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Factor Analysis of Construction Discrepancy to Building Approval Documents (PBG)

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ABSTRACT: In practice, there are often discrepancies between the physical construction of the building and the building permit documents provided by Dinas Penataan Ruang dan Pertanahan Kota Palu. These discrepancies can include various aspects, such as building design, structural design, layout, or unauthorized design changes. These non-conformities can also occur caused by various factors, such as insufficiently skilled resources, lack of communication between construction teams, unauthorized design changes, and lack of supervision. The aim of this research is to determine the factors that influence construction non-conformance with Building Approval documents (PBG) and the factors that most influence construction non-conformance with Building Approval documents (PBG) In this research, the sampling technique used was probability sampling with the number of respondents as many as 114 using the Slovin formula, and the application for a building construction permit was submitted to Dinas Penataan Ruang dan Pertanahan Kota Palu from January 2022 to June 2023. A total of 114 respondents were surveyed. Data collection uses observation techniques and distributing questionnaires. Data analysis using Factor Analysis. Based on research findings, there are seven factors that influence deviations from building permits (PBG) documents namely 1). Regulation and Supervision; 2) Resources; 3) Design; 4). Management; ; 5). Technical; 6). Sanctions and 7). Implementation. The size of the influence of all these factors reached 61.955%, The remaining 38.045% is influenced by other factors whose influence is less significant.

KEYWORDS: PBG, Construction Discrepancy, Building

1. INTRODUCTION

Population growth in Indonesia is currently increasing at a positive rate. This means that the population in general is always increasing from time to time. This is also the case with Palu City, where population growth is currently quite rapid. [1]

The increase in population causes the need for buildings to increase. In the development process, building licensing (PBG) is a mandatory step to ensure construction compliance with applicable regulations.[2] The Palu City Spatial Planning and Land Office plays an important role in issuing building permits and monitoring to ensure compliance with established regulations.

In practice, Often there is a gap between the physical construction work of a building and the building permit documents provided by Dinas Penataan Ruang dan Pertanahan Kota Palu.

These discrepancies can include various aspects, such as building design, structural design, layout, or unauthorized design changes. This difference It can also occur due to various factors, for example not being skilled resources, lack of communication between constructions team, unauthorized design changes, and lack of oversight.

The problem of discrepancies between the physical construction of buildings and building licensing documents has a significant impact. First, this mismatch can threaten the security and safety of occupants and the community around the building. If the physical construction does not comply with the technical requirements stipulated in the licensing documents, the risk of structural failure, or even building collapse can increase dramatically. Secondly, this non-conformity also reflects the low level of compliance with applicable regulations in building construction.[3]

Factors that cause construction non-conformities with building permit documents need to be comprehensively understood and analyzed so as to reduce the number of such non-conformities in the future. By analyzing these factors, the Dinas Penataan Ruang dan Pertanahan Kota Palu can increase the effectiveness of issuing building permits and improve development supervision in the city. Building Approval (PBG) is a mandatory step to ensure construction compliance with applicable regulations.[4]

Knowing the factors that influence deviations in building structures contained in the Building Construction Permit (PBG)

is the aim of this research also and to find out the factors that most influence construction non-conformity with Building Approval Documents (PBG)

2. LITERATURE REVIEW

There are several concepts and literature reviews related to and supporting the object of research:

2.1 Construction

Construction also includes activities to build facilities and infrastructure in the fields of architecture or civil engineering. Structures are also referred to as buildings or infrastructure units in an area or region. In other words, the structure is defined as the entire building object consisting of components. For example, the building structure is the overall shape of the building structure. Further examples: Road construction, bridge construction, shipbuilding, and so on.[5]

2.2 Building

Building can be interpreted as a container with various functions where humans carry out all forms of activities.

Building Construction Permit (hereinafter abbreviated as PBG) is a permit granted to the building owner to construct, change, expand, reduce and/or maintain a new building within a period of time in accordance with the technical requirements of the Building Regulations.[6]

2.3 Building Structure

The building structure must be able to function to ensure the strength, stability, safety, and comfort of the building against all kinds of loads. The structure must be able to withstand planned and unexpected loads. Building structures must also be able to withstand other hazards from surrounding conditions such as landslides, seawater intrusion, strong winds, tsunamis, and so on.[7]

Buildings are formed from building structures. The building structure is part of a building system that works to distribute the load caused by the building on the ground. The function of the structure can also be interpreted to support or support the strength and rigidity of a building to prevent a building from collapsing. The structure is also useful for channeling the loads that work on the building to the foundation.

2.4 Building Technical Standard Requirements In SIMBG

In addition to administrative requirements, there are still technical requirements for building buildings that sometimes do not meet the technical requirements, thus hampering the issuance of building approvals.[8] Building planning and design standards include building planning provisions and building reliability provisions contained in SIMBG in the form of a self-assessment list including requirements in the architectural field, structural field, geotechnical field and mechanical, electrical, plumbing field.[9]

2.5 Factor Analysis

Factor analysis is a technique that contains information about the grouping of factor variables in a study, which aims to filter out the advantages of each variable chosen by the researcher.[10] The results can be used to distinguish the dominant component or variable based on the existing ranking to explain a problem.

Factor analysis is a method for simultaneously analyzing the interdependence of several variables with the aim of simplifying the form of relationship between these variables into a number of factors that are smaller than the variables studied. This means that factor analysis can also explain the structure of research data. Basically, factor analysis is used to group several variables with similarities into one factor.

The factor analysis process is based on a correlation matrix between one variable and another variable, so factor analysis requires the correlation of all variables. Test the accuracy of the factor model, the Barletts and Kiser-Mayer-Olkin (KMO) test of sphericity was used as a statistical test to determine sample adequacy. [11]

Table 1. KMO Value Criteria

No	Nilai KMO	Keterangan
1	KMO value of 0.9	Excellent
2	KMO value of 0.8	Good
3	KMO value of 0.7	Medium
4	KMO value of 0.6	Fair
5	KMO value of 0.5	Less
6	KMO value of <0.5	Rejected

The number of factors is determined to represent the variables of interest based on the magnitude of the eigenvalues and the percentage of total difference. Only factors that have eigenvalues equal to or greater than one is retained in the factor analysis model, while others were excluded from the model.

3. RESEARCH METHODS

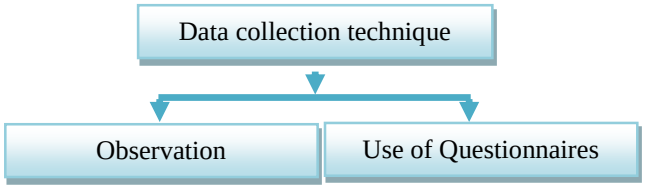
Research methods are essentially scientific methods for obtaining data for certain purposes or applications.[12]. The scientific method means research activities are carried out rationally, empirically and systematically. Rational means that this research activity is carried out rationally and logically according to thinking abilities. Experiential means the method used can be observed with the senses, so that other people can observe and feel the method used, and systematic means the method used in this research is specific to the process used in this research, meaning it contains logical steps.

3.1 Research Location

The research location is in Palu city for PBG documents submitted to Dinas Penataan Ruang dan Pertanahan Kota Palu in 2022 until June 2023.

3.2 Data Collection Technique

The data collection method in this research uses two data management techniques:



Picture 1. Data Collection Process

3.3 Research Instruments

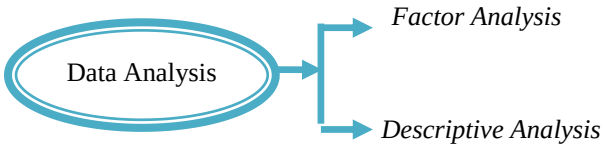
Research instruments used in this research was a questionnaire designed by researchers.[13] Research instruments are data collection instruments used to identify the size of objects such as natural or social phenomena. Therefore, the use of research tools is to get complete information about problems, both natural and social phenomena. The aim of the instrument used in this research is to provide accurate information on a Likert scale that measure the opinions and perceptions of each individual or group of people towards social phenomena.[14] The following is an explanation of the 5 points of the Likert scale :

Table 2. Likert Scale

No	Kriteria Penilaian	Skala Likert
1	Strongly agree (SP)	5
2	Simply Agree (CS)	4
3	Agree (S)	3
4	Disagree (TS)	2
5	Strongly Disagree (STS)	1

3.4 Data analysis

Quantitative statistical analysis used in the data analysis of this research techniques using the Product and Service Statistics (SPSS) software solution and carries out several processes, including :

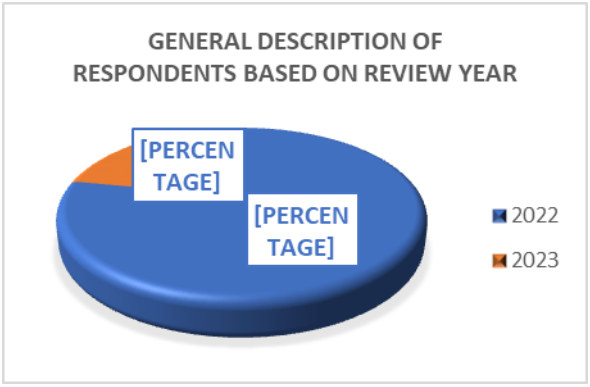


Picture 2. Data Analysis Process

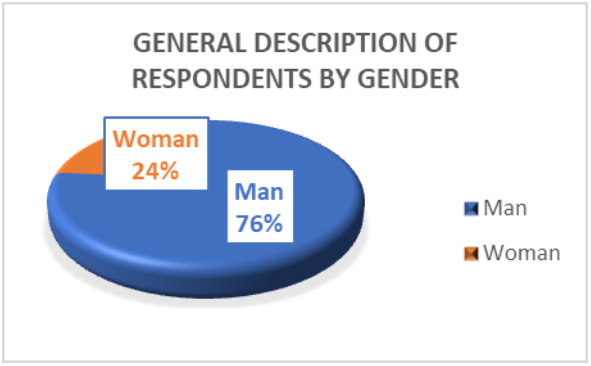
4. RESULTS AND DISCUSSION

In this case , the researcher selected as the object of research was the Applicant Below will be presented the characteristics of respondents in general according to the year of building inspection/monitoring.

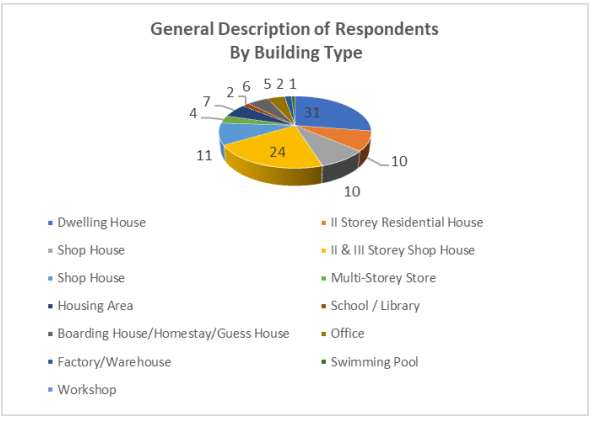
4.1 Description of Respondents Based on the Year of Application for Building Approval (PBG)



Picture 3. General Description of Respondents Based on Review Year



Picture 4. General Description of Respondents Based on Gender



Picture 5. General description of respondents based on building type

4.2 Validity Test

To test whether a questionnaire is valid or not from each variable, necessary to test validity-his.[15] The validity test in this study used Pearson Correlation Bevariate correlation.. The context is different. This is achieved by correlating each indicator value with the number of variables in the questionnaire. If rcount > rTable then the equipment is declared valid, if rcount < then the equipment is declared valid. If rtable, equipment applies. Outside. In this validity test, researchers tested Answers from 50 respondents with a confidence level of 95% or significance level (α) = 0.05 and an r table was produced (see Appendix 2). The number of validity tests carried out in this research is can be seen in the table below

Table 3. Research Variable Validity Test Results

	r_{hitung}	r_{tabel}	Information
X1.1	.679**		Valid
X1.2	.735**		Valid
X1.3	.674**		Valid
X1.4	.669**		Valid
X1.5	.720**		Valid
X2.1	.735**		Valid
X2.1	.704**		Valid
X2.3	.677**		Valid
X2.4	.631**		Valid
X2.5	.730**		Valid
X3.1	.735**		Valid
X3.2	.703**	0.182	Valid
X3.3	.744**		Valid
X3.4	.736**		Valid
X4.1	.775 **		Valid
X4.2	.670**		Valid
X4.3	.739**		Valid
X4.4	.766**		Valid
X5.1	.590**		Valid
X5.2	.609**		Valid
X5.3	.661**		Valid
X5.4	.675**		Valid
X5.5	.615**		Valid

From the results of the validity test calculations in the table above, it can be explained that all indicators are active are calculated in the fractional table (0.182), this research is declared valid, then we can analyze the data for each indicator.

4.3 Reliability Test

This research requires a To measure the consistency of the questionnaire used, a reliability test was used to measure the impact on the design, [16] Factor (X1), Management Factor (X2), Resource Factor (X3), Legal Factor (X4), and Sanction Factor (X5). Test reliability refers to the level of stability, consistency, predictive power, and accuracy. Reliable measurements are measurements that provide reliable information. The method commonly used is the reliability test with Cronbach's alpha. If the value of Cronbach's alpha is jagt 0.60, in this case each variable tested has a reliable indicator. The following are the results of the reliability test :

Table 4. Reliability Test Results

Variabel	*Cronbach's Alpha*	*Cronbach's Alpha* yang disyaratkan	Information
Design Factors (X1)	0.722		Reliabel
Management Factors (X2)	0.732		Reliabel
Resource Factors (X3)	0.707	> 0.600	Reliabel
Legal Factors (X4)	0.929		Reliabel
Sanction Factors (X5)	0.620		Reliabel

The reliability test results above show that the Cronbach alpha value for each variable is greater than the Cronbach alpha value (0.60) required for Cronbach alpha. These results indicate that all statements in the questionnaire are recognized as reliable, so that the questionnaire remains consistent even though the measurements are carried out at different times and with different models or designs, so it can be said that the results obtained are as follows.

4.4 Factor Analysis

Factor analysis to reduce data or combine several old variables into several new variables while maintaining most of the information contained in the original variables.[17]

A. Calculation of Kaiser Meyer Olkin (KMO) and Bartlett's Test

To test the feasibility of the analysis, it is first necessary to check whether the assumptions as conditions for carrying out factor analysis are met.[18] To determine whether the data of this study could be processed with factor analysis, we relied on two important analyses Kaiser-Meyer-Olkin (KMO) coefficient and Bartlett's test of sphericity. The KMO statistical test is used to measure sample adequacy. This matrix compares the magnitude of the correlation coefficient considered with the

partial correlation coefficient. A low KMO value indicates that the correlation between pairs of variables cannot be explained by other variables, and factor analysis may not be appropriate.. If the KMO value is 0.50 and the significance value is less than 0.05, factor analysis can be carried out. To find out the results of the KMO and Bartlett's Test can be seen in table 5 below:

Table 5. KMO dan *Bartlett's Test*

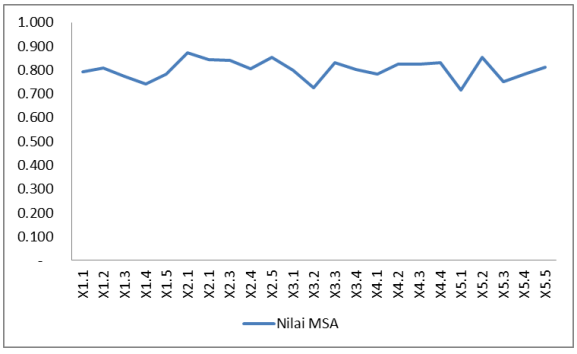
KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.800
Bartlett's Test of Sphericity	Approx. Chi-Square	776.850
	Df	253
	Sig.	.000

Based on Table 5, the KMO value obtained in the first analysis was 0.759 dangt; 0.5 and Bartlett's test gives a total of around 776,850 chi-squares The degrees of freedom (df) is 253 and the significance value is 0.000, meaning less than 0.05. Because of that, this research material is considered usable and analysis of the material can be continued at the next stage.

A. Measure Of Sampling Adequacy (MSA)

The MSA test is a test that measures homogeneity between variables and then filter them so that only variables that meet the requirements can be processed further..[19] he function of this test is to analyze the adequacy of the sample for each variable studied. You can see this in the Anti-Image Correlation section in the analysis results output table to see which variables are suitable for continuing to the next stage of factor analysis.

The MSA value has the same characteristics as the power of "a" for each number in the inverse image matrix table in the inverse image correlation column. The MSA test requirement for each variable is that the variable can be analyzed further if the MSA value is high; 0.5. If MSA andltt; 0.5, then this variable cannot be predicted and analyzed further. Alternatively, the variable should be removed and retested using a variable with an MSA value <0.5. The MSA test results for this research variable are presented in Table 6 below:



Picture 6. Test Results Curve MSA

We performed an MSA analysis and found no such subfactor. A total of 4.444 cases were below standard or did not meet the requirements. This means that the MSA value of the 23 subfactors above is . 0.5, so we can continue to further analyze the data from these 23 subfactors.

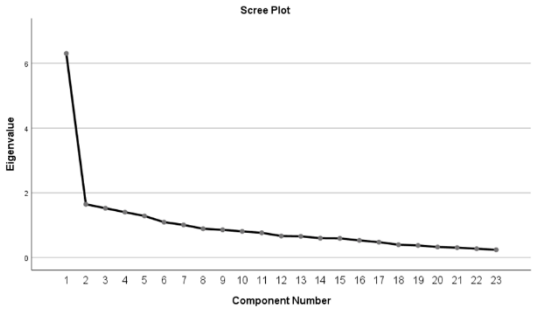
B. Factor extracted

This analysis can produce factors, the number of which is smaller than the number of variables studied.[20] Author The extraction method used in this research Principal component analysis Determine the number of factors identified in this study based on eigenvalues, variance percentages, and plot levels. The coefficient consists of components whose criteria are eigenvalue, eigenvalue and gt 1. The order of eigenvalues is always from largest to smallest. The number of factors can be seen in Table 6 below.

Table 6. Factor Extraction Results

Total Variance Explained									
Comp.	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.305	27.414	27.414	6.305	27.414	27.414	2.834	12.323	12.323
2	1.645	7.153	34.567	1.645	7.153	34.567	2.382	10.357	22.68
3	1.523	6.623	41.19	1.523	6.623	41.19	2.089	9.084	31.764
4	1.402	6.096	47.285	1.402	6.096	47.285	1.981	8.615	40.379
5	1.284	5.581	52.866	1.284	5.581	52.866	1.771	7.698	48.077
6	1.093	4.752	57.618	1.093	4.752	57.618	1.726	7.504	55.581
7	1.007	4.377	61.995	1.007	4.377	61.995	1.475	6.413	61.995
8	0.89	3.869	65.864						
9	0.856	3.72	69.584						
10	0.808	3.513	73.097						
11	0.764	3.322	76.418						
12	0.666	2.894	79.312						
13	0.655	2.85	82.162						
14	0.597	2.597	84.759						
15	0.592	2.575	87.334						
16	0.53	2.302	89.637						
17	0.474	2.062	91.698						
18	0.395	1.716	93.414						
19	0.373	1.623	95.038						
20	0.326	1.417	96.455						
21	0.305	1.327	97.782						
22	0.271	1.18	98.961						
23	0.239	1.039	100						
Extraction Method: Principal Component Analysis.									

The amount of variance explained by 7 factors. The new factors formed show that 61.95% influence design errors, while the remaining 38.045% are influenced by factors other than. Indicators are used in this research. And because the cumulative value and variance value are 61.955% greater than the required 60% cumulative variance value, we can proceed to the next variance analysis. Apart from Table 6 above, the elements of this research are also summarized.



Picture 7. Scree Plot

The flat plot shows that there are seven components whose eigenvalues are greater than 1, so that separating these factors results in the formation of 7 new factors.

C. Matrix Components and Rotation

The next step is to determine some of the most dominating items in each section, which can be seen in table 7 Comnponent Matrixa below, which outlines the distribution of each sub-factor analyzed in the three newly formed factors.

Table 7. Component Matriks

Component MatAtrix[a]							
	Component						
	1	2	3	4	5	6	7
X1.1	0.543	-0.421	0.226	-0.004	0.086	0.279	-0.322
X1.2	0.554	-0.567	0.075	0.059	-0.074	-0.142	-0.096
X1.3	0.449	-0.27	0.147	0.17	-0.586	0.186	0.124
X1.4	0.487	-0.059	0.392	0.424	0.015	-0.232	0.147
X1.5	0.484	-0.228	0.194	0.473	-0.198	-0.153	-0.001
X2.1	0.643	-0.105	-0.088	-0.24	0.039	-0.347	-0.303
X2.2	0.652	0.194	0.159	0.027	0.148	-0.403	-0.048
X2.3	0.537	-0.106	0.112	-0.33	-0.004	0.03	-0.324
X2.4	0.493	0.107	-0.041	-0.304	-0.455	0.154	0.065
X2.5	0.529	0.092	-0.032	-0.45	-0.038	-0.402	0.084
X3.1	0.49	0.463	0.224	0.216	-0.204	0.027	-0.15
X3.2	0.473	0.607	0.084	0.208	-0.005	-0.092	0.133
X3.3	0.507	0.356	0.254	-0.071	0.169	0.403	-0.227
X3.4	0.555	0.369	0.027	-0.202	-0.173	0.03	-0.048
X4.1	0.559	-0.2	-0.46	0.038	-0.029	-0.035	0.145
X4.2	0.478	-0.007	-0.463	0.086	0.118	0.028	-0.166
X4.3	0.505	-0.014	-0.5	0.051	0.011	-0.069	0.014
X4.4	0.611	0.087	-0.417	0.09	0.012	0.192	0.04
X5.1	0.459	0.019	-0.034	0.363	0.501	0.172	-0.208
X5.2	0.591	0.031	-0.173	0.084	-0.148	0.247	0.292
X5.3	0.433	-0.057	-0.087	0.09	0.385	0.007	0.398
X5.4	0.507	-0.149	0.219	-0.345	0.222	0.324	0.269
X5.5	0.421	-0.134	0.385	-0.286	0.263	-0.048	0.376
Extraction Method: Principal Component Analysis.							

Based on the results of the reduction analysis process above, it is still difficult to determine the dominant subfactor or subfactor index by considering the highest value of each factor.

Therefore, to be able to more precisely determine the components contained in the three elements formed, these elements must be rotated. The rotation process in this case The aim of this research is to obtain coefficients whose individual loadings are sufficient for interpretation. The inverse component matrix is a correlation matrix that shows the distribution of factors more clearly and correctly compared to the component matrix. There are several methods that can be used in the orthogonal rotation method, but this time we will use the Varimax method. Varimax rotation focuses on simplifying the factor matrix columns in the analysis or making only one factor correlation dominant. This method makes it easier to interpret each main item by bringing the item correlation of each factor closer to the absolute values of 1 and 0. See Table 8 below for details

Table 8. Rotated Component Matrix

Rotated Component Matrix[a]							
	Component						
	1	2	3	4	5	6	7
X1.1	0.144	-0.017	0.302	0.083	**0.746**	0.17	0.088
X1.2	0.249	-0.233	**0.536**	0.301	0.375	0.133	0.143
X1.3	0.134	0.051	0.501	-0.068	0.169	0.027	**0.643**
X1.4	0.01	0.277	**0.712**	0.096	0.017	0.228	-0.068
X1.5	0.164	0.124	**0.738**	0.045	0.116	-0.009	0.096
X2.1	0.315	0.086	0.166	**0.693**	0.3	0.016	0.008
X2.2	0.176	0.419	0.342	**0.54**	0.05	0.193	-0.145
X2.3	0.115	0.128	0.024	**0.44**	0.517	0.101	0.161
X2.4	0.202	0.252	-0.026	0.244	0.12	0.088	**0.63**
X2.5	0.172	0.141	-0.001	**0.719**	-0.053	0.25	0.172
X3.1	0.057	**0.708**	0.252	0.102	0.106	-0.081	0.143
X3.2	0.197	**0.734**	0.153	0.118	-0.194	0.111	-0.011
X3.3	0.069	0.626	-0.083	0.007	0.496	0.214	0.025
X3.4	0.19	**0.52**	-0.035	0.326	0.114	0.096	0.289
X4.1	**0.691**	-0.065	0.17	0.184	0.027	0.136	0.159
X4.2	**0.646**	0.106	0.021	0.151	0.181	-0.063	-0.067
X4.3	**0.676**	0.069	0.066	0.211	0.007	0.002	0.053
X4.4	**0.695**	0.258	0.041	0.043	0.135	0.103	0.138
X5.1	0.392	0.289	0.217	-0.101	**0.395**	0.15	-0.441
X5.2	**0.498**	0.25	0.176	-0.053	0.045	0.289	0.355
X5.3	0.392	0.077	0.167	0.019	-0.052	**0.543**	-0.167
X5.4	0.114	0.083	-0.03	0.092	0.352	**0.693**	0.199
X5.5	-0.083	0.051	0.154	0.268	0.105	**0.721**	0.044
Extraction Method: Principal Component Analysis.							
Rotation Method: Varimax with Kaiser Normalization.							
a. Rotation converged in 9 iterations.							

Factor loading is the magnitude of the correlation between a set and its members or factors. Here information is obtained that the highest correlation value for each factor (component) indicates that the sub-factor is included in that factor. For example, as seen in table 8 above, suppose that sub-factor X1.1 has a correlation of 0.144 with factor group (component) 1, correlation -0.017 with factor group 2, correlation 0.302 with factor group 3, correlation 0.083 with factor group 4, correlation 0.746 with factor group 5, correlation 0.170 with factor group 6,

and correlation 0.088 with factor group 7 so that X1.1 is included in factor group 5, because factor (component) 1 has the highest loading value of 0.746.

D. Factor Implementation

From the findings previously processed and analyzed, there are seven factors that influence the building's non-compliance with the Building Construction Permit (PBG) document.

1. Regulatory and supervisory factors Variance Value 27.414
2. Resource factor Variance value 7.153
3. Design factor Variance value 6.623
4. Management factor Variance value 6.096
5. Technical factors Variance value 5.581
6. Sanction factor Variance value 4.752
7. Implementation factor Variance value 4.337**5.**

5. CONCLUSION

Based on the systematic research results described in the previous chapter, the following conclusions can be drawn:

1. There are seven factors that influence construction non-conformity with Building Approval documents, the seven factors are 1). Regulation and Supervision; 2) Resources; 3) Design; 4). Management; 5). Technical; 6). Sanctions and 7). Implementation. The magnitude of the influence caused by all these factors is 61.955%, while the remaining 38.045% is a factor outside the research variables whose influence is not significant, this is obtained from the factor analysis test.
2. From the results of this study, it is obtained that the factor that has the highest influence on construction non-conformity with Building Approval documents (PBG), is the Regulation and Supervision factor, with the highest Variance value of 27, 414%.

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