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Risk Analysis of Heritage Building in Jakarta

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ABSTRACT

The purpose of this study is to identify risk factors that influence building safety. The damage suffered by cultural heritage building requires the owner and manager of the building to further improve the supervision of the building safety aspects. This research was conducted in Jakarta and the methods used to identify risks were interviews and questionnaires. Risk analysis uses probability and weight matrices. Finally, there are 23 high risks and the solution can be identified for reducing the risk. The results of this study are beneficial for owners of heritage buildings and the government. Furthermore, the results of this study are also beneficial for academics studying the heritage building field as a literature review.

Keywords: Building Maintenance, Heritage Building, Probability and Weight Matrix, Recognition Pattern, Risk assessment

INTRODUCTION

Building maintenance, especially for historic buildings, requires special attention and handling to maintain their good standard. Regular building maintenance becomes the main determining point in enabling both cultural and non-cultural heritage buildings to survive (Idrus, et al., 2010). Overall maintenance of buildings in Indonesia is regulated by Regulation of Ministry of Public Works No. 24 of 2008 to maintain the reliability of buildings and infrastructure with the result that they properly function. Specific regulations regarding cultural heritage buildings are stipulated by Law no 11 of 2010 and Regulation of Minister of Public Works and Public Housing of the Republic of Indonesia no 01/prt/m/2015 concerning Preserved Cultural Heritage Buildings.

The regulation demands that every preserved heritage building must meet administrative and technical requirements. Cultural heritage buildings pose considerable risks that must be taken into account. The maintenance process and repairs must pay attention to the values contained therein since they hold good values of their historic, economic and other values (Isa, et al., 2011). The economic value refers to tourist attraction requiring excellent building maintenance. Workers' competency is a critical point for succeeding the program (Qing, et al., 2020). All the advantages possessed by the company can be achieved due to the quality and professionals of human resources.

Structures and materials of the buildings are different from those of modern buildings. This greatly influences how buildings are handled. It is necessary to identify the factors likely to hamper the maintenance process. According to PMBOK 6th edition, risk management is a process that includes the identification of risks, regulations, and mitigation of a project. The goal is to reduce negative risks and

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increase positive risks. Risk management detects the possibility of change and prevents or, at least, reduces the impact of change (Stare, 2011, p. 76). Regarding the maintenance of cultural heritage buildings, Law No. 11 of 2010 and Regulation no 01/prt/m/2015 were applied. The regulations demand that each preserved cultural heritage building to meet administrative and technical requirements. These comprise categories of reliability requirements including safety, health, comfort and convenience. The implementation includes a team of experts from various fields of science, with competency certifications to provide recommendations for setting, ranking and eliminating cultural heritage.

The team of cultural heritage building (TABG-CB) provides technical considerations in the stages of preparation, technical planning, implementation, utilization and demolition of cultural heritage buildings. In previous research conducted on building X, it was stated that the building posed several high risks with serious obstacles, such as the problem of inaccurate historical information, inhibiting the licensing process by the team (Suwandari, 2019). The study findings could be utilized as a reference to conduct further research on identifying the risks of maintaining cultural heritage buildings in other buildings in Jakarta.

Literature Review

Risks that affect the Preservation of Cultural Heritage Buildings
According to PMBOK 5th edition, risk management is a process that includes identification, analysis, response planning and risk control of the project. Project risk identification is useful in minimizing factors threatening project sustainability. After identifying the next step, risk analysis is based on qualitative and quantitative analysis so that the most influential risk factors are obtained. Qualitative risk analysis, the probability and impact matrix, is by determining the value of the risk factor (FR). The frequency value is multiplied by the impact value on each risk factor to obtain the risk rating as the formula: Risk Factor (FR) = F X R.

Figure 1: Probability and Impact Matrix

| Probability	Threats				
0,90	0,05	0,09	0,18	0,36	0,72
0,70	0,04	0,07	0,14	0,28	0,56
0,50	0,03	0,05	0,1	0,20	0,40
0,30	0,02	0,03	0,06	0,12	0,24
0,10	0,01	0,01	0,02	0,04	0,08
	0,05/ Very Low	0,1/ Low	0,2/ Moderate	0,4/ High	0,8/ Very high

Source: Project Management Institute, 2013

Risk Management Strategy
According to Wardani et al. (2019), strategy is defined as a process connecting an organization with management and external relations with suppliers, customers and competitors, who take certain responsibilities from the economic and social environment in which the company is located.

Risk Response

Risk response is the process of developing steps to increase opportunity and reduce the threat of project objectivity. According to PMBOK Management 5th edition, several strategies are applied to each type of risk that has been analyzed. Figure 2.2 illustrates this strategy. For high risk, the step taken is to avoid/exploit. For medium risks with qualifications, it is likely to occur low with a high impact then mitigation measures are taken. When the risk is likely to occur high with have a low impact then a transfer/share is taken.

Figure 2: Risk Respond
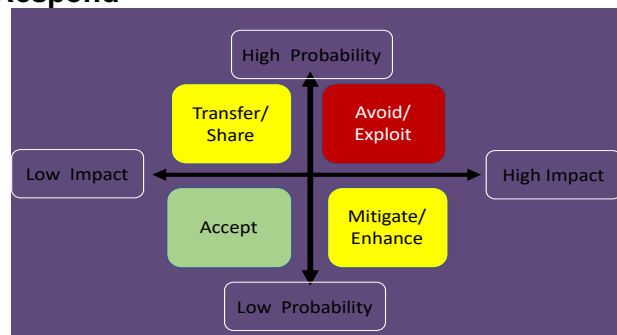
Source: PMBOK 5th edition

Building Maintenance

According to the Council on Training in Architectural Conservation (2015), maintenances include of planned and unplanned maintenance as illustrated in figure 3.

1. Unplanned Maintenance

    It is a response where the problem is not identified first or not seen.

2. Planned Maintenance

    It is a response to prevent something from happening in the building's age cycle. This maintenance is divided into:

    a. Preventive Maintenance

        It is the process of using maintenance planning before it breaks. This maintenance is divided into:

        • Schedule-based Maintenance

            It is based on a specified schedule.

        • Condition-based Maintenance

            Maintenance strategies are monitored according to building conditions.

    b. Corrective Maintenance

        It is a planned maintenance with the result of errors from the maintenance plan. The difference with the unplanned maintenance is that errors occurs so that repair planning can be done.

Figure 3: Maintenance Categories
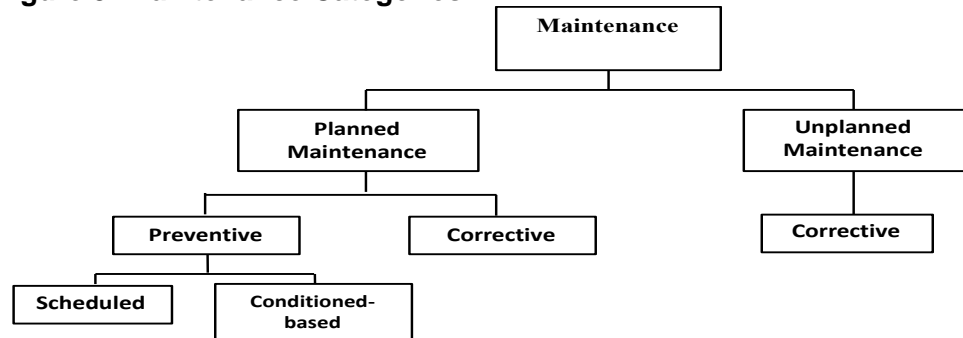
Source: Council on training in Architectural Conservation (2015)

RESEARCH METHOD

The methodology for the research was a qualitative method. Interviews and questionnaires were used for obtaining the data. The respondent criteria were determined based on their work experience in handling the heritage building maintenance process. Probability and impact factor analysis was used to analyze the data, then perform the highest risk factor. Furthermore, after validating the result to three experts with more than 10 years of experience in the Heritage Building, the recognition pattern method was used for defining the most effective mitigation action. The process stages of research as follows:

Figure 4: The Research Flow Diagram

RESULTS AND DISCUSSION

They were 23 risks high risk as a result from the probability and impact matrix as describe in Table 1.

Table 1: The High Risk

Rank	Var	Risk	fxr
1	r10	Building technical data is not appropriate when making observations	0,253
2	r2	Historical building information is inaccurate.	0,250
3	r6	Building interventions that cause initial building damage	0,240

Rank	Var	Risk	fxr
4	r8	Poor quality control of building repairs	0,231
5	r3	No preservation schedule for cultural heritage buildings	0,231
6	r22	Error in the use of cultural heritage buildings that are not in accordance with their designation	0,231
7	r4	Log book / historical data on building cultural heritage buildings are not available	0,224
8	r40	The Building Owner does not understand the owner about how to care for cultural heritage buildings	0,224
9	r9	Building data incomplete	0,223
10	r15	Technical skill in maintaining cultural heritage buildings is still lacking	0,220
11	r27	Lack of budget for the improvement of cultural heritage buildings	0,220
12	r28	Lack of skilled personnel in repairing cultural heritage buildings	0,211
13	r24	Inaccurate data repair on the building to be repaired	0,210
14	r13	There is no schedule for maintaining a heritage building	0,207
15	r20	Error in identifying cultural heritage buildings that need priority improvement	0,197
16	r5	Lack of management support	0,195
17	r17	Error in defining the area of repair site for cultural heritage buildings	0,193
18	r18	Error in determining damage to cultural heritage buildings	0,187
19	r25	Ineffective communication between owner and contractor in the building renovation process	0,186
20	r1	The application of K3 to cultural heritage buildings was not planned	0,185
21	r36	The progress phase of the repair work is slow	0,185
22	r7	The direction and supervision of the owner for the contractor's performance is lacking, causing quality problems in the work of repairing the cultural heritage building	0,183
23	r14	The review of the improvement plan is incomplete	0,182

Source: Probability and weight matrix output, processing by authors

Risk respond is needed when the high risk occurred. The experts gave their opinion how to mitigate the risk and how to reduce the impact of the risk. In addition, recognition pattern was used for identifying which factors mostly cause, impact, preventive and corrective action.

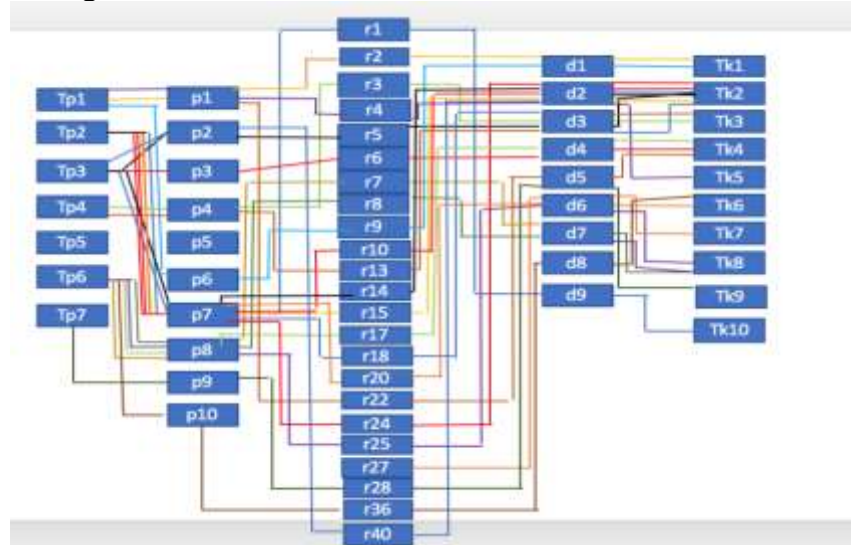**Figure 5. Recognition Pattern**

Figure 5 shows the highest cause is P7, which is the competence of employees in the field of preservation of cultural heritage that can cause the most impact on D2, namely the error in determining the improvement plan. The most preventive measures are TP 2 and TP 6, "Hiring consultants to supervise renovation project work". The most corrective actions are TK 2 "Re-checking the structure, assisted by the consultant".

CONCLUSIONS

The result of the study describes the barriers to the maintenance heritage building. The top 2 highest-ranking is building inappropriate technical data and inaccurate historical building information. The accuracy of building data is very important for reducing the negative impact of the risks. The analysis shows that the skilled worker in cultural heritage remains a problem. The government manages comprehensive training to improve the skills, knowledge, and abilities of workers and building owners in maintaining historic buildings. Besides, the government could invite competent organizations in the training.

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