

# Implementation of Mosque Maintenance Management in Jakarta Region: Result of Pilot Survey

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## Abstract

The maintenance management is the practice of leading and turning the organization through the deployment and handling of available resources such as financial, facilities, material, knowledge and resources. Because of it, the maintenance management needs to be emphasized by any means of planning, directing, implementing and controlling and several improving methods to achieve the organization vision. This paper is study the practical of maintenance management on Muslim public facilities (mosque). Few criteria to optimize the effectiveness of maintenance are created in this paper. The paper also reach the chance to improve the current maintenance management on public facilities (mosque).

## Keywords

Maintenance, Maintenance Management, Mosque, Indonesia.

## 1. Introduction

Based on Worldpopulationreview data, Indonesia is the country with the largest Muslim population in 2021, which is 236 million people. In second place, Pakistan with a Muslim population of 212.3 million people and in third place is India with a Muslim population of 200 million people (Kusnandar, 2021). Based on data from the Directorate General of Population and Civil Registration (Dukcapil) of the Ministry of Internal Affairs, the total population of Indonesia is 272.23 million in 2021. Of this number, 236.53 million people (86.88%) are Muslims. This means that the majority of Indonesia's population is Muslim (Kusnandar, 2021). There are 30 provinces where the majority of the population is Muslim or more than 50% of the population is Muslim. Only in 4 provinces, Islam is a minority religion or below 50% (Kusnandar, 2021).

“*Masjid*” or mosque is a place of prostration and serve as a community place for communal worship (Low, 2021). The term mosque according to *syara*’ (codification of Islamic law) is a permanent place provided for prayer and other relevant Islamic rituals (Hidayat, Danuri, & Purwanto, 2018). In 2017, MUI (*Majelis Ulama Indonesia* or Indonesian Council of Ulama), DMI (*Dewan Masjid Indonesia* or Indonesian Mosque Council) have launched the national program named *eco masjid*. *Eco masjid* is a program of sustainable mosque through efforts to preserve the environment and natural resources oriented to on aspects of *idarah* (management), *imarah* (prosperity activities), and *ri’ayah* (maintenance and facilities) which dominantly related to its building (Hidayat et al., 2018). Salikha, Gabriel, and Nurcahyo (2020) studied the application of utilization scheme of ablution water can reduce the consumption of clean water and have an impact on the sustainability of water supply at mosque. Ablution water utilization scheme started by utilizing water to fulfill water needs from the category of water with the lowest quality to higher quality of processed water. The potential of ablution water that can be reused as an alternative of water resource at Mosque (Salikha et al., 2020).

Maintenance management on mosque is very important to make sure the buildings and equipment are functional and have good attraction to occupants (Low, 2021). Besides, maintenance work or activities cannot separate with the involvement of cost which sometimes high depends to type of failure occur. Services maintenance system will be analyzed throughout the whole building which includes dome, minarets, loudspeakers system, external wall and other mechanical and piping features (Low, 2021). It needs a holistic approach while implementing a maintenance system of mosques to intensify the efficiency of building and equipment systems and religious activities that are held in mosques (Low, 2021).

Currently there are more and more mosques standing in both big cities and remote villages. The mosque is not only a means of performing worship, but also one of the means for the development of Muslims themselves. The development of the function of the mosque is not always in line with the number of users of the facility. One of the reasons for this is the lack of effective maintenance both in the operational scope and the facilities at the mosque. Therefore, it is necessary to have an effective maintenance management so that the role of the mosque can run optimally.

### **1.1 Objectives**

This study, therefore, attempts to investigate the maintenance management of mosque and to recommend better solution in maintenance management of mosque in Indonesia.

## **2. Literature Review**

The British Standard Glossary defined maintenance as “the combination of all technical and administrative actions, including supervision actions, intended to retain an item in, or restore it to, a state in which it can perform a required function” (British Standards Institution, 1984). In addition, maintenance is a set of organized activities that are carried out in order to keep an item in its best operational condition with minimum cost required. Likewise, maintenance tasks are defined as “Sequence of elementary maintenance activities carried out for a given purpose. Examples include diagnosis, localization, function check-out, or combinations” (International Electrotechnical Commission, 2009). Preventive maintenance is the performance of inspection and/or servicing tasks that have been pre-planned or scheduled for specific points in time in order to retain the functional capabilities of operating equipment or systems (General Services Administration, 2000). Other standards such as ISO 13372:2012 define preventive maintenance as “maintenance performed according to a fixed schedule, or according to a prescribed criterion, that detects or prevents degradation of a functional structure, system or component, in order to sustain or extend its useful life.” (ISO, 2012).

Maintenance is a combination between administrative and technical actions, which is intended to retain an item in, or restore it to, a state in which it could perform a required function (Nurcahyo, Darmawan, Jannis, Kurniati, & Habiburrahman, 2018). Another definition of maintenance is the set of activities performed during the life cycle of an item to preserve the value of an asset (Al-Turki, Ayar, Yilbas, & Sahin, 2014). Maintenance is not just ensuring the equipment availability but it also aims to achieve the organization's goals and objectives (Dhingra & Velmurugan, 2015).

Corrective or reactive maintenance is carried out after fault recognition and intended to put an item into a state in which it can perform a required function (British Standards Institution, 2010). This maintenance policy is also called failure-based maintenance because the asset is operated until it fails. Predictive maintenance refers to the routine inspection of equipment, machines, or materials to prevent a failure. It is a type of proactive maintenance that focuses on determining the potential root causes of machine or material failure and dealing with those issues before problems occur. It is achieved by the measurement of some physical or performance variable (Carnero, 2006).

Better practices of maintenance management is needed in order to achieve operational excellence in the framework of the international standard ISO 55000:2014. Better practices in maintenance management have the following attributes: they are realistic, specific, achievable, and tested in the industry; they contribute in making maintenance more efficient and profitable, while optimizing operation costs and improving equipment's reliability (Patino, Jesus, & Guevara Carazas, 2019). In order to identify the most relevant indicators facing a organization's maintenance strategy, it is necessary to distinguish between effectiveness and efficiency. For maintenance purposes, effectiveness measures the health of equipment, while efficiency measures the state of the equipment in comparison with the effort and resources needed to maintain that state. Spare part inventory management is one of important aspects of maintenance management in order to maintain the operational availability and reduce the unnecessary downtime due to component failure (Nurcahyo, Malik, & Farizal, 2018).

The mosque is considered one of the most important buildings of the Islamic city since the Prophet's Mosque (peace and blessings be upon him), and maintenance is considered an important element and a cornerstones of buildings in general, with the deterioration of public buildings generally with the bad use and common ownership the mosque and its facilities are deteriorated (Elkady & Elrahman, 2017). The preventive maintenance of the mosque needs a range of tools and methods in order to succeed (Elkady & Elrahman, 2017).

### 3. Methods

According to Fink (2003), “survey” is a system of collecting information to describe, compare and explain: practice, knowledge, behavior or attitude. The research methodology comprises of the following steps.

Survey questionnaire development The questionnaire designed in this survey consists of three main parts: the project objectives, the questionnaire body and the glossary. The most important part, the questionnaire body is divided into two parts :

1. General information – Questions that will provide general information of participating organizations such as: industry sectors, age of plant, type of manufacturing processes, etc.
2. Maintenance measurement – Questions that are central to the survey objectives. They are categorized into ten parts according to ten key ingredients (factors) of successful maintenance.

The questions are designed based on the list of Key Criteria of maintenance effectiveness as shown in Table 1.

Table 1. Questionnaire used in this research

Criteria	Code	Indicators
Facilities	P1	The loudspeaker system (speakers & toa) works well (types of facilities maintained)
	P2	The air conditioning system (AC and/or fan) is functioning properly
	P3	Water machines (pumps and faucets for ablution and toilets) are functioning properly
Availability	P4	Speaker system (speakers & toa) ready to use anytime (Readiness of the facility when it will be used)
	P5	The air conditioning system (AC and/or fan) is ready to use anytime
	P6	Washing facilities (ablution area and toilet) are ready to be used anytime
Reliability	P7	Speaker system (speakers & toa) works well as planned (more than 6 months or 1 year)
	P8	Prayer equipment can be used after the 2 month plan
	P9	Washing facilities (ablution area and toilet) are functioning well (more than 6 months or 1 year)
Expense	P10	There is a dedicated budget for equipment maintenance activities
	P11	The realization of expenditure for maintenance never exceeds the available budget
Maintainability	P12	Speaker maintenance activities are available and running well
	P13	Air conditioning maintenance activities (AC and/or fans) are present and running well
	P14	Maintenance activities Washing facilities (ablution areas and toilets) exist and are running well

### 4. Data Collection

After collecting the questionnaires from 30 participants which reflected 30 DKM (*Dewan Kemakmuran Masjid* or manager of each mosque), authors analyzed based on the percentage of achievement of each key criteria. Then, authors obtained the information performance of each criteria to decide the priority of maintenance improvement.

The maximum score was obtained from the maximum scale of questionnaire and total respondents in this survey. And the achievement or score comes from the scale of the questionnaire and total respondents in each scale. As an indicator that the criteria reach the target, the study sets the average of all criteria score as a target or standard achievement.

### 5. Results and Discussion

After the questionnaires are distributed and get a number of targeted data (shown in Table 2), then the next step is to test the validity. From the data validity test, with  $n = 30$  and the value of  $t$  table (95%) = 1.734, the result is that the questionnaire data distributed is valid.

Table 2. Answer from respondents

n	Indicators													
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14
1	3	2	2	3	2	2	5	2	2	3	1	2	2	2
2	3	4	3	3	4	3	3	2	4	1	5	3	3	2
3	3	3	3	3	2	4	4	4	2	4	5	3	2	5
4	4	2	2	2	2	2	3	4	3	1	1	3	3	4
5	5	3	3	5	3	2	3	3	2	3	1	4	2	2
6	3	3	2	2	3	3	2	3	5	4	4	5	3	4
7	5	2	2	4	4	2	2	2	2	3	1	5	3	4
8	4	5	3	4	3	4	5	3	4	1	4	3	2	2
9	5	4	2	4	2	2	2	2	3	1	2	2	4	3
10	4	4	2	4	2	4	3	3	4	2	5	3	4	3
11	4	5	3	4	4	4	2	2	2	3	3	3	4	5
12	5	4	5	2	2	2	4	5	2	2	5	2	4	4
13	5	4	3	3	3	3	2	2	5	5	4	2	2	5
14	4	2	5	3	2	3	4	3	4	5	2	2	3	3
15	4	2	3	4	4	3	3	2	5	5	3	5	4	5
16	5	2	5	5	4	3	2	2	4	2	5	5	3	4
17	5	2	4	3	2	5	2	4	4	5	2	3	2	2
18	4	2	5	2	3	4	5	4	5	2	3	4	2	3
19	5	3	4	4	2	3	3	5	3	3	2	5	4	4
20	5	5	5	4	3	5	4	3	5	2	4	3	4	4
21	4	2	4	3	5	4	4	2	2	1	5	5	3	5
22	4	4	4	4	5	5	4	3	2	5	2	3	5	3
23	5	3	5	4	3	4	3	4	5	3	2	3	3	3
24	4	4	4	3	4	3	2	4	2	4	3	3	4	4
25	5	5	4	4	4	5	4	4	4	5	3	3	4	5
26	4	5	2	4	4	2	5	5	5	3	4	4	5	2
27	4	5	4	3	5	2	4	5	4	2	4	5	4	5
28	5	5	4	4	3	3	5	5	4	4	4	4	4	2
29	4	3	3	5	5	4	5	4	4	3	5	4	5	5
30	5	4	5	5	5	4	5	5	5	5	3	4	4	5

rx <sub>y</sub>	0,367	0,404	0,555	0,397	0,602	0,426	0,388	0,549	0,417	0,340	0,322	0,323	0,612	0,338
t	2,088	2,339	3,531	2,287	3,985	2,492	2,228	3,474	2,424	1,913	1,800	1,803	4,093	1,902
t table	1,734													
result	valid	valid	valid	valid	valid	valid	valid	valid	valid	valid	valid	valid	valid	valid

With the weighting that has been done (considering the percentage % weight of each criterion), and after processing the data from the previous questionnaire, the following results are obtained (Table 3):

Table 3. Weight, score and priority

Criteria		Question	Weight		Score	Priority	
1	Facilities	P1	25%	10%	4,3	0,430	12
		P2		5%	3,4	0,172	5
		P3		10%	3,5	0,350	11
2	Availability	P4	15%	5%	3,6	0,178	8
		P5		5%	3,3	0,165	1
		P6		5%	3,3	0,165	2
3	Realibility	P7	15%	5%	3,5	0,173	6
		P8		5%	3,4	0,168	3
		P9		5%	3,6	0,178	9
4	Expense	P10	30%	15%	3,1	0,460	13
		P11		15%	3,2	0,480	14
5	Maintainability	P12	15%	5%	3,5	0,175	7
		P13		5%	3,4	0,168	4
		P14		5%	3,6	0,182	10

With data processing and the lowest score obtained, the lowest 3 points will be taken which will be the priority for improvement, namely P5, P6 and P8.

- Air conditioning system ready to use anytime (P5)  
In this case, it is necessary to periodically check the function of the air conditioner. In addition, it is necessary to plan for periodic and regular repairs, so that the function of the air conditioner can be maximized and avoid damage that can lead to greater repairs (bigger impact).
- Washing facilities are ready to use anytime (P6)  
Purification facilities here are expected that each mosque is able to carry out daily control of cleanliness (toilet). This is because most of the checks are not carried out regularly and periodically. So suggestions for improvement that need to be done is to carry out the maintenance function regularly on a daily basis, so that the facilities for the washing place can be comfortably and ready to be used.
- Prayer equipment can be used after the 2 month plan (P8)  
Prayer equipment is a facility that may often be used by every congregation, so it is necessary to carry out good maintenance. Suggestions for improvement that might be done are by classifying prayer equipment facilities, namely the consumptive aspect (perfume), and the reuse aspect (sajadah, skullcap, rukuh). For the consumptive aspect, it is necessary to have a daily control function, with the aim of maintaining the availability of facilities every time they want to be used. As for the reuse aspect, it is necessary to have a slightly longer maintenance plan, namely weekly, because the maintenance of these facilities requires a longer time.

## 6. Conclusion

Around 236.53 million Indonesians, or 86.88 percent of the population, are Muslims. The term mosque refers to a permanent location where Muslims can pray and perform other Islamic rituals. To improve the efficiency of building and equipment systems, as well as religious activities done in mosques, a holistic approach is required when

developing a mosque maintenance system. After collecting surveys from 30 participants representing 30 mosques, the authors examined the results based on the percentage of key criteria that were met. The authors then gathered data on the performance of each criterion in order to prioritize maintenance improvements. With data processing and the lowest score acquired, the lowest three points, P5 (Air conditioning system ready to use anytime), P6 (Washing facilities are ready to use anytime), and P8 (Prayer equipment can be used after the 2 month plan), will be prioritized for improvement.

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