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DECISION ANALYSIS ON IMPLEMENTATION OF PRIORITY CARE AND MAINTENANCE DUE TO POTENTIAL DAMAGE AT ALFAMIDI MINIMARKET IN MALANG USING THE AHP METHOD

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ABSTRACT

The decision on the priority for care and maintenance at Alfamidi Minimarket uses the AHP method to evaluate the decision for building care and maintenance to predict any potential damage to Alfamidi Minimarket. Thus, numerous complaints may be reduced, and building quality can be maintained to assure customer safety and comfort while shopping at Alfamidi Minimarket. The objectives of this research are as follows: (1) to determine the condition analysis of Alfamidi Minimarket in Malang, (2) to obtain a priority scale for implementing care and maintenance at Alfamidi Minimarket in Malang using the AHP method and Expert Choice V.11 Application modeling. This research applied a quantitative approach with a descriptive analysis technique; the sampling procedure was purposive sampling, and 13 Alfamidi Minimarkets in Malang served as the sample. The subjects of the research were Alfamidi and shop employees. The data collection method used a form about the building condition and a priority weighting questionnaire as supporting data. The Analytical Hierarchy Process (AHP) method can be utilized in making decisions since it systematically has multi-criteria properties to describe a problem. The analysis results show that: (1) The average condition of Alfamidi Minimarket in Malang based on the building condition index shows a good category with a percentage of 82.0669% with an average architectural component index (IKK) of 77.8%, a structural IKK of 97.75 %, Utilities IKK was 88.28%, and Environmental Management IKK was 63.0%. (2) According to the priority results, Alfamidi Dieng had the lowest building condition index at 78.99%, while Alfamidi Sigura-Gura had the highest at 85.82%

Keywords: *Priority; Care and Maintenance Building; AHP Method.*

1. Introduction

Most business Indonesian trade is fulfilled with effort retail so the growth building shopping moment is very fast one of them is building *a Minimarket* [1]. In Indonesia, for 5 years final growth total *Mini Market* experience increase reached 36,146 outlets stores in 2020 [2]. The number of shopping buildings, especially *Minimarkets*, has currently increased by 39% compared to 2015 with a total of 26,102 outlets dominated by several large companies with the *Minimarket brand name.* such as Indomaret, Alfamart, and Alfamidi. One *Minimarket* that has a fairly complete product compared to the other two brands is Alfamidi.

Alfamidi consists of 12 branches. One of the locations where Alfamidi operates is in the city of Malang. Malang City based on the highest income is supported by the trade sector [3]. This is supported by the number of trading facilities in the city of Malang which has 26 market units and 17,071 which are shops/kiosks/warungs. With this trade potential, there is potential for growth of 10-15% per year, one of which is in-store buildings such as *Minimarkets* which are dominated by the

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Alfamart trademark, Indomaret [4]. The total number of *minimarkets* in the city of Malang in 2021 according to the BPS city of Malang is 287 units, of which 15% are the Alfamidi trademark.

Based on this increase in number, it is necessary to pay attention to management, especially in the process of caring for and maintaining buildings. This is done to maintain the function of the building in accordance with the design age. The existence of the *Minimarket building* is also inseparable from the maintenance and maintenance of the building. This can affect the services provided to visitors, so the building must have good conditions in order to meet the comfort and satisfaction of visitors in shopping at Alfamidi *Minimarket.* In this case, the *Minimarket* is a means of trading and a place to support the economy of the surrounding community [5], it is necessary to review the damage to the Alfamidi *Minimarket infrastructure building.*

Aim study this is: a). To find out the analysis of the condition of the Alfamidi minimarket building in the city of Malang. b). To find out the scale of handling the implementation of care and maintenance of the Alfamidi minimarket building in the city of Malang.

2. Theoretical Basis

2.1. Determination of the value of the condition of the building

Assessment of the condition of a building at once by determining the record state value of the building which is a mixture of at least two section values multiplied by the weight of each section as shown by (Hartono et al., 2017). composite condition index which is formulated in the following equation:

$$\mathbf{C1 = W1 \times C1 + W2 \times C2 + W3 \times C3 + \ldots\ldots Wn \times Cn} \quad (1)$$

$$\mathbf{CI} = \sum_{i}^{n} \boldsymbol{Wi\ X\ Ci} \quad (2)$$

CI = Composite Condition Index, C = Component condition value,
n = Number of Components, W = Component Weights, i = The nth Component

The number of reduced incentives for each object (sub-component) assessed depends on the type of damage, degree of loss, and amount of damage whose value varies from 0 (zero) to 100 (one hundred). Calculation of structural condition records according to [6] is explained in the calculation stages as follows:

Stage 1: Index Sub Element Conditions (IKSE)

$$\boldsymbol{IKSE = 100 - \sum_{i=1}^{p} \sum_{i=1}^{m} \lambda\,(Tj, Sj, Dj) x\, F(t, d)} \quad (3)$$

With: λ = Subtracted value
T_j = number of types of damage for sub-element groups
Sj = number of damage levels for the type of damage
Dj = Total quantity of damage for all sub-elements
F(td) = correction factor for different multiple defects

The deduction value of the damage combination must be corrected so that the total deductible value is not more than 100 for each type of damage. The correction value that occurs l the deduction value is not more than one hundred. For each type of damage, the value of the correction factor that occurs is determined by considering the priority of the damage hazard. The number of correction factors for each combination of damage in one sub-element is one, as shown in Table 1.

Table 1. Correction factors for more than one damage combination

Number	Amount Combination Damage	Priority Danger Damage	Correction Factor F(t,d)
1	2	I	0.8-0.7-0.6
		II	0.2-0.3-0.4
2	3	I	0.5-0.6
		II	0.3-0.4
		III	0.1-0.2

Source: (Urzasky, 2011)

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In one sub-element, the maximum number of multiplications between the deduction value and the correction factor is one hundred for all types of damage in one sub-element. The resulting IKSE values range from 0 (zero) to 100 (one hundred). Sub-elements that are still in good condition (without damage) are given a deduction value equal to 0 (zero) so that an IKSE score equal to 100 (one hundred) is obtained. Basic guidelines in handling buildings based on the *US Army Corp of Engineers* (USACE) standards for assessing building conditions are described in table 2 below.

Table 2. Rating Scale of Building Conditions

No	Index Condition	Criteria Condition	Description condition	Handling Measures
1	85-100	Well very	No visible damage, some flaws may be visible	Immediate action is still not needed
	70-84	Well	Only minor deterioration or damage occurred	
2	55-69	Currently	Starting to occur deterioration or damage but does not affect the function of the building structure as a whole	It is necessary to make an economic analysis of alternative improvements to determine the appropriate/appropriate action.
	40-54	enough	Occur deterioration or damage but the building still has enough function however level of comfort no fulfilled with good	
3	25-39	Bad	There was critical damage so the function of the building was disrupted.	A detailed evaluation is needed to determine *repair*, rehabilitation, and reconstruction actions, in addition to evaluation for safety.
	10-24	So bad	The damage was severe and the building was barely functional	
	0-9	Collapse	In the main component of the building, there was a collapse	

Source: Urzaski (2009)

Stage 2: Elemental Condition Index (IKE)

$$IKE = IKSE_1 \times BSE_1 \times IKSE_2 \times BSE_2 + \dots + IKSE_r \times BSE_r \quad (4)$$

Where: IKE = Element Condition Index
IKSE = Index Sub Element Conditions
BSE = Weight Functional Sub Elements
R = Number of sub-elements

Stage 3: Sub-Component Condition Index (IKSK)

$$IKSK = IKE_1 \times BE_1 + IKE_2 + BE_2 + \dots + IKE_s \times BE_s \quad (5)$$

Where: ISKK = Condition Index of Sub Components
IKE = Element Condition Index
BE = Functional Weight of Element
s = Number of elements

Stage 4: Component Condition Index (IKK)

$$IKK = IKSK_1 \times BSK_1 + IKSK_2 \times BSK_2 \times BSK_2 + \dots + IKSK_t \times BSK_t \quad (6)$$

Where: IKK = Component Condition Index
IKSK = Component Sub-Component Index
BSK = Functional Weight of sub-components
t = Number of Sub-Components

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Stage 5: Building Condition Index (IKB)

$$IKB = IKK_1 \times BK_1 + IKK_2 \times BK_2 + \ldots + IKK_v \times BKv \quad (7)$$

Where: IKB = Building Condition Index
IKK = Component Condition Index
BK = Functional Weight of Component
V = Many Components

Calculation of the Weight of Building Elements in determining importance uses the AHP method, Analytical Hierarchy Process (AHP), which is a method to help arrange a priority from various alternative choices using several criteria. Saaty (1991) defines a comparative scale of several levels of importance:

Table 3. Pairwise Comparison Rating Scale

Scale	Definition	Description (Example)
1	Equally likable/important/good	Elements 1 and 2 are both desirable/important/good
3.	Enough Liked / important/good	Element 1 is sufficiently liked / important/good / compared to element 2
5	More likable/important/good	Element 1 is more likable/important/good compared to element 2
7	Very likable/important/kind	Element 1 is highly preferred/important/good in comparison
9	Absolute likable/important/good	Element 1 is absolutely likable/important/good compared to element 2.
2,4,6,8	values _ Among	When in doubt in choosing a scale, for example choosing very liked or absolutely liked.
Reciprocal	If element 1 compared to element 2 is a scale of 3, then element 3 compared to element 1 is 1/3	Incoming assumptions _ sense.

Source : Saaty, 1988 [7]

To determine the weight of components and elements using the AHP method, the following formulas can be applied:

a. Calculate the priority vector, with the following equation:

$$wi = \sqrt[n]{a_{11} \times a_{12} \times \ldots \times a_{1n}} \quad (8)$$

b. Calculating the eigenvectors:

$$xi = \frac{Wi}{\sum \quad Wi} \quad (9)$$

c. Calculating the maximum Eigenvector(λ_{Maks}) :

$$\lambda_{Maks} = \sum \quad a_{ij} \times x_i \quad (10)$$

d. Calculating Consistency Index:

$$CI = \frac{(\lambda\, max - n)}{(n-1)} \quad (11)$$

e. Calculating the Consistency Ratio:

$$CR = \frac{CI}{RI} \quad (12)$$

Is said to be consistent if CR ≤ 0.1

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The random index mean (RI) is as follows:

Table 4. Table of Index Values (RI)

Size Matrix	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
RI value	0	0	0.58	0.90	1,12	1.24	1.32	1.41	1.45	1.49	1.51	1.48	1.56	1.57	1.59

Source : (Andriawan, 2020) [8]

3. Method

In this study, the locations used were in the city of Malang, the minimarket buildings in Malang were 13 Alfamidi minimarket buildings. Malang City consists of 5 districts such as Kedungkandang, Klojen, Blimbing, Lowokwaru, and Sukun. The Alfamidi minimarket buildings studied were as follows: Alfamidi Tidar, Alfamidi Dieng Canal, Alfamidi Ijen 2, Alfamidi Sigura-Gura, Alfamidi Mertojoyo, Alfamidi bandulan, Alfamidi Sudanco II, Alfamidi Lt. Col. Sugiono, Alfamidi Lake Toba, Alfamidi Lake Bratan, Alfamidi Simpang sulfate, Alfamidi Sulfate, and Alfamidi A. Yani.

Primary data was obtained by direct observation at Alfamidi buildings in Malang city and questionnaire forms from related respondents. Secondary data was obtained from a number of existing and valid sources including PU Regulation No. 24/PRT/M/2008, RI Regulation No. 16 of 2021 concerning buildings, as well as applicable *minimarket building requirements*. The other data includes the address of the building, information on the geographical location of the official office building, the determination of the criteria hierarchical model, and other data that will support the primary data The preparatory process stage includes identifying problems according to the research theme, and searching for and gathering information related to research on minimarket buildings in the city of Malang.

Building Condition Determination Stage :

a) Determining the structure of the AHP Hierarchy from each of the building criteria for Alfamidi minimarkets in the city of Malang
b) Create questionnaire forms and building condition assessment forms
c) Conduct validity and reliability instrument tests
d) Distributing questionnaires to get the weight value of each alternative criterion.
e) Conducting surveys and assessing the physical condition of buildings
f) Calculating the value of the building condition index based on the element volume of the element damage.
g) Determine maintenance actions for the maintenance of the Alfamidi *minimarket building* based on the building condition index (IKB) value
h) Alfamidi *minimarket* building in Malang city by considering the Building Condition Index (IKB).

4. Result and Discussion

4.1. Result

4.1.1. Validity test

The number of samples (n) in this study is 25 respondents if the r-table value is a crucial value determined from the statistical table using alpha 5. then the r-table value is 0.3961, then it is included in the test criteria (Sugiono, 2015)

Based on the validity test conducted on the entire instrument is said to be valid.

4.1.2. Reliability Test

The test results can be said to be reliable if the values are ≥ 0.6 (critical value) according to (Sugiyono, 2015). Based on these results, Cronbach's Alpha was obtained at 0.992 so it can be concluded that the reliability coefficient value of Cronbach's Alpha on all variables is more than the critical value of 0.6, so the research questionnaire is considered reliable.

4.1.3. Weighting

Calculation of the weight of Alfamidi minimarket building components in Malang city is done by comparing each component. Using the formula for calculating the weight of building components and elements, the combined results obtained from all respondents, are in the following table:

Table 5. AHP weighting results from a combination of all respondents

Element Name	Weight	Element Name	Weight	Element Name	Weight
K. Architectural	0.149	SE. Shutters	0.241	SE. Water tank	0.142
SK. Roof Cover	0.139	SE. Lock and handle	0.172	SE. Water tub	0.214
E. Roof Cover	0.435	SE. Window Hinges	0.225	SE. Pipe installation	0.228
E. Cam	0.219	SE. Window Paint	0.270	SE. Tap	0.287
E. Lisplang	0.346	**K. Structural**	0.369	E Dirty water installation	0.385
SK. Palate	0.204	**SK. Roof Structure**	0.233	SE. Water Closet	0.136
E. Ceiling Framed	0.292	E. Roof Truss	0.417	SE. Pipe installation	0.236
E. Roof Cover	0.297	E. The horses	0.583	SE. Septic tank	0.259
E. Ceiling Paint	0.411	**SK. Upper Structure**	0.380	SE. Dirty water line	0.370
SK. Partition wall	0.248	E. column	0.336	**Rainwater Facility Decree**	0.340
E. Brick masonry	0.135	E. Plates	0.201	E. Gutters	0.329
E. Aci Plaster	0.139	E. Beam	0.463	E. Pipe	0.617
E. Wall paint	0.282	**SK. Bottom Structure**	0.380	**K. Environmental Management**	0.317
E. Partition	0.282	E. Foundation	0.703	**SK. Fence**	0.189
E. Wall Ceramics	0.211	E. Sloop	0.297	E. Fence Pole	0.346
SK. Floor	0.261	**K. Utilities**	0.166	E. Fence Paint	0.654
E. Floor Coverings	0.546	**SK. Communication Installation**	0.153	**SK. Parking**	0.811
E. Base Floor	0.454	E. Phone	0.212	E. Parking Access	0.583
SK. Window Door.	0.148	Cable Internet	0.788	E. Pavement field.	0.417
E. door	0.536	**SK. Electrical installation**	0.290		
SE. Door frame	0.095	E. Cable Installation	0.225		
SE. Leaf doors	0.175	E. Lights	0.188		
SE. Door lock and handle	0.254	E. Stop Contact	0.256		
SE. Door hinges	0.251	E. Switch	0.331		
SE. Door paint	0.225	**SK. Plumbing Installation**	0.216		
E. window	0.464	E. Installation of clean water	0.385		
SE. Windows frame	0.092	SE. Pump	0.130		

Source: Analysis, 2023

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4.1.4. Building Condition Index Calculation

Determination of the condition of the building is done by determining the value of the building condition index which is a combination of two or more component condition values multiplied by each using the index condition formula according to Hudson [9][10]. The value of the condition of the Alfamidi minimarket building in the city of Malang is as follows on Table 6.

4.2. Discussion

Based on the results of the calculation analysis from this study, it can be discussed that:

1). Based on the calculation of the results of the analysis, it was obtained that the average condition of the Alfamidi *Minimarket building* in Malang city was based on the calculation of the Building Condition Index with a percentage of 82.0669% in the good category. So that in this analysis no moderate or severe damage was found, but there was only some minor damage, in the Alfamidi *Minimarket building in Malang.* In line with research conducted by Hartono, w, et al, (2017) which shows that the results of the building condition index can still be relevant to be used as a reference for assessing building conditions to determine priorities for care and maintenance of the Alfamidi *Minimarket*, even with different building objects and functions.

2). There is a difference with the previous study conducted by purwaamijaya (2021) which stated that there were findings of 3 levels of damage such as mild, moderate, and severe damage, but in the findings of this study, there was no moderate and severe damage. Only light damage was found, this explains that the care and maintenance of the Alfamidi *Minimarket building* in Malang are quite well cared for. Evidenced by the average building condition index value in very good condition in accordance with the IKB calculation guidelines that have been calculated.

Table 6. Building Condition Index (IKB) for Alfamidi minimarkets in Malang

No	Store Name	Index Condition Component: IKK Architecture	IKK Structure	IKK Utilities	IKK Environmental Management	IKB	Criteria Condition	Order priority
1	Alfamidi Dieng	64.3852	94.0	85.4974	65.5753	78.9910	Well	1
2	Alfamidi Pendulum	77.5421	97.7	88.6303	53.3998	79.0207	Well	2
3	Alfamidi Lake Toba	72.2300	97.8	87.6774	56.4749	79.0287	good	3
4	Alfamidi Intersection sulfate	79.7123	97.8	87.6774	53.3998	79.1956	Well	4
5	Alfamidi Sulfate	78.0270	94,1	89.7483	57.5257	79.2946	Well	5
6	Alfamidi Sleep	74.6493	95.3	88.3837	65.57525	81.5419	Well	6
7	Alfamidi Lake Bratan	76.5302	96.0	86.9085	65.57525	81.8257	Well	7
8	Alfamidi Sudanco	85.3067	100.0	85.2790	62.67741	83.4137	Well	8
9	Alfamidi Mertojoyo	78.1100	100	89.7483	65.57525	83.9815	Well	9

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No	Store Name	Index Condition Component: IKK Architecture	IKK Structure	IKK Utilities	IKK Environmental Management	IKB	Criteria Condition	Order priority
10	Alfamidi Colonel Sugiono	85.2375	98.09	88.6989	65.57525	84.2072	Well	10
11	Alfamidi A yani	81.9997	100	92.3284	65.57525	85.0100	Well very	11
12	Alfamidi Ijen 2	80.5423	100	90.8516	68.65035	85.5169	Well very	12
13	Alfamidi Sigura-gura	77.3530	100.0	86.2550	73.6248	85.8420	Well very	13
	Average	77.8173	97.7568	88.2834	63.0157	82.0669	Well	

Source: Analysis, 2023

5. Conclusions

Based on the results of the calculation analysis from this study, it can be concluded that:

a. *Minimarket* Building in Malang city based on the calculation of the Building Condition Index (IKB) analysis shows results in 2 (two) Condition criteria, namely very good, and good. Of the 13 Alfamidi *Minimarket buildings* in Malang, there are 10 buildings in good condition and 3 in very good condition.
b. The order of priority for the care and maintenance of the Alfamidi *Minimarket Building* in Malang is as follows: Alfamidi Dieng, Alfamidi Bandulan, Alfamidi Lake Toba, Alfamidi Simpang Sulfat, Alfamidi Sulfat, Alfamidi Tidar, Alfamidi Danau Bratan, Alfamidi Sudanco, Alfamidi Mertojoyo, and Alfamidi Colonel Sugiono. Meanwhile, the order of priority for Alfamidi *Minimarket buildings* in Malang, where maintenance is only carried out, is as follows: Alfamidi A. Yani, Alfamidi Ijen 2, and Alfamidi Sigura-Gura.

Some suggestions by the author for further research:

a. it is necessary to have detailed comparative data in order to determine the amount of damage that is more thorough and clearer, such as the existing floor plan *in* accordance with the *Minimarket building* being examined.
b. There needs to be a criterion that is examined further and, in more detail, and specifically based on the function of the building used and focused on one component so that it can be more systematic.
c. There is a need for different and varied decision-making methods in the field of care and maintenance of buildings other than the AHP method, such for example the *Analytical Network Process* (ANP), Fuzzy *Logic,* and *Multifactor evaluation process* (MFEP).

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