

# Effective Maintenance Management in Indonesian Hotel Industry

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## Abstract

The customer satisfaction is the most important thing for the hotel series. Effective maintenance is important for the hotel management to make sure the building and utilities in good condition and work properly. There were nine dimension of effective maintenance management to be analyzed. Weighted average method is used to determine the highest effect on effective maintenance. Based the finding Maintenance Approach has the highest score (0,486) as the highest effect on effective maintenance while Spare Part Management and Contracting Out Maintenance have the lowest score (0,393) that indicate the lowest effect on effective maintenance.

## Keywords

Effective Maintenance, Maintenance Management, Hotel Industry

## 1. Introduction

Tourism is a sector that has an important position for economic growth in Indonesia. One of the industries that support tourism development is the hotel industry. Not only local tourists, foreign tourists also use the hotel industry services. Based on data from the Indonesian Central Bureau of Statistics (2021), in 2017, 2018 and 2019, the number of foreign tourists were 14 million, 14.7 million, and 14.9 million. The total occupancy rates of star-rated hotel rooms in 2017, 2018 and 2019 were 56.69%, 58.75%, and 54.81% (Indonesian Central Bureau of Statistics 2021). However, in 2020, the number of foreign tourist visits has decreased and will have an impact on the occupancy rate of star-rated hotel rooms.

Hotels are lodging places that become customer's destination for various events, such as meetings with colleagues, seminars, employee gatherings, family gatherings, or just to spend vacation time. Industries that offer lodging services operate 24 hours. All the facilities offered by the hotel are important points that must be managed properly to maintain customer satisfaction.

Customer satisfaction is the key to the success of the hotel industry sector. Barusman and Rulian (2019) say that one of the efforts to increase customer satisfaction is to fix all lodging facilities. Therefore, all facilities, buildings, equipment and machinery in the hotel environment must be ensured to function properly. This effort can be done with maintenance management. Regardless of the occupancy rate of the hotel room, maintenance management needs to be done properly to maintain the quality of hotel services. The maintenance of all hotel facilities will have a direct impact on the quality of hotel services.

The role of maintenance management is very important for the hotel industry. Preventive maintenance schedule is the most important part of the hotel maintenance management (Priyangika et al. 2019). Maintenance management will have an impact on quality, quantity, safety and determine the level of company profitability (Nurcahyo et al. 2018). This is a consideration for the hotel management to implement proper maintenance management.

## 1.1 Objectives

Hotel management needs to do hotel maintenance management to maintain and improve service quality. Therefore, hotel management must know the key measure for the success of hotel maintenance management. This research aims to :

1. Identify the variables that become maintenance key measure for hotel maintenance management.
2. Identify the basic maintenance management for the hotel industry in Indonesia.
3. Identify the consistency of policies and standards.
4. Identify internal and external information management related to task planning and scheduling, part management, and supplier contracts.
5. Identify financial aspects and their role in supporting the development of maintenance management.

## 2. Literature Review

### 2.1 Maintenance Management

The reliability, availability, and performance of the company will increase with the implementation of maintenance activities (Rahayu et al. 2019). Maintenance management is the action necessary to ensure the correct operation of a device, equipment or component, or to prevent damage to components, or the work required to repair them in the event of a failure (Öztürk and Öztürk 2019). Maintenance management helps maintain high asset productivity in the company (Mehmeti 2018). Standard and work procedures in maintenance management have a role to get better benefit from the available resources, namely staff, equipment and materials (Oliveira et al. 2015). Garg and Deshmukh (2006) divide maintenance management into six areas, namely maintenance optimization models, maintenance techniques, maintenance scheduling, maintenance performance measurement, maintenance information systems, and maintenance policies. Maintenance techniques and performance maintenance are two of the six areas stated by Garg and Deshmukh (2006) which are important concerns in hotel maintenance management.

Maintenance management requires skills and competencies to play a facility management role in the effectiveness of hotel maintenance management. The facility manager contributes to managing the maintenance of the facility where the facility manager must have good competence in the scope of hotel maintenance management. The skills that a facility manager must possess include being able to provide leadership, understand business organizations, manage people, manage places, manage the work environment, manage resources, and manage services (Priyangika et al. 2019).

Longart (2019) divides hotel maintenance management into a framework consisting of three perspectives, namely a strategic view, operational view, and stakeholder view. The strategy view includes long-term strategy, asset management, and maintenance policy/ strategy. The operational view includes maintenance planning, human resources, record-keeping, performance management. The stakeholder view includes relationships between departments, relationships with suppliers as well as customers, budget allocations and guidelines. The hotel maintenance management framework has the objectives of cost reduction, guest satisfaction, increase in assets life, and staff satisfaction.

### 2.2 Maintenance Method

Maintenance strategies have developed in practice, namely reactive maintenance (RM), preventive maintenance (PM), predictive maintenance (PdM) and Prognostics & health management (PHM) (Jin, et al. 2016). Reactive maintenance (RM) is a corrective action for unexpected failures that have occurred. Preventive maintenance is an equipment maintenance strategy that is carried out to avoid unexpected failures. Predictive maintenance (PdM) is a maintenance strategy that is carried out when the reliability indices of a unit reach a predetermined level. Prognostics and Health Management (PHM) maintenance strategies for understanding or detecting equipment failures and predicting the remaining useful life of equipment.

Mehmeti et al. (2018) divides maintenance methods into preventive maintenance and corrective maintenance. Preventive maintenance is included in the category of planned maintenance which has fixed maintenance intervals to prevent damage to the facility while corrective maintenance is carried out after a breakdown has occurred.

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### 2.3 Maintenance Key Measure

Literature study was conducted to collect variables as maintenance key measures for hotel maintenance management. Table 1. shows the variables used in identifying the variables that key measures of the success of hotel maintenance management.

Table 1. Summary of maintenance key measures formulated from the literature

Variable	R1	R2	R3	R4	R5	R6	R7	R8
Policy deployment and organization			v			v		v
Maintenance approach	v	v	v		v	v	v	v
Task planning and scheduling		v	v	v		v	v	
Information management and CMMS			v		v			v
Spare part management		v	v					
Human resource management		v	v	v		v	v	v
Contracting out maintenance		v	v					
Financial aspect			v		v		v	
Continuous improvement			v	v		v		

Notes: R1: Mehmeti et al. 2018; R2: Gebauer et al. 2008; R3: Cholasuke et al. 2004; R4: Lavy and Bilbo 2008; R5: Chinese and Ghirardo 2010-; R6: Ahuja and Khamba 2008; R7: Jin et al. 2016; R8: Oliveira et al. 2015

#### 1. Policy deployment and organization

The hotel organization must first have strong core values that will make hotel maintenance management more effective (Longart 2019). Ahuja and Khamba (2008) said that most organizations put maintenance organization problem as their main organizational problem. Policy deployment and organization as a variable describes the standard of preventive maintenance in the hotel management, as a performance indicator and target to achieve. How efficiently the maintenance function operates also depends highly on the maintenance of organizational structure. Maintenance policy and organization variable consist of maintenance standard and type of maintenance organization structure.

#### 2. Maintenance approach

Maintenance approach is a maintenance technique used by technicians and/ or staff to perform maintenance. It consists of troubleshooting, inspection, and process optimization to maximize equipment effectiveness. Maintenance management has the goal of calculating maintenance requirements before the equipment is failure (Mehmeti et al. 2018).

#### 3. Task planning and scheduling

Apart from maximizing equipment effectiveness and predictive and preventive maintenance training for equipment, planning and scheduling strategies are also aspects of optimizing maintenance management (Gebauer et al. 2008). Maintenance plans and schedules distribute the schedule of maintenance and allocating the resource for each work. This variable consists of maintenance schedule, routine inspection, and monitoring of equipment condition.

#### 4. Information management and CMMS

Effective information management has an important role in the success of maintenance management where this information will support an organization to achieve maintenance goals (Cholasuke et al. 2004). In addition, the use of CMMS has a significant effect on performance. According to the Chinese and Ghirardo (2010) survey, CMMS is mainly used for archiving data to store maintenance data regarding preventive maintenance obligations. Information management and CMMS are variables to measure the current information system in the company to monitor the spare part availability. This key maintenance measurement is a data integrity.

#### 5. Spare part management

The maintenance of spare parts has a strong impact on the achievement of operational management (Gebauer et al. 2008). The spare part availability at the time of maintenance task will increase the maintenance performance. The contract with the supplier will help maintain the spare part availability. The quality of spare parts and cheap parts need to be considered in this variable.

#### 6. Human resource management

Human resources are the driving force behind the maintenance management. Therefore, human resources need to be managed properly through training, work motivation, and ensuring the adequacy of the required resources (Cholasuke et al. 2004). Human resource management includes basic operations training, advanced training on the planned predictive and preventive maintenance of equipment, and the transfer of knowledge about the use of planning and scheduling strategies to optimize maintenance techniques. It is recognized that maintenance staff should receive formal training, but there is no guarantee that training will be completed due to many constraints. The training is not limited to operational knowledge, but more importantly on predictive and preventive maintenance for the equipment. In addition, the maintenance department need the knowledge on using planning strategies to optimize maintenance techniques.

#### 7. Contracting out maintenance

Strategic partnerships with third party maintenance providers such as equipment suppliers or external service providers can bring about huge benefits to the organization. Gebauer et al. (2008) said that partnerships with machinery and equipment suppliers can reduce operating costs by increasing reliability and integrity. The ineffectiveness of third party maintenance providers cause high maintenance costs and low maintenance performance resources (Cholasuke et al. 2004).

#### 8. Financial aspect

The maintenance strategy is designed to optimize operational profit by controlling maintenance costs and breakdown costs (Jin et al. 2016). This aspect includes the budget allocation by management to support the process of preventive maintenance.

#### 9. Continuous improvement

Profitability and reduction of operating costs is a goal of making continuous improvements. Management commitment to making long-term improvements and continuing to strive for better ways of doing things. Effective performance measurement, management commitment, and implementation of proactive maintenance are all factors in continuous maintenance improvement (Cholasuke et al. 2004).

## 6. Methods

This study is to evaluate effective maintenance management in Indonesian Hotel industry, the research methodology is as below:

1. **Literature review** to gain the factor of effective maintenance. Based on the identification of a research problem consisting needs to evaluate the hotel maintenance management variables and to identify which variables are the key measure for the success of hotel maintenance management.
2. **Develop the questioner**, the questioner consists of two parts, first part is for general information of the hotel such as hotel star calcification, year of operation, number of employees, and number of rooms the second part is related to effective maintenance for hotel Industry. To analysis the data the researcher used Likert Scale as a measurement data of the Questionnaire to gather data. This scale used to measure response in the survey research. To response the Likert Scale, respondent specify their level of agreement or disagreement on a systematic question.
3. **Data Collection**, questioner was distributed to the respondent that work in Hotel Industry in Indonesia, and there were 30 respondents responded for the survey.
4. **Data Analysis**, to analyze the data, researcher used Weighted Average to find the values contribution of factor more than others. Formula mentioned as below:

$$W = \frac{\sum_{i=1}^n \omega_i X_i}{\sum_{i=1}^n \omega_i}$$

Where  $W$  = Weighted Average  
 $N$  = The number of terms to be averaged  
 $\omega_i$  = Weights applied to x values  
 $X_i$  = Data values to be averaged

#### 4. Data Collection

Data collection was carried out by distributing questionnaires to 30 respondents who worked at the hotel. The location of the hotel is spread across several provinces in Indonesia, namely DKI Jakarta, West Java, Bali, Central Java, Bangka Belitung, and Riau. Hotel profiles are classified based on hotel grade, operational years, number of employees, and number of rooms.



Figure 1. Hotel grade

Figure 1. shows the hotel's grade based on star, namely 2-star, 3-star, 4-star, and 5-star. Respondents who work in 4-star hotels are 40%. Respondents who work in 5-star hotels are 23%. Respondents who worked in 2-star hotels and 3-star hotels respectively were 20% and 17%.

The hotel has a varying number of rooms. Figure 2. shows the classification of the number of rooms in each star hotel. Hotels that have number of rooms >100, namely 2-star hotels, 3-star hotels, 4-star hotels, and 5-star hotels. There are ten 4-star hotels that have facilities >100 rooms where this number is the highest among the other. Not only 4-star hotels that have the number of rooms >100, but also 5-star hotels, 3-star hotels, and 2-star hotels respectively, seven hotels, five hotels and one hotel. Hotels with 76-100 rooms are one hotel, namely 2-star hotel. For the number of rooms 51-75 rooms, consisting of two 4-star hotels and one 2-star hotels. Hotels that have 26-50 rooms and <25 rooms consist of 2-star hotels each one hotel and two hotels.

Figure 3. presents data on the number of employees at star hotels. Classification of the number of employees at 5-star hotels, namely 151-200 employees, 101-150 employees, and 50-100 employees, each one hotel, three hotels and three hotels. 4-star hotels have a number of employees with a classification of 101-150 employees, 50-100 employees, <50 employees, each of four hotels, seven hotels, and one hotel. The number of employees at 3-star hotels, namely 50-100 employees of four hotels and <50 employees of one hotel. The number of employees at 2-star hotels, namely 50-100 employees of one hotel and <50 employees of five hotels.

Hotel operational years are classified into five, namely <3 years, 4-6 years, 7-8 years, 9-10 years, and > 10 years. In Figure 4. shows the percentage of hotel operational years. The highest percentage is for 4-6 years and >10 years, which is 33%. Hotel operational years 7-8 years by 20%. Hotel operational years <3 years and 9-10 years have the lowest percentage, which is 7%.

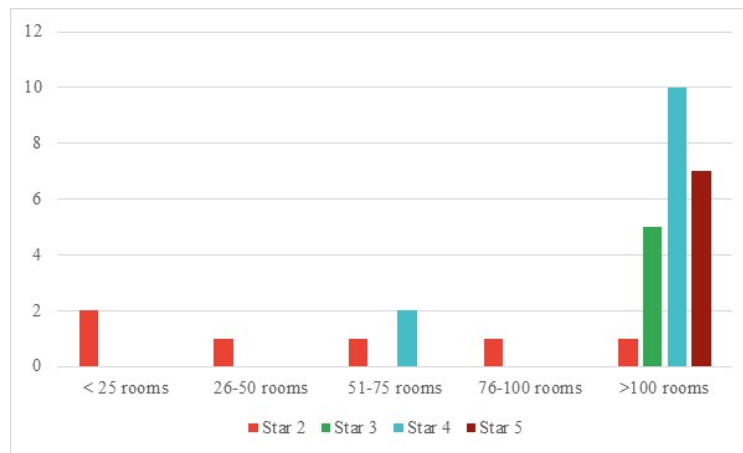


Figure 2. Hotel number of rooms

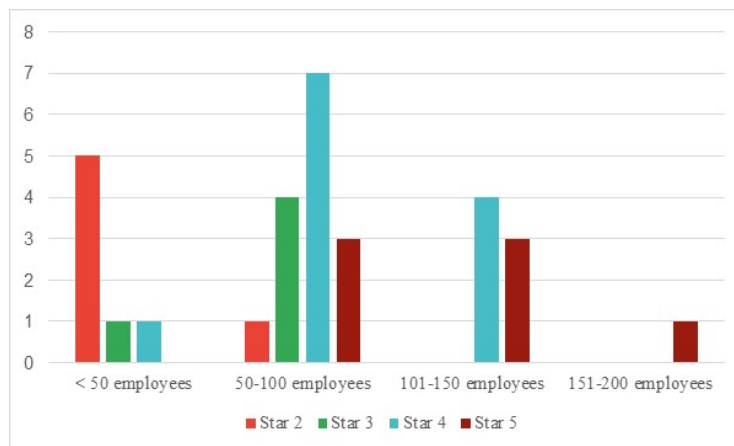


Figure 3. Hotel number of employees

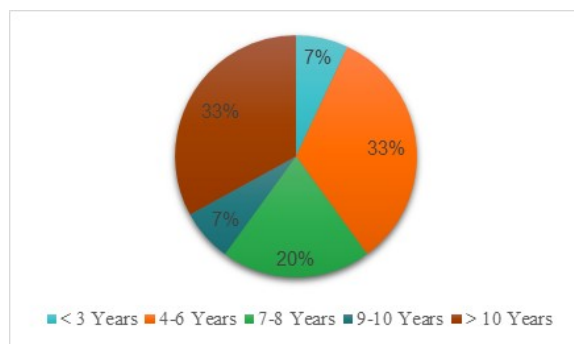


Figure 4. Hotel operational years

## 5. Results and Discussion

### 5.1 Analysis

In terms of maintenance approach, preventive, and routine maintenance is mandatory in all hotels and a standard operating procedure on maintenance problem is already established. In Table 2. we can conclude that they have basic maintenance management, differences occur in relation to tools and equipment condition and routine inspection of equipment and facilities.

Table 2. Maintenance Approach

Indicator	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Implement preventive maintenance on building and facilities	90%	10%			
Implement routine maintenance on building and facilities	37%	60%	3%		
Implement standard operating procedure regarding problems on maintenance	57%	37%	7%		
Tools and equipment are in good condition	33%	57%	7%	3%	
Do routine inspection on quality of tools and equipment	30%	50%	20%		
Do routine inspection on quality of facilities and building	33%	53%	13%		

All hotels have established maintenance management. However, a variety of response in implementation of standard and policy indicates there is a sense of obscurity regarding the consistency of policies and standards (Table 3.). Even two respondents, disagree with the existence and consistency of their organization.

Table 3. Policy Deployment and Organization

Indicator	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Has standard and procedure regarding facilities and building	70%	23%	7%		
Has standard and procedure regarding maintenance	37%	50%	13%		
Has maintenance organization	23%	63%	7%	7%	

From the Table 4., we can conclude that maintenance organization has clear information regarding their internal operation from equipment, maintenance schedule and control. However, there is clear difference when it comes to

external suppliers. It is understandable that hotel maintenance team has difficulties to access real-time data from suppliers regarding stock condition and location, the condition would be worse for specific and rare parts. The same problem with external suppliers also exists within the scheduling function of maintenance management, as parts replacement is very dependent on suppliers' stock (Table 5.).

Table 4. Information Management

Indicator	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Has easy access to inventory of tools and equipment	60%	33%	7%		
Has easy access to maintenance schedule	27%	67%	7%		
Has easy access to supplier for parts replacement	23%	30%	30%	13%	3%
Has easy control to ongoing maintenance	23%	60%	17%		

Table 5. Task Planning and Scheduling

Indicator	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Has short term maintenance schedule	33%	57%	10%		
Has long term maintenance schedule	43%	47%	10%		
Provide routine inspection for personnel	43%	43%	13%		
Provide parts replacement schedule	13%	43%	33%	10%	

The root of the problems with information and schedule with external vendors comes from the existence of MOU or contract between hotels and their suppliers or vendors. Table 6. and Table 7. show more than half of the respondents do not have a contract with part suppliers or maintenance vendors. This situation explains why most hotels have problems with parts management.

Table 6. Contracting-out Maintenance

Indicator	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Has long term contract with parts suppliers	13%	33%	33%	17%	3%
Has long term contract with maintenance vendors	20%	37%	37%	7%	

Table 7. Spare part Management

Indicator	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Hotel has quality standard for parts	33%	43%	13%	7%	3%
Hotel has stock of spare parts	17%	37%	33%	3%	10%
Hotel has cooperation with parts suppliers	10%	30%	33%	20%	7%

Only small numbers of respondents' hotel management that did not provide maintenance organization with adequate budget for them (Table 8.). The corrective action of maintenance program evaluation can run smooth as the program is supported with enough budgets. It is shown in Table 9. that all respondents' hotel carried out continuous improvement activities.



Table 8. Financial Aspect

Indicator	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Has budget allocation for parts replacement	10%	60%	27%		3%
Has budget allocation for tools and equipment replacement	10%	63%	23%		3%
Has budget allocation for building renovation	17%	57%	23%		3%
Has budget allocation for training	13%	43%	37%	3%	3%
Achieve operational cost saving	13%	50%	33%	3%	

Table 9. Continuous Improvement

Indicator	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Evaluate maintenance policy periodically	30%	57%	13%		
Evaluate maintenance activity	20%	60%	20%		
Take corrective action based on maintenance evaluation	33%	50%	17%		

In most hotels, the maintenance personnel already have decent training (Table 10.). Adequate training will improve effective maintenance in the hotel.

Table 10. Human Resource Management.

Indicator	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Personnel has decent training regarding maintenance management	30%	43%	17%	7%	3%
Personnel has decent training regarding tools and equipment	33%	53%	7%	7%	
Personnel able to make maintenance activity report	30%	50%	17%	3%	

Using the average value from each variable, Table 11. shows that we can extract the weighted average from every variable assuming each variable has the same weight.

Table 11. Weighted Variable Summary

Variable	Weight	Average	Weighted Average
Policy deployment and organization	11.11%	4.30	0.478
Maintenance approach	11.11%	4.37	0.486
Task planning and scheduling	11.11%	4.12	0.457
Information management and CMMS	11.11%	4.09	0.455
Spare part management	11.11%	3.53	0.393
Human resource management	11.11%	4.03	0.448
Contracting out maintenance	11.11%	3.53	0.393
Financial aspect	11.11%	3.73	0.415
Continuous improvement	11.11%	4.11	0.457

It can be concluded that most hotels have proper maintenance management and policy organization. Figure 1. shows that 80% of the respondents are from 3-star hotels, 4-star hotels, and 5-star hotels. They are required to have proper maintenance management and policies.

Maintenance Approach, Continuous Improvement and Policy Deployment and Organization are factors that need to be maintained. However, they are somewhat lacking in Spare Part Management and Contracting Out Maintenance, both variables related with external provider. We can assume that the cooperation between internal management and external provider should be increased as it is related to spare part stock and overhaul. To overcome this, an agreement or memorandum of understanding (MOU) should be made between hotel and external provider to secure spare part stock and technical support.

There are differences in the standards held by hotels in maintenance management. This standard influenced by many factors, such as hotel management, grade, government regulations, etc. This research covers the hotels from 2 to 5 stars in Indonesia. As shown in Figure 1., this study uses 20% for 2-star hotels, 17% for 3-star hotels, 40% for 4-star hotels and 23% for 5-star hotels.

The variables on maintenance management after the research is carried out can be seen in Figure 5. that the three lowest factors are contracting out maintenance, spare part management and financial aspects. On the other hand, the top three variables are maintenance approach, policy deployment and organization, task planning and scheduling, and continuous improvement. The top three factors cannot run smoothly if they are not supported by other variables, including the lowest three variables.

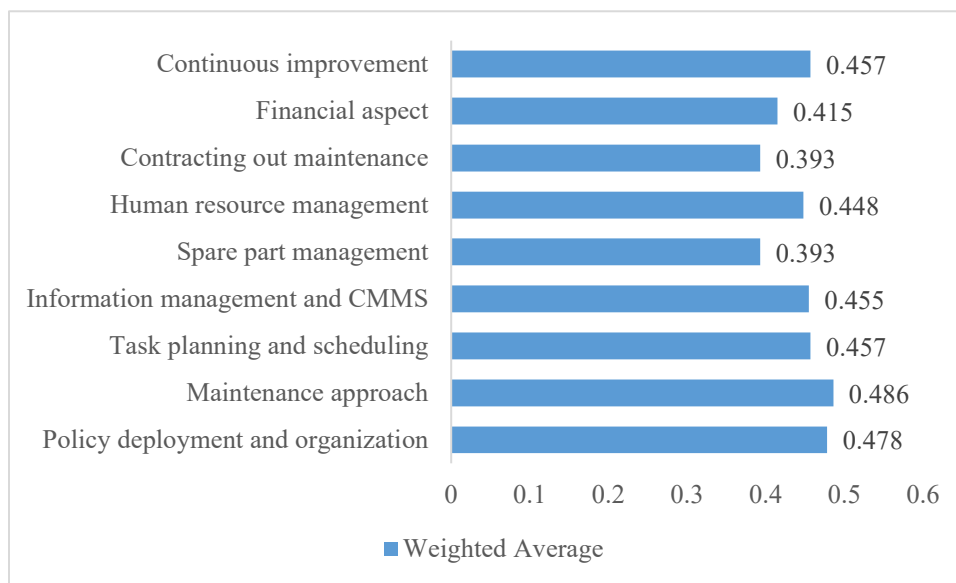


Figure 5. Weighted Variable Maintenance Management

## 5.2 Proposed Improvement

There are several limitations used in this study, further research is still needed to obtain results that can cover a greater range. The weight of the variables in this study still uses a distribution evenly between variables, further research can be developed by finding out weights according to the variables, including sub-variables. Then, the research was carried out in pandemic conditions which allowed several variables to be sidelined in order to maintain the sustainability of the business. Further research can also be carried out the under normal condition.

## 6. Conclusion

To improve the effective maintenance paying attention to all aspects related to the maintenance management need to be considered. The good condition of the hotel buildings and their utility is to be maintained by hotel management. We

have identified the effective variables of maintenance, namely Policy deployment and organization, Maintenance approach, Task planning and scheduling, Information management, Spare part management, Human resource management, Contracting out maintenance, Financial aspect, and Continuous improvement. We can conclude hotel in Indonesia has a proper maintenance management and policy organization but lacking in Spare part management and Contracting out maintenance. However, we cannot ignore the other variables for the effective maintenance since the other variables have the contribution of the effective maintenance.

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## Biography

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