16	1
	Total/Percent	480	100%	1568	100%

The Figure 5.7 shows the combination of major fault with the downtime analysis for the period from 1 July 2012 to 30 Dec 2012. The Door has the highest percentage among all of the others faults, while the lowest percentage of the number of faults are bed.

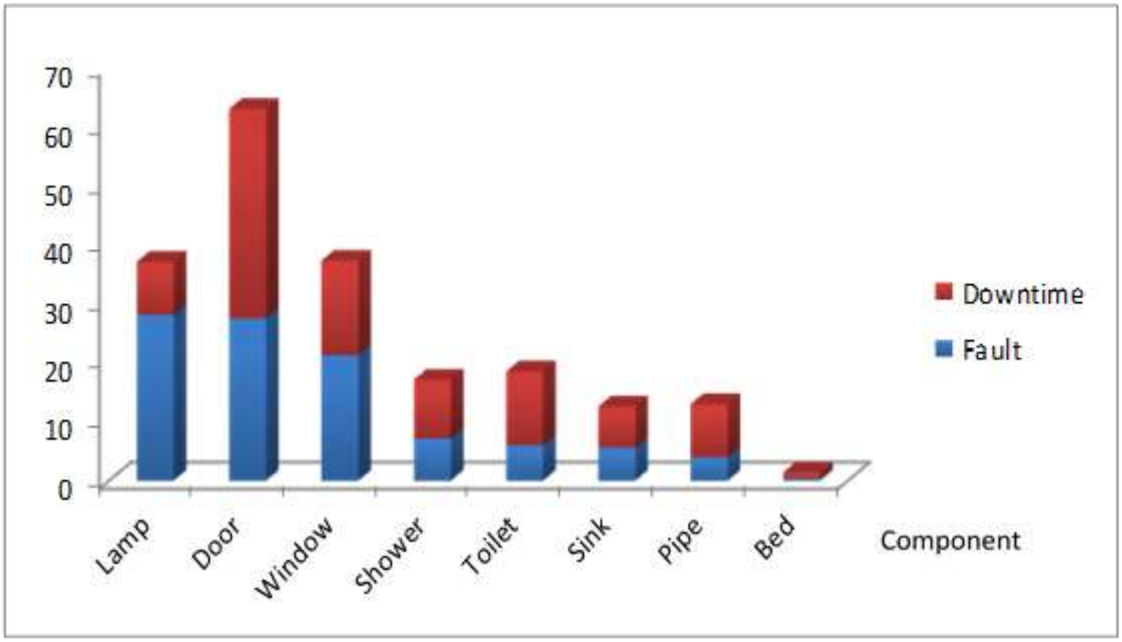

Figure 5.7 Number of Faults and the Associated Downtime by Area for the Period from 1 July 2012 to 30 Dec 2012

Combined Major Fault with the Fault Mode Analysis

The Table 5.7 shows the combination of major fault with the fault mode analysis for the period from 1 July 2012 to 30 Dec 2012. The component name/area of major fault and fault mode, including eight component in HFM such as a lamp, door, window, shower, sink, pipe, toilet and bed.

Table 5.7 Combined Major Fault with the Fault Mode Analysis for the

For the Period from 1 July 2012 to 30 Dec 2012 (KUIM)

		CAUSES OF FAULTS						TOTAL FAULT	PERCENT
TOTAL FAULT		Jammed	Broken	Leak	Age	Poor Design	Other		100%
COMPONENT NAME/ AREA OF FAULT	Lamp	35	35	25	15	14	11	135	28.1
	Door	43	37	21	16	10	5	132	27.5
	Window	30	27		15	12	18	102	21.3
	Shower	7	6		7	10	4	34	7.1
	Sink	7	11		3	4	4	29	6
	Pipe		7	10	7		3	27	5.6
	Toilet	6				9	4	19	4
	Bed		1		1			2	0.4
PERCENT		128	124	56	64	59	49	480	

As shown in Figure 5.8 it shows the number of faults by area and mode of faults for the period from 1 July 2012 to 30 Dec 2012. From the figure 5.8 the lamp create the higher percentage among the other due to the increase of fault. The lowest is a bed, while the sink, shower and pipe almost have the same percentage of cost of fault .

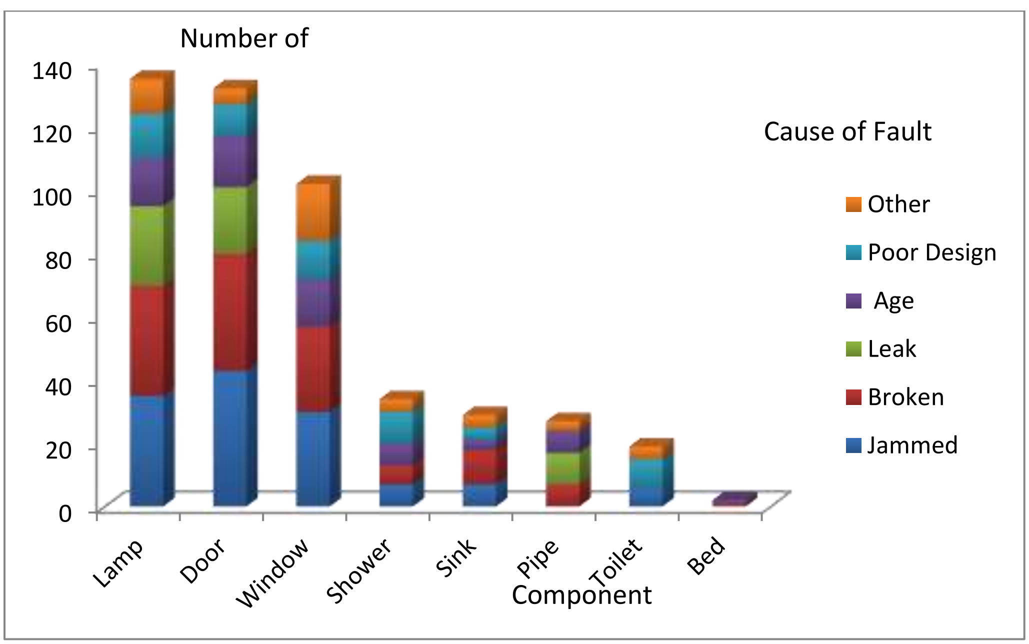

Figure 5.8 Numbers of Faults by Area and Mode of Faults for the Period from 1 July 2012 to 30 Dec 2012-series

Combined Major Fault with the Fault Effect Analysis

The Table 5.7 shows the combination of major fault with the fault mode analysis for the period from 1 July 2012 to 30 Dec 2012. The component name/area of major fault and fault mode, including eight component in HFM such as a lamp, door, window, shower, sink, pipe, toilet and bed.

Table 5.8 Combined Major Fault with the Fault Effect Analysis for the Period from 1 July 2012 to 30 Dec 2012

	EFFECT OF FAULTS							
component	SAFETY (DANGER)	PARTIALLY DISRUPT THE SERVICE	AFFECT IN LONG RUN (LONGRUN)	OTHERS	DECREASE COMPONENTS QUALITY	NOT COMPLETED EFFECT	TOTAL FAULT	PERCENT
Lamp	35	35	25	15	14	11	135	28.1
Door	43	37	21	16	10	5	132	27.5
Window	30	27		15	12	18	102	21.3
Shower	7	6		7	10	4	34	7.1
Sink	7	11		3	4	4	29	6
Pipe		7	10	7		3	27	5.6
Toilet	6				9	4	19	4
Bed		1		1			2	0.4
Percent	26.7	25.8	11.6	13.6	11.8	10.5	480	100%

Shown in Figure 5.9, it shows the number of faults by area and mode of fault effect analysis for the period from 1 July 2012 to 30 Dec 2012. From the Figure 5.9, the lamp create the highest percentage among the other due to the increase of fault. The lowest is a bed, while the sink, shower and pipe almost have the same percentage of fault effect.

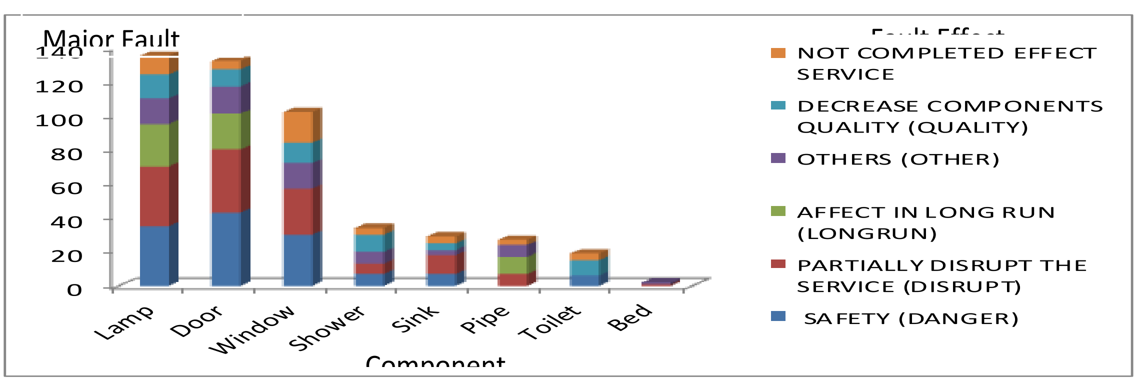

Figure 5.9 Combined Major Fault with the Fault Effect Analysis for the Period from 1 July 2012 to 30 Dec 2012

Combined Major Fault with the Number of Faults, Cost and Downtime

Figure 5.9 Combined Major Fault with the Fault Effect Analysis for the Period from 1 July 2012 to 30 Dec 2012

Figure 5.9.Combined Major Fault with the Number of Faults, Cost and Downtime

The Table 5.9 shows the combined major fault with the number of faults, cost and downtime analysis for the period from 1 July 2012 to 30 Dec 2012. The component name/area of fault including door, window, lamp, pipe, shower, sink, toilet and bed.

Table 5.9 Combined Major Fault with the Number of Faults, Cost and Downtime Analysis for the Period from 1 July 2012 to 30 Dec 2012 (KUIM)

		Fault	(%)	Cost	(%)	Downtime	(%)
COMPONENT NAME/ AREA OF FAULT	Lamp	135	28.1	11,350.00	32.4	136	9
	Door	132	27.5	10,200.00	29.2	560	35.5
	Window	102	21.3	5,400.00	15.4	248	16
	Shower	34	7.1	3,920.00	11.2	160	10
	Toilet	29	6	1,700.00	4.9	200	12.5
	Sink	27	5.6	1,450.00	4.1	112	7
	Pipe	19	4	570	1.6	136	9
	Bed	2	0.4	400	1.1	16	1
	Percent	480	100%	34990	100	1568	100

As shown in Figure 5.10 it shows the number of faults by area and mode of Faults, Cost, and Downtime Analysis for the period from 1 July 2012 to 30 Dec 2012. From the Figure 5.10, the lamp creates the highest percentage among the other due to the increase of faith. The combination of all analysis aims to assess the criticality of the components to compare and decide which components are more critical. By combining the analysis, each component will be assessed based on major consequences. The ranks could be performed based on the number of faults, criticality, cost or downtime. Figure 5.10 and Table 5.9 shows the criticality ranking for each of the components. From the graph, it shows that door is the highest value, followed by lamp and window

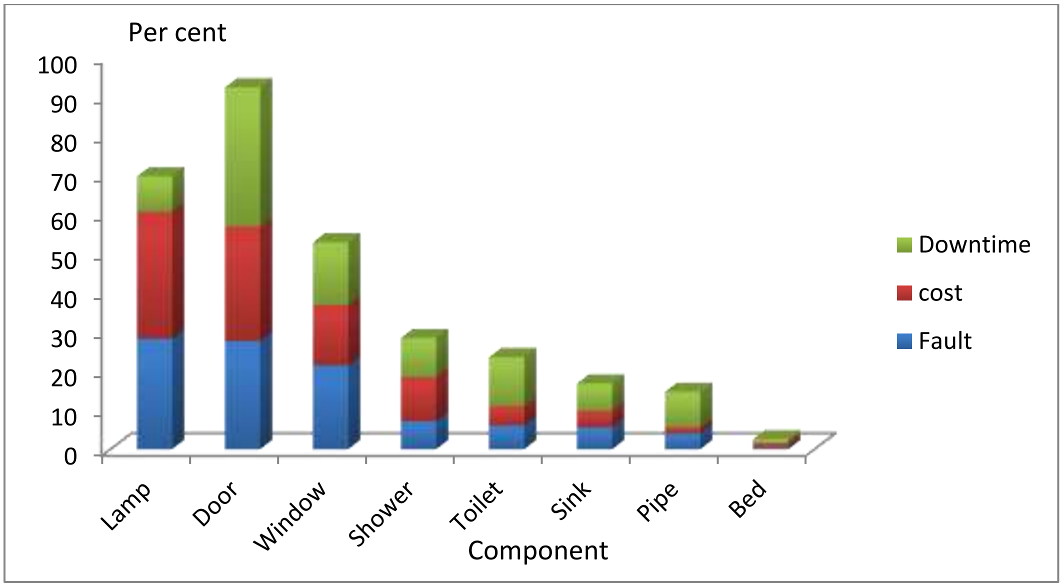

Figure 5.10 Combined Major Fault with the Associated Number of Faults, Cost, and Downtime Analysis for the Period from 1 July 2012 to 30 Dec 2012

.5.3 Failure Modes, Effects & Criticality Analysis (FMECA)

FMECA is used as a management tool to drive the development process by ensuring that the high-risk areas are improved by appropriate corrective action. As shown in the Table 5.10, critically Index is based on Mode of failure,failure effect and cause in the component of HFM.

Table 5.10: Criticality Index

HFM	No	Component	Mode of Failure	Failure effect	Causes	Severity		Occurrence		Detection		COST (RM)	Criticality Index
KUIM	1	Lamp	Replace	Burn	Not Quality	4	5	5	4	5	4	100	80
	2	Door	Need To Replace	Damage Door	Age	7	6	8	7	7	8	392	336
	3	Window	Repair	Broken	Poor design	7	5	7	5	6	8	294	200

In Table 5.10, it shows the critically index for components in HFM, KUIM consist of the Lamp, Door and window. It contains of factors related to the Mode of Failure , Failure effect and causes of effect. Thus, by using FMECA, the critically index shows the highest index is Door, followed by window and lamp. For critically high cost component is Door .with the value is RM 392 folowed by window RM 294 and Lamp RM100.

5.4 Availability Model

Estimation of Operational Availability

1.Downtime of components

Table 5.11 shows the downtime of the various components from July 2012 to December 2012. For example, the downtime of the Door during June 2012 is observed to be 3144 hours, which is the sum of the breakdown hours on various occasions during the month of July to Dec 2012. Similarly for all other components, for various periods, the times are calculated and the data were presented with respect to the number of failures for each component monthly..

Table 5.11 Estimated Total Downtime by Area and their Percentages for the Period from 1 July 2012 to 30 Dec 2012 (KUIM)

		DOWNTIME CALCULATION						TOTAL TIME	PERCENT
		July	August	Sept	Oct	Nov	Dec		
COMPONENT NAME/ AREA OF FAULT	Door	1035	881	504	382	222	120	3144	36
	Window	720	648		360	288	432	2448	27.4
	Lamp	168	264		72	96	96	696	8
	Toilet	144				216	96	456	5
	Shower	168	144		168	240	96	816	10
	Zinc	150	110		72	96	78	506	6
	Pipe		168	240	168		72	648	7
	Bed		24		24			48	0.6
	Percet (100%)	27	25	8	14	13	22	8762	100

As shown in Figure 5.11 it shows the estimated total downtime ,The Door has the highest percentage among all of the others faults followed by Window and Lamp, while the among lowest percentage of the number of faults must be pipe and bed.

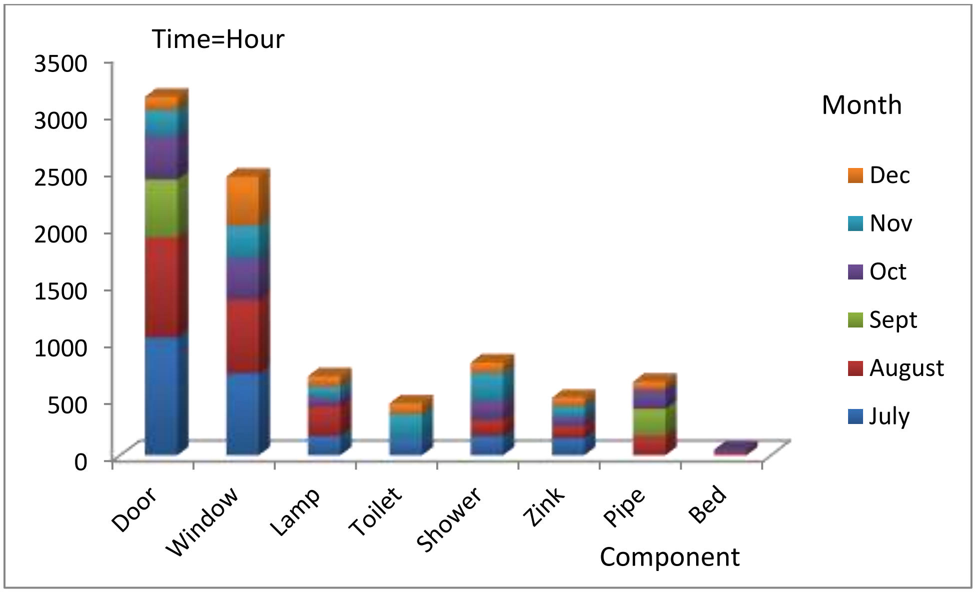

Figure 5.11 Estimated Total Downtime by Area and Cause of Faults for the

Period from 1 July 2012 to 30 Dec 2012

4.0 Conclusion and Discussion

Building Maintenance management for KUIM consists of managing, planning and also controlling. 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.

a) The Organization structure and general responsibilities of maintenance management.
b) The maintenance policies and standard for maintenance.
c) The maintenance management planning and scheduling.
d) The maintenance management for budgeting and cost controlling.(Yacob,2006).

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[16].

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 [17].

The proposed research to KUIM maintenance management focuses on 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 [18].

Conclusion

The first objective is to identify the most critical component for hostel facilities maintenance by using enhanced snapshot model during identification of the actual maintenance problem. It is a model that aims to facilitate maintenance staff in developing the enhanced snapshot model for maintenance problem identification, especially when data is incomplete. Incomplete or missing data is commonly found in various areas in maintenance. The Hostel facilities maintenance has been designed, implemented and tested at three University Hostel buildings (KUIM, UITM, ICYM). The testing has been carried out based on the data collected for a semester at 1 July to 31 December 2012.

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