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ANALYSIS OF FACTORS CAUSING THE DELAY OF IMPLEMENTATION OF BUILDING CONSTRUCTION WORK IN MOROWALI DISTRICT

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Abstract— Morowali Regency is one of the new autonomous regions in Central Sulawesi Province which was established in 1999 as a result of the division of Poso District. As a new autonomous region, of course the need for facilities and infrastructure for building construction is increasing. However, the construction does not always run smoothly, one of the important problems in the implementation of construction projects is the delay. The purpose of this study is to analyze the factors that cause delays in building construction work in Morowali Regency. The sample of the study was the Commitment Making Officers and Service Providers namely contractors and supervisory consultants totaling 108 respondents in the Office of Public Works and Spatial Planning, the Office of Education and Teaching and the Regional General Hospital. By using the factor analysis method (SPSS 17) the research results are obtained, that there are 6 factors consisting of 26 variables that cause delays in building construction work in Morowali Regency, namely location and equipment characteristic factors, changes in work document factors, material and equipment factors, factors communication, inspection system factors, job control and evaluation factors and managerial factors.

Keywords— Delay; Building Projects; Factor Analysis;

I. INTRODUCTION

Morowali Regency is one of the new autonomous regions in Central Sulawesi Province, which was founded in 1999. As a new autonomous region, the need for infrastructure for building construction is increasing. However, the construction does not always run smoothly, one of the important problems in the implementation of construction activities or projects is the delay. As we know together that delays occur in almost every construction project work. In the implementation of each construction work has a specific plan and implementation schedule, when the implementation of the work must begin, when it must be carried out how the work should be done and how the provision of resources. Planning a construction work always refers to the estimates that existed at the time the construction plan was made. Therefore problems can arise if there is a mismatch between the plans that have been made with the actual reality. So that the punctuality of work can be said is a necessity for the contractor in order to get the trust of the owner of the activity.

II. THEORY

Building is a physical form of construction work which is integrated with the place of domicile, partly or wholly above and / or in land and / or water which functions as a place for humans to carry out their activities, both for residential (residential), religious activities, business activities, social and cultural activities and special activities (article 1 number 1 of Law number 28 of 2002 concerning Buildings). Based on Presidential Decree No. 16 of 2018, the meaning of construction work is the whole or part of activities which include a series of activities that cover the construction, operation, maintenance, demolition and rebuilding of a building.

Delay in work is a condition in which the execution of work cannot complete work on time in the contract. Understanding delays according to Ervianto, (1998) in Pratama, (2017), namely the implementation time that is not utilized in accordance with the planning of activities that causes an activity or some activities to be delayed or even cannot be completed according to the planned schedule. According to Levis and Atherley, (1996) in Primary, (2017) if a job has been targeted to be completed in accordance with the planning time but for some reason it cannot be fulfilled, so it can be said the work is experiencing delays. Delays that occur in a construction project can cause additional time for project implementation and can even increase project costs. The impact of delay on the client or owner is the loss of the opportunity to place its resources into other projects, increasing direct costs incurred which means that increased expenses for employee salaries, equipment rental and so on and reducing profits. From this description it can be concluded that the project will be delayed if it cannot be submitted by the service provider to the service user on the handover date of the first assignment for a certain reason.

The success of a project can be seen from the final results obtained whether the project was completed on time according to initial planning and costs that have been determined or even vice versa there is a delay and not in accordance with the initial plan and cost overruns. So it can be concluded that the success factors of a project can be seen from the time (time), cost (cost), and quality (quality). In a construction project a lot may occur that can result in an increase in the time of an activity or a delay in the completion of an overall project. Some of the most common causes include: changes in field conditions, changes in design or specifications, changes in weather, unavailability of labor, materials, or equipment.

III. METHODS AND ANALYSIS

A. Research Design

This type of research is quantitative descriptive research method that is descriptive and uses more analysis. Quantitative research aims to find relationships that explain the causes in measurable social facts, show the relationship of variables and analyze the relationship of these variables.

B. Research Locations

The location of this research was conducted in Morowali Regency, Central Sulawesi Province. The research location can be seen in Figure 1.

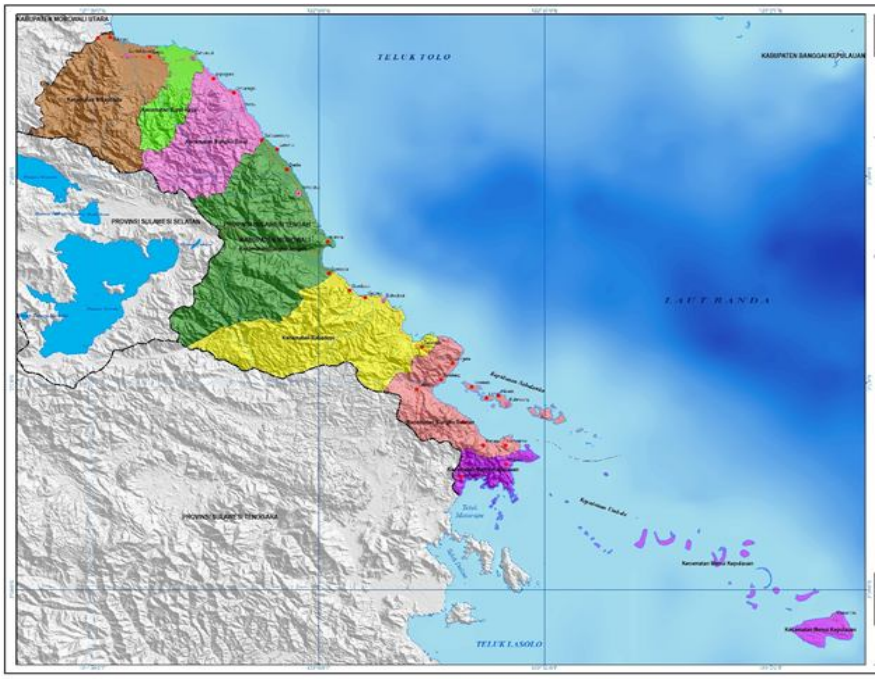

Fig. 1 Morowali Map

C. Population, Samples and Sampling Techniques

The population that will be examined in this study is the Commitment Making Officers and Service Providers namely contractors and supervisory consultants in several Regional Apparatus Organizations in Morowali Regency. To find out the total population, the researchers conducted an initial survey at the Office of Public Works and Spatial Planning, the Office of Education and Teaching and Regional Public Hospitals with the scope of the last 5 (five) years, namely from 2013 to 2018. Based on the data collection, the obtained for Building Activities as many as 70 (seventy) activities with a period of Fiscal Year of the last 5 (five) years. Details of these data can be seen in Table I.

TABLE I - Research Population

No.	Population	Amount
1.	Commitment Officer	20
2.	Contractor	70
3.	Supervising consultants	30
	Total	120

The sample is part of the number of characteristics possessed by a particular population that is said by Sugiono, (2002) in Primary, (2018). The sampling technique uses simple random sampling. To determine the size of the sample as a representative population, researchers used the Slovin formula guidelines (1993) in Rahmiyanti, (2019). The Slovin formula used to determine sample size is:

$$n = \frac{N}{1 + Ne^2} = \frac{120}{1 + 120(0{,}03)^2} = 108{,}303 \approx 108$$

Then obtained the number of samples as in Table II

TABLE II - Research Samples

No.	Population	Amount
1.	Commitment Officer	18
2.	Contractor	63
3.	Supervising consultants	27
	Total	108

D. Operational Variables

In this study the variables and sub variables used consisted of:

1. Labor (labors)
   Workforce expertise (X1), Labor discipline (X2), Labor motivation (X3), Inadequate number of workers (X4), Labor nationalism (X5), Replacement of new workers (X6), Communication between workers and heads handyman (X7).
2. Material (material)
   Delay in delivery of goods (X8), Lack of construction materials (X9), Poor material quality (X10), Damage to materials in storage (X11), Material changes in shape, function and specifications (X12), Scarcity due to specificity (X13), Inaccurate ordering time (X14).
3. Equipment
   Delay in delivery / supply of equipment (X15), Equipment damage (X16), Availability of adequate equipment / as needed (X17), Productivity of equipment (X18), Ability of foreman or operator that is lacking in operating the equipment (X19).
4. Site Characteristics
   Surface and subsurface conditions (X20), Sight or environmental response (X21), Physical characteristics of buildings around the project site (X22), Material storage (X23), Access to project location (X24), Work space requirements (X24) X25), Project location (X26).
5. Finance (financing)
   The absence of intensive money for contractors, if the completion time is ahead of schedule (X27), material prices (X28), funding difficulties in the contractor (X29), difficulty in payment by the owner (X30).
6. Situation (environment)
   The intensity of rainfall (X31), social and cultural factors (X32), the occurrence of unexpected things such as fire, flood, very bad weather, storm / storm, earthquake and landslide (X33).
7. Changes (change)
   There was a design change by the owner (X34), a design error made by the planner (X35), an error in the ground investigation (X36).
8. Scope and Contract / Contract Document
   Incorrect / incomplete planning (drawings / specifications) (X37), Changes in scope of work at the time of implementation (X38), Delay of the owner in making decisions (X39), There are many (often) added jobs (X40),

There are requests for changes to the work completed (X41), Disagreement between drawing work between planners and contractors (X42).

9. Planning and Scheduling (planning and scheduling)
   Incomplete identification of type of work (X43), Work order plan that is not well structured / integrated (X44), Determination of duration of work that is not carefully done (X45), Work plan of owner that changes frequently (X46), Construction method / work implementation wrong or incorrect (X47).
10. Work Inspection, Control and Evaluation System
    Differences in sub-contractor schedules in project completion (X48), Submission of material samples by unscheduled contractors (X49), Process of approval of material samples for a long time by the owner (X50), Failure of the contractor to carry out work (X51), Delays in the inspection process and material test (X52), Failure of the contractor to carry out the work (X53), Many work results must be repaired / repeated due to defects / incorrect (X54), Process and procedures for evaluating the progress of work for a long time and past the agreed schedule (X55).
11. Managerial (managerial)
    Field manager experience (X56), Communication between the owner and contractor representative (X57), Communication between planners and contractors (X58).

E. Data Collection Techniques

Data collection techniques are ways that are used to collect data. The data in this study are primary data sourced from the project owner, supervisor consultant and contractor. To obtain research data used 4 (four) methods, namely: 1). Interview 2). Questionnaire or questionnaire 3). Literature study and 4). Observation (observation).

F. Instrumenpenelitianataubahan dan alat

The instrument used in this study was a questionnaire and adjusted questions based on the phenomenon of the implementation of construction in Morowali District. By using a Likert scale with 5 levels, namely in the form of a method of scoring data involving a scale of 1 to 5, namely: strongly agree = 5, agree = 4, neutral = 3, disagree = 2, and strongly disagree = 1.

The validity of a research result is determined by the measuring instrument used, because a valid measurement tool describes the actual object of the research object. For this reason, two types of testing are needed, namely the validity test (validity test) and the reliability test (reliability test).

1. **Test Validity**
   Validity test is a test of the accuracy or accuracy of a measuring instrument in measuring what is being measured. The benefits of the validity test are for the accuracy of measuring power. To find out whether the instrument used is valid or not, Pearson correlation is used. Where the item is said to be valid if the value of p <0.05.
2. **Reliability Test**
   The answer scores for all items were tested for reliability with the aim of showing the extent to which the measurements gave relatively no different results if the measurements were taken again on the same subject. According to Sugiono, (2009) a reliable instrument is an instrument that, if used several times to measure the same object, will produce the same data. Where the question items are declared reliable if the value of Croncbach's Alpha> 0.6 and the greater the value of α, the greater the reliability.

G. Analisis Data

Data analysis was performed using the factor analysis method with the help of the SPSS program. Factor analysis is one of Multivariate statistical analysis techniques which aims to reduce data. Santoso, (2012) and Karyasa, (2014) in Primary, (2018) wrote that there were 5 (five) stages of factor analysis namely first determining what variables had fulfilled the requirements for analysis. The variables chosen are variables that are relevant to the research conducted and must be based on previous research, the theory and the researcher's own opinion. The second tested Kaiser Meiyer Olkin (KMO) and the Measure of Sampling Adequacy (MSA) method. KMO testing is done to determine whether the factors in the study are valid or not. The KMO number is considered sufficient if it meets the requirements of more than 0.5 while for a significant Barlette's Test must be <0.05. Research can be further analyzed if the KMO and Barlette's Test values are eligible. Furthermore, if the KMO and Barlette's Test values meet the requirements, then proceed with MSA testing. The MSA test is considered sufficient if the MSA value is ≥ 0.5. However, if the variable with the MSA value does not meet the requirements (<0.5) then the analysis process must be re-done in the same way but must first discard the variable that does not meet the requirements.

Next is extraction. Factor extraction is the process of separating variables that meet the correlation of MSA values. The factor extraction method is related to determining the number of factors that describe the data structure. The method used is Principal Components Analysis (PCA).

The total initial eigenvalues value> 1 are the core factors that can determine the number of factors, on the contrary the total initial eigenvalues value <1 cannot be used to determine the number of factors. The fourth stage is rotating factors, with the aim of facilitating interpretation in determining which variables are included in a factor. In this study varimax rotation was used. The final stage is naming factors. There are no specific rules in naming this, but the naming of a factor should reflect the variables formed therein.

IV. RESULTS AND DISCUSSION

By using a factor analysis method that aims to find out the factors that cause delays in building construction work in Morowali Regency. Then the analysis results are obtained as follows, but before doing the factor analysis, first do the validity test (validity) and reliability test (reliability).

A. Validity Test

Validity test is used to determine the accuracy of 58 statement items in reflecting the factors causing delays in the implementation of building construction work in Morowali District. The instrument validity test (questionnaire) was addressed to 108 respondents. After testing the validity of 58 items, there are 10 items that do not meet the requirements because the value of p> 0.05, namely X1, X4, X5, X29, X30, X31, X33, X46, X47 and X51, because there are 10 instruments that are not valid only 48 instruments will be further analyzed while the 10 instruments will be removed / removed.

B. Reliability Test

After testing the reliability of 58 instruments, a Croncbach's Alpha value of 0.908 is obtained, which means> 0.6. This data shows that the measurement results of all instruments are reliable so that they can be used in further analysis.

C. AnalisisFaktor

Instruments that have fulfilled the requirements in testing the validity and reliability of the factors analysis can be done. In conducting a factor analysis the first decision that must be taken by the researcher is to analyze whether the existing data are sufficient to meet the requirements for a factor analysis. After testing the validity and reliability it is known that there are only 48 items that meet the requirements for a factor analysis. Then KMO and MSA were tested. The KMO test results can be seen in Table III.

TABLE III - KMO and Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0,513
Bartlett's Test of Sphericity	Approx. Chi-Square	5774,590
	df	1128
	Sig.	0,000

Based on Table III, it is known that the KMO value has met the requirements of 0.513 which means> 0.50 with a significant value of Bartlett's 0,000 which means <0.05. The MSA test results revealed that there were 21 variables that did not meet the MSA value requirement because <0.5. From this data it is known that the KMO and MSA analysis processes must be carried out again in the same way but must first discard variables that do not meet the requirements.

After the second KMO test on 27 variables, a KMO value of 0.723 is obtained, which means> 0.50 with a significant value of Bartlett's 0,000, which means it has fulfilled the requirements. This shows that these variables can be further analyzed by conducting a second MSA test. Based on the results of the second MSA analysis, it is known that there is still one variable that does not meet the requirements, namely X57 with an MSA value of 0.498, so that the third KMO and MSA testing must be re-done until all the variables meet the MSA value requirement of ≥ 0.5.

The third KMO test was performed again on 26 variables, then the KMO value obtained was 0.746, which means that it had fulfilled the requirements with a significant value of Bartlett's 0,000. Based on the results of the third MSA analysis, it is known that all variables have fulfilled the MSA value requirements,> 0.5 So it can be concluded that the 26 variables are sufficient for further analysis.

After conducting the KMO test and the MSA test, the next analysis to do is variable extraction. Extraction of variables into several groups of factors, using the PCA (Principal Component Analysis) method. There are 26 independent variables in this study that will be analyzed in the hope that it can provide a comulative variant value of> 60%.

TABLE IV - Total Variance Explained

Total Variance Explained						
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	10,255	39,441	39,441	10,255	39,441	39,441
2	2,804	10,784	50,226	2,804	10,784	50,226
3	2,265	8,712	58,938	2,265	8,712	58,938
4	1,492	5,738	64,676	1,492	5,738	64,676
5	1,130	4,344	69,020	1,130	4,344	69,020
6	1,112	4,277	73,297	1,112	4,277	73,297
7	0,967	3,719	77,016			
8	0,840	3,231	80,247			
9	0,813	3,128	83,376			
10	0,669	2,575	85,950			
11	0,538	2,070	88,020			
12	0,456	1,755	89,775			
13	0,427	1,643	91,418			
14	0,399	1,533	92,951			
15	0,335	1,290	94,241			
16	0,299	1,150	95,391			
17	0,276	1,060	96,451			
18	0,181	0,695	97,146			
19	0,171	0,656	97,802			
20	0,166	0,637	98,439			
21	0,127	0,489	98,928			
22	0,088	0,340	99,268			
23	0,077	0,295	99,563			
24	0,060	0,232	99,795			
25	0,035	0,133	99,928			
26	0,019	0,072	100,000			

Extraction Method: Principal Component Analysis.

After extracting the variables, it is known that the factors formed amount to 6 factors, because these 6 factors have a total initial eigenvalue value of more than 1 by giving a comulative variant value of 73.297%, which means that it has been in line with expectations> 60%. Of the 6 factors formed can represent 26 variables causing the delay in the implementation of building construction work in Morowali Regency which explains approximately 73.297%. Thus the extraction of 6 factors obtained can be stopped and has met the requirements.
Based on the initial eigenvalue values in Table IV, the Scree plot graph is obtained as follows:

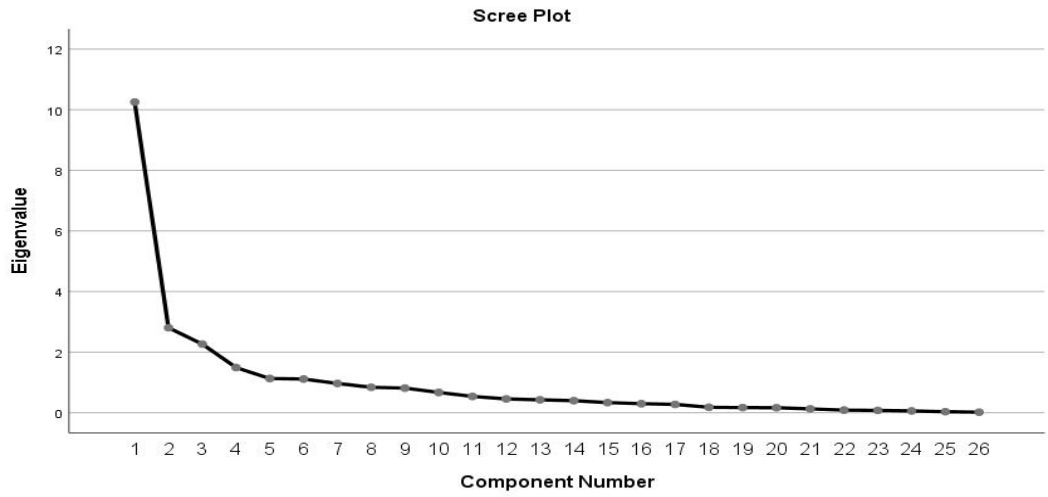

Fig. 2. Scree Plot

Next do the factor rotation. By using varimax rotation, the results obtained are Rotated Component Matrixa all variables have a factor laoding value> 0.4, which means 26 variables that have been analyzed affect the delay in the implementation of building construction work in Morowali Regency

TABLE V - Rotated Component Matrix

Rotated Component Matrix[a]						
	Component					
	1	2	3	4	5	6
x7	0,445	0,128	0,082	0,579	0,112	0,043
x9	-0,234	-0,081	0,855	0,101	0,033	-0,087
x11	0,080	0,410	0,645	0,386	0,245	-0,024
x12	0,184	0,353	0,648	0,444	0,179	0,084
x13	0,591	0,251	0,209	0,324	0,327	-0,153
x14	0,511	0,027	0,043	0,519	0,064	0,144
x17	0,154	0,365	0,718	-0,146	0,213	0,166
x18	0,540	0,451	0,254	-0,140	-0,058	0,464
x19	0,598	0,308	0,180	-0,047	0,318	0,408
x20	0,431	0,085	0,531	0,377	-0,223	0,322
x21	0,507	0,035	0,654	0,200	-0,165	0,299
x22	0,746	0,090	0,363	0,214	0,005	0,166
x23	0,799	0,139	0,203	0,146	0,136	-0,027
x24	0,921	0,108	-0,039	0,186	0,031	0,138
x25	0,861	0,298	-0,053	0,201	0,114	0,119
x26	0,807	0,215	-0,201	0,163	-0,046	0,026
x34	0,190	0,835	0,106	0,028	0,089	-0,042
x35	0,108	0,855	0,074	0,041	0,081	-0,022
x36	0,176	0,764	0,071	0,108	0,260	0,088
x37	0,366	0,532	0,164	0,277	0,217	0,220
x38	0,155	0,524	0,121	0,368	-0,054	0,146
x42	0,142	0,110	0,164	0,583	0,055	0,533
x43	0,304	0,151	0,281	0,597	0,190	0,097
x52	-0,026	0,156	-0,003	0,248	0,780	0,139
x53	0,213	0,182	0,161	-0,025	0,853	0,077
x58	0,083	0,004	0,021	0,174	0,170	0,759

From the factor laoding values obtained, it can be seen the grouping of variables into each factor. The grouping of factors is divided into 6 (six) factors with each variable as follows:

1. Factor 1 consists of 8 variables, namely X13, X18, X19, X22, X23, X24, X25, and X26, each of which has a factor laoding value of 0.591; 0.540; 0.598; 0.746; 0.799; 0.921; 0.861 and 0.807.
2. Factor 2 consists of 5 variables, namely X34, X35, X36, X37 and X38, each of which has a factor laoding value of 0.835; 0.855; 0.764; 0.532; and 0.524.
3. Factor 3 consists of 6 variables namely X9, X11, X12, X17, X20 and X21, each of which has a factor laoding value of 0.855; 0.645; 0.648; 0.718; 0.531 and 0.654.
4. Factor 4 consists of 4 variables, namely X7, X14, X42 and X43, each of which has a factor laoding value of 0.579; 0.519; 0.583; and 0.597.
5. Factor 5 consists of 2 variables, namely X52 with a laoding factor of 0.780 and X53 with a factor laoding of 0.853.
6. Factor 6 only consists of 1 variable, namely X58 with a laoding factor value of 0.759.

The last stage is naming factors. The naming of factors is done by looking at the variables formed in one factor. There are no specific rules in naming factors so researchers give names to factors based on characteristics that match the variable. The naming of factors is as follows:

1. Factor 1, namely location and equipment characteristic factors
2. Factor 2 is a factor in changing work documents
3. Factor 3, namely material and equipment factors
4. Factor 4 is the communication factor
5. Factor 5, namely the inspection, control and evaluation of the work system
6. Factor 6 is managerial factor

V. CONCLUSIONS

Based on the results of the research that has been done, it can be concluded that there are 6 (six) factors that cause delays in building construction work in Morowali Regency, namely location and equipment characteristic factors, changes in work document factors, material and equipment factors, communication factors, inspection system factors, controls and job evaluation and managerial factors.

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