

## Financial Factor Affecting Maintenance Management In Safety And Health Practices

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**ABSTRACT:** Financial is often being the barrier to maintenance management in organizing maintenance activities of a building. This condition leads to a few maintenance management to neglect an accomplished maintenance although it will affect the safety and health of the building occupants. The aim of this paper is to present the current scenario of maintenance management in safety and health practice based on financial factor. Location of the study only focused on nine from sixty one blocks of government offices in Putrajaya, Malaysia. There are two groups of respondents in this study; the government office employees with a total number of 562 persons and the maintenance management employees with a total number of 100 persons. The study presents findings using quantitative methods including descriptive and inference statistics using Statistical Package for Social Sciences (SPSS) software. Majority of both respondents conclude that the maintenance management had realized their role towards the need of budget for every maintenance plan in safety and health practices. Besides that, the maintenance management is ready to provide sufficient budget for that purpose.

**Keywords:** Maintenance management, financial, safety, health

### I. INTRODUCTION

Financial in the maintenance or more synonymous with the term maintenance budget could assure an effective and systematic maintenance planning. Financial means for the realization of necessary maintenance work should always be available at the right time. Recently, maintenance budgets were often not determined systematically, and a number of different budgeting methods are in used [1]. According to [2], maintenance is often regarded as a necessary expense that belongs to the operating budget. The maintenance budget should be balanced with the annual work schedule that has been decided. [3] add, budgetary control has been defined as the process whereby appropriate budgets are calculated and agreed, and expenditure against them monitored before and after commitment, to ensure that once budgets are set they are neither under-spent nor exceeded other than to meet variations in the performance criteria or market conditions on which they were based. Therefore, the appropriate budget should be prepared and designed based on the expected cost of maintenance work programmed in accordance with the requirements and the legal system or equipment. This is because the aspect of maintenance includes the maintenance of short term and long term.

Current building maintenance strategies, whether based on planned or unplanned maintenance, are most likely to be budget driven [4]. Rather than setting budgets to address needs, i.e. "zero-based budgeting" where operation and maintenance resources are estimated from scratch for

every fiscal year [5] [6]. [4] said the easiest way to cut maintenance costs is to stop doing maintenance and this approach is simple, but the long-term result are usually very costly. Most accountants still regard maintenance as a necessary evil that costs what it costs [7]. Thus, the investment (cost) in the maintenance gives the retention of assets value to help reduce the problem in terms of safety and health. [7] conclude that periodic maintenance was first prescribed to improve safety rather than to increase availability or reduce costs.

In Malaysia, the development plan allocation for repair and maintenance works increased from RM296 million during the Eighth Malaysian Plan to RM1,079 million in the Ninth Malaysian Plan and hence it is expected that repair and maintenance work will become more important in the future [8]. Maintenance and reliability of equipment are important factor that can considerably influence an organization's ability to compete effectively [9] [10]. [11] added, building maintenance is the combination of technical and administrative actions to ensure the items and elements of a building in an acceptable standard to perform its required function.

This paper aims to present the current scenario of maintenance management in safety and health practice based on financial factor. Among the key elements of the maintenance budget that effect the safety and health are adequate financial provisions for preventive maintenance and corrective maintenance repair including spare parts cost.

### II. METHODOLOGY

This research focused on the office complex in Malaysia Federal Government Administrative Centre, Putrajaya. For the record, there are twenty one government office complex in Putrajaya with sixty one blocks of government offices in operation at present. It covers four main areas of Putrajaya Precinct 1, Precinct 2, Precinct 3 and Precinct 4. Nine blocks from sixty one government office blocks have been selected as the study site based on a few factor such as the group's office in each district or precinct, design, size or age of the area and office. According to [12] there are numerous factor that influence maintenance cost indicators of buildings to varying degrees including building characteristics, political and other factor.

#### 2.1 POPULATION AND SAMPLE

Based on the research location selected, population and sample was divided into two groups. The population and sample for the first group is the government office employees of three categories; Top Management, Management and Profesional and Support (Table 1). This group is the user or recipient of services that will evaluate the overall performance of the financial factor of office maintenance carried out by maintenance management

organization. Thus, data and information from these groups are very useful in this study.

A total of eight top management representing 10 percent population of nine government offices involved in questionnaire survey. Meanwhile, 10 percent of the population from each government offices involved in questionnaire survey are represented by employees of management and professional and support.

The second group is the maintenance management employees. This group is the service providers who are able to determine the overall performance of maintenance work. A representative of this group consists of senior staff, middle staff and subordinates who have their respective functions in managing the maintenance office. Table 2 shows brief description about the functions of each category in the first group.

There are a total of fifteen maintenance management organizations in the nine research locations. Number of maintenance management organization in the research location is based on the division of the scope and responsibilities as determined by the maintenance management organization that appoints by the Ministry of Works Malaysia. There are three division in the scope and responsibility for maintenance management organization in the government offices, as illustrated in Table 3.

The scope and responsibilities of the first "comprehensive maintenance management services operation and maintenance of mechanical engineering and electrical engineering" involving a total of six maintenance management organization. While the scope and

responsibilities of "comprehensive maintenance management services operation and maintenance of civil engineering work, housekeeping, landscaping and pest control" also involves six maintenance management organization. Finally, the third scope and responsibilities of "comprehensive maintenance management services operation and maintenance of mechanical engineering, electrical, civil, housekeeping, landscaping and pest control" involves only three maintenance management organization.

Table 4 shows the number of population and sample for maintenance management employees. All of the fifteen senior staff of nine government offices were involved in the questionnaire survey. Meanwhile, 50 percent of the population of all government offices involved in the questionnaire survey are represented by the middle staff. Finally, 10 percent of the population of all government offices involved in the questionnaire survey are represented by the subordinate staff. According to [13], survey research sample should be at least 10 percent of the population.

## 2.2 DATA COLLECTION

Research requires systematic method in data and information collection to obtain accurate and robust research. This method was conducted to obtain data through a questionnaire survey. There are two parts in the questionnaire survey. Part 1 concerned about respondent personal data which consist of gender, age, duration of work in the office and job category. Part 2 is an assessment of respondent toward financial factor in office maintenance management.

**Table 1.** Number of population and sample for government office employees

Government office block	Number of population			Number of sample		
	Top management	Management and professional	Support	Top management	Management and professional	Support
A	11	252	181	1	25	18
B	8	136	467	0	14	47
C	7	174	491	1	17	49
D	10	291	341	0	29	34
E	9	198	231	1	20	23
F	10	269	505	1	27	51
G	10	287	472	0	29	47
H	8	97	361	1	10	36
I	8	274	510	3	27	51
<i>Total</i>	<i>81</i>	<i>1,978</i>	<i>3,559</i>	<i>8</i>	<i>198</i>	<i>356</i>

**Table 2.** Description of the main functions of maintenance management employees

Category	Designation	Function
Senior staff	Manager and Assistant Manager	Formulate, plan and manage activities related to maintenance management including preventive maintenance, corrective maintenance, cleaning, upgrading work etc.
Middle staff	Engineer, Executive, Technical Assistant and Supervisor	Monitor and implement activities related to maintenance management including preventive maintenance, corrective maintenance, cleaning, upgrading work etc.
Subordinates	Technician, Handyman, General Worker, Clerk	Implement activities related to maintenance management including preventive maintenance, corrective maintenance, cleaning, upgrading work etc.

**Table 3.** Scope and responsibility of maintenance management organization

Scope and responsibility		No.of maintenance management organization
1st	- Comprehensive maintenance management services operation and maintenance of mechanical engineering and electrical engineering	6
2nd	- Comprehensive maintenance management services operation and maintenance of civil engineering, housekeeping, landscaping and pest control	6
3rd	- Comprehensive maintenance management services operation and maintenance of mechanical engineering, electrical, civil engineering, housekeeping, landscaping and pest control	3
<i>Total of maintenance management organization</i>		<i>15</i>

**Table 4.** Number of population and samples for maintenance management employees

Government office block	Number of population			Number of sample		
	Senior staff	Middle staff	Subordinates	Senior staff	Middle staff	Subordinates
A	1	8	39	1	4	4
B	2	8	59	2	4	6
C	2	8	40	2	4	4
D	2	8	58	2	4	6
E	2	8	64	2	4	6
F	1	8	47	1	4	5
G	2	8	80	2	4	8
H	1	8	42	1	4	4
I	2	8	57	2	4	6
<i>Total</i>	<i>15</i>	<i>72</i>	<i>486</i>	<i>15</i>	<i>36</i>	<i>49</i>

### 2.3 DATA ANALYSIS

Analysis of survey data is done using the program Statistical Package for the Social Science (SPSS) version 16.0 to get the best results of the research. According to [14], SPSS is a computer software package that is very useful for data management and analysis. There are two types of analysis used in the study; descriptive analysis and inferential analysis. Descriptive analysis was used in data analysis in order to reveal and describe the phenomenon of the variables found in the survey questionnaire. That method aims to explore an area which has not been or less explored, with the aim to identify a thing to explain a phenomenon that is taking place. Descriptive analysis used in this study are described in terms of percentage (percent). The inference analysis used in this study is Mann-Whitney U test. The aim is to see the evaluation difference between two respondents for all items of financial factor in maintenance management.

### III. RESULTS AND DISCUSSION

Table 5 shows the results of a questionnaire survey analysis Part 1. The research included a total number of 562 respondents representing government office employees and 100 respondents representing maintenance management employees in government offices, Putrajaya. Majority of the respondents or 358 government office employees are female which represent 63.7 percent, while the rest of them or 204 persons which represent 36.3 percent are male. For maintenance management employees, majority of them are male respondents or 82 persons which represent 82.0 percent and the rest of them are female or only 18 persons which represent 18.0.

The study also found that the largest percentage of respondents' age, which represents government offices employees are between 21 and 30 years, which reached 60.1 percent, and 20.3 percent of the respondents, age are between 31 and 40, followed by 10.0 percent of respondents, age are 51 years or more. Meanwhile, 9.1 percent of the respondents, age are between 41-50 years and only 0.5 percent of the respondents, age between 18-20 years or less. Next, the largest percentage of respondents age, which represents the maintenance management employees are between 21 and 30 years or 77.0 percent, while 16.0 percent are between 31 and 40, followed by 6.0 percent between 41 and 50 and only 1.0 percent age 51 years or more.

A total of about 181 persons or 32.2 percent of the government office employees have worked in the office for 1 to 2 years, followed by 20.6 percent (116 persons) of respondents have worked for 3 to 4 years, while 12.6 percent (71 persons) of respondents had worked for 6 to 11 months. Next, 11.8 percent (66 persons) of the government offices employees have been working for 5 to 6 years, 11.6 percent (65 persons) of respondents have worked for only 5 months or less and the rest only 11.2 percent (63 persons) of respondents have worked in the office for the longest period of 7 years or more. Most of the respondents' duration of employment in government offices, Putrajaya are due to the duration of the office development completion in stages since 1999. This description also takes into account that there were no migrations of the government office employees from the original government agency.

**Table 5.** Demographic profile of respondents

<b>Description</b>	<b>Government office employees (%)</b>	<b>Maintenance management employees (%)</b>
<i>Gender</i>		
Male	36.3	82.0
Female	63.7	18.0
<i>Age</i>		
18 - 20 years	0.5	-
21 - 30 years	60.1	77.0
31 - 40 years	20.3	16.0
41 - 50 years	9.1	6.0
51 years or more	10.0	1.0
<i>Duration of work in the office</i>		
5 months or less	11.6	14.0
6 - 11 months	12.6	24.0
1 - 2 years	32.2	51.0
3 - 4 years	20.6	10.0
5 - 6 years	11.8	1.0
7 years or more	11.2	-

For maintenance management employees, 51.0 percent of the total respondents have worked in the office for 1 to 2 years, while 24.0 percent have been working for 6 to 11 months and followed by 14.0 percent for 5 months or less. Furthermore, 10.0 percent are maintenance management employees who have worked for a period of 3 to 4 years and only 1.0 percent represent the longest duration of 5 to 6 years. For majority of the respondents, their working duration in the office are based on the duration of service agreement contracts received by the company or organization with the maintenance management of the government offices agencies. Normally, the services duration of a contract agreement is 2 years and would be extended a few year (2 years + 1 year). For maintenance management employees who had served more than three years, this condition occurs based on two factor, firstly, the maintenance management of the company or organization where employees are working successfully secured new contracts with other government offices. The second factor, the employee has received offers to work with a company or organization which recently obtain a new maintenance management contracts.

Before further analysis of a questionnaire survey of Part 2 is done, the Cronbach's Alpha reliability analysis should be done to the data collected. This analysis determines the degree of accuracy and precision of the measurements done by a research instrument. The lower the degree of error for an instrument, the higher reliability of these instruments [15]. In a research, reliability refers to the ability of a study to obtain similar values when the measurement is repeated. In this study, researchers set a measuring instrument that can be considered appropriate and acceptable to be the value of Cronbach's alpha coefficients exceeding 0.70 [16]. Tests results found that the items measuring financial factor have a good reliability value with Cronbach's Alpha value of 0.78 on 11 items measured. Table 6 shows the evaluation of financial factor on the maintenance management for both respondents.

### 3.1 EVALUATION OF GOVERNMENT OFFICE EMPLOYEES

Table 6 shows, a total of 62.8 percent of respondents agreed and 6.9 percent of respondents strongly agreed that the maintenance management provided financial allocation based on periodic schedule, followed by respondents agreed or strongly agreed by 63.7 percent (58.5 percent agreed, 5.2 percent strongly agreed) that the maintenance management provided financial allocation based on requirement of actual safety and health, while a total of 63.1 percent of respondents agreed and 5.2 percent of respondents strongly agreed that the maintenance management provided financial allocation for preventive maintenance related to safety and health. According to [17], the safety of equipment and employee is improved by preventive maintenance services.

Also, most respondents (71.6 percent) agreed or strongly agreed (66.6 percent agreed, 5.0 percent strongly agreed) that the maintenance management provided financial allocation for corrective maintenance related to safety and health, followed by 65.7 percent of respondents agreed and 4.8 percent of respondents strongly agreed that the maintenance management provided financial allocation for emergency maintenance related to safety and health, while respondents agreed and strongly agreed by 66.5 percent (59.4 percent agreed, 7.1 percent strongly agreed) that the maintenance management provide additional financial allocation if necessary for maintenance related to safety and health.

A total of 80.8 percent of respondents either were neutral, disagreed or strongly disagreed (42.9 percent neutral, 34.0 percent disagreed, 3.9 percent strongly disagreed) that the maintenance management provide yearly financial allocation which often prioritize cosmetic maintenance. Further more, 45.4 percent (41.8 percent agreed, 3.6 percent strongly agreed) of respondents agreed or strongly agreed that the maintenance cost increased especially related to spare part cost. However, there are 64.1 percent (55.9 percent agreed, 8.2 percent strongly agreed) of respondents agreed or strongly agreed that the maintenance management gave more priority to the original spare part although higher costs related to the safety and health.

**Table 6.** Evaluation of financial factor

No.	Item	Government office employees					Maintenance management employees				
		SA	A	N	D	SD	SA	A	N	D	SD
1.	Maintenance management provide financial allocation based on periodic schedule	6.9	62.8	26.4	3.2	0.7	20.0	62.0	15.0	2.0	1.0
2.	Maintenance management provide financial allocation based on requirement of actual safety and health	5.2	58.5	30.2	5.7	0.4	14.0	64.0	19.0	2.0	1.0
3.	Maintenance management provide financial allocation for preventive maintenance related to safety and health	5.2	63.1	28.3	3.0	0.4	24.0	56.0	17.0	1.0	2.0
4.	Maintenance management provide financial allocation for corrective maintenance related to safety and health	5.0	66.6	24.7	3.2	0.5	24.0	56.0	17.0	2.0	1.0
5.	Maintenance management provide financial allocation for emergency maintenance related to safety and health	4.8	65.7	25.8	3.0	0.7	23.0	59.0	16.0	1.0	1.0
6.	Maintenance management provide additional financial allocation if necessary for maintenance related to safety and health	7.1	59.4	29.9	2.7	0.9	28.0	53.0	15.0	3.0	1.0
7.	Maintenance management provide yearly financial allocation which often prioritize cosmetic maintenance	1.1	18.1	42.9	34.0	3.9	6.0	17.0	35.0	37.0	5.0
8.	Maintenance cost increased especially related to spare part cost	3.6	41.8	33.5	18.8	2.3	24.0	42.0	19.0	12.0	3.0
9.	Maintenance management gave more priority to the original spare part although higher costs related to the safety and health	8.2	55.9	30.9	4.3	0.7	25.0	48.0	21.0	5.0	1.0
10.	Maintenance management often feel that the maintenance is a wasted	1.2	13.4	29.4	47.5	8.5	11.0	16.0	15.0	46.0	12.0
11.	Maintenance management want to earn greater gain and refuse to spend more for maintenance	1.6	13.2	28.3	47.5	9.4	13.0	18.0	22.0	36.0	11.0

**Notes:** Five-point Likert scale (SA = Strongly Agree; A = Agree; N = Neutral; D = Disagree; SD = Strongly Disagree)

Lastly, a total of 56.0 percent (47.5 percent disagreed, 8.5 percent strongly disagreed) of respondents disagreed or strongly disagreed that the maintenance management often feel that the maintenance is a wasted. Hence, majority of the respondents or 56.9 percent disagreed or strongly disagreed that the maintenance management want to earn greater gain and refuse to spend more for maintenance.

### 3.2 EVALUATION OF MAINTENANCE MANAGEMENT EMPLOYEES

Based on Table 6, the research found that 82.0 percent of respondent agreed or strongly agreed (62.0

percent agreed, 20 percent strongly agreed) that the maintenance management provided financial allocation based on periodic schedule, followed by 64.0 percent of respondents agreed and 14.0 percent strongly agreed that the maintenance management provided financial allocation based on requirement of actual safety and health, while a total of 56.0 percent of respondents agreed and 24.0 percent of respondents strongly agreed that the maintenance management provided financial allocation for preventive maintenance related to safety and health.

Many respondents (80.0 percent) agreed or strongly agreed (56.0 percent agreed, 24.0 percent strongly agreed) that the maintenance management provided

financial allocation for corrective maintenance related to safety and health (80.0 percent), followed by 59.0 percent agreed and 23.0 percent strongly agreed that the maintenance management provided financial allocation for emergency maintenance related to safety and health, while respondents agreed or strongly agreed by 81.0 percent (53.0 percent agreed, 28.0 percent strongly agreed) that the maintenance management provide additional financial allocation if necessary for maintenance related to safety and health.

For item the maintenance management provide yearly financial allocation which often prioritize cosmetic maintenance, 77.0 percent of the respondents whether neutral, disagreed or strongly disagreed (35.0 percent neutral, 37.0 percent disagreed, 5.0 percent strongly disagreed), followed by 66.0 percent of respondents agreed or strongly agreed (42.0 percent agreed, 24.0 percent strongly agreed) that the maintenance cost increased especially related to spare part cost. This finding supported the research by [18] that the current rate of building repair and maintenance cost in the UK is likely to grow supported by the following facts:-

- total spending on building maintenance in the UK has increased by 66 percent in the last ten years;
- repair and maintenance of building stock represented over 5 percent of Gross Domestic Product, or £36 billion in 1996; and
- repair and maintenance output is expected to increase by 43.6 percent between 1989 and 2001.

This condition does not affect maintenance management, where a total of 73.0 percent of respondents agreed or strongly agreed (48.0 percent agreed, 25.0 percent strongly agreed) that the maintenance management gave more priority to the original spare part although higher costs related to the safety and health. Furthermore, 27.0 percent of respondents agreed or

strongly agreed (16.0 percent agreed, 11.0 percent strongly agreed) that the maintenance management often feel that the maintenance is a wasted. However, according to [19], the primary objective of planned maintenance is the minimization of total cost of inspection and repair, and equipment downtime. Finally, 31.0 percent of respondents agreed or strongly agreed (18.0 percent agreed, 13.0 percent strongly agreed) that the maintenance management want to earn greater gain and refuse to spend more for maintenance.

### 3.3 DIFFERENCES EVALUATION BETWEEN RESPONDENTS

Table 7 shows evaluation difference between both groups of respondents for items 1 to 6 and item 8 to 9 which is significant at level  $p < 0.01$ ; and item 11 which is significant at level  $p < 0.05$ .

Maintenance management employees have of mean rank value much higher than the government office workers for all items. This reflects that the maintenance management employees have a more positive evaluation for financial provision made than the government office workers who are affected by the financial provisions. However, the analysis found no significant differences for item 7 and item 10.

### IV. CONCLUSION

This paper concluded that maintenance management was aware of safety and health in the maintenance of offices by providing adequate financial provision for these purposes. This research also found that there are significant differences in evaluation between the two respondents against nine financial factors tested, except for items "maintenance management provide yearly financial allocation which often prioritize cosmetic maintenance" and "maintenance management often feel that the maintenance is a wasted"

**Table 7.** Evaluation between both groups of respondents

Items of financial factor	Mean Rank		Mann-Whitney U	Z
	Government office employees	Maintenance management employees		
1.	321.36	388.51	22399.00**	- 3.77
2.	321.81	385.97	22653.00**	- 3.53
3.	319.69	397.85	21465.00**	- 4.37
4.	320.74	391.98	22052.00**	- 4.07
5.	319.57	398.56	21394.50**	- 4.50
6.	318.17	406.41	20609.00**	- 4.82
7.	331.65	330.64	28014.00	- 0.05
8.	317.56	409.86	20264.50**	- 4.71
9.	322.42	382.54	22996.00**	- 3.22
10.	329.86	340.73	27177.00	- 0.56
11.	323.97	373.80	23870.00*	- 2.56

\* $p$ -value  $< 0.05$ , \*\* $p$ -value  $< 0.01$

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