

The Impact of Project Resource Management on Contractor Performance

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Abstract: The resources within the construction project are one of the most vital things in the construction process. This study aims to analyze the project resources management that simultaneously affect the contractor's performance. The problems raised in this research are how the management of construction project resources such as human, material, equipment, and methods of implementation are reviewed on the contractor's performance in the construction project of Al Azhar Campus II Tazkia IIBS Kab. Malang. For this purpose, sampling data were collected on 30 people involved in the building process. The analysis process uses correlation analysis to know how big the influence of variables and indicators of project resource to contractor performance. Then proceed with regression analysis to determine the effect of collectively and each variable so that it can conduct assessment of contractor performance with the help of SPSS 25.0. From this research, the biggest variable that influenced is the absence of quality management on the project. Then the result of the regression found that the project resources had an effect of 30.7% on the contractor's performance and 69.03% contributed by the variable that was not in the research. Material resources are the most influential variables on contractor performance.

Keywords: resources, performance, contractors, regression analysis

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I. INTRODUCTION

The construction project resources represent potential capabilities and capacities that can be utilized for construction activities. The construction project resources consist of several types including cost, time, manpower, materials, and equipment used in project implementation, which in the operation of these resources needs to be done in a good management system, therefore it can be utilized optimally [1]. The resource factor is one of the most important phases in a construction implementation. The resource factors in the construction process greatly affect the contractor's performance on the project. That is why all of the resources related to the implementation of construction must be planned and well-controlled. Resource factors relate to contractor performance.

Every year there is a degression in the performance of contractor companies caused by the limitations in managing and managing the resources owned. Where, for example in the field, it is often found inadequate resources such as: technical staff, workers / laborers and tool operators. In addition, the heavy equipment provided is also not in accordance with the conditions of field work, the quality and age of the tool. These are part of the factors causing delays in project completion, resulting in a degression in contractor performance and poor quality of work. In the construction project of Tazkia International Islamic Boarding School located in the district of Dau, Malang which has entered the 6th stage, the workmanship is delayed two months from the initial schedule. Could be, the factor of project resources management that is not maximal become one of the factors of delay in the construction project and the impact on the quality of the building.

II. MATERIAL AND METHODS

A. Project Construction Resources

Resources are needed to carry out the works that is a component of the project. This is done in relation to the accuracy of the calculation of elements of cost, quality, and time. How to manage (in this case the effectiveness and efficiency) of the use of these resources will result in the cost and schedule of implementation of the work.

In managing resources there are two key aspects, namely ensuring the required resources are available when needed and the second is ensuring resources are used efficiently [2]. To achieve both of these aspects, sufficient and timely resources must be supplied so that the project can run well and be completed on time. Lack of resources will cause a delay.

Construction project resources consist of several types, including human resources, materials, equipment, and implementation methods used in project implementation, where in operationalizing these resources need to be done in a good management system, so that can be utilized optimally.

- **Human Resources**

Human resource management is a typical approach to labor management that seeks to achieve competitive advantage through the development of a strategy of a highly capable and highly committed workforce using an integrated, structural, and personnel engineering culture [6].

The construction workforce is divided into two types, namely the provider or supervisor as well as the workers or the laborers (Craft labor). The number of providers is only 5-10% of the number of workers supervised. Besides, if seen from the form of working relationship between the parties concerned, the workforce of the construction project in particular is divided into two, namely [5]:

- a. Direct hire,
- b. Wholesale labor,

The implementation of the project, human resources in the form of labor is a determinant of the success of a project. The type and intensity of the project activity changes rapidly throughout its cycle, so the provision of the amount of labor should include the approximate type and for when the labor is required. By knowing the estimated number and schedule of its needs, then the provision of human resources both quality and quantity to be better and efficient [4].

- **Material Resources**

In every construction project, the use of materials is the most important part that has a substantial percentage of the total project cost. From several studies stating that material costs 50% -70% of project costs, this cost does not include the cost of material storage [1]. Therefore the use of excellent and appropriate management techniques to purchase, store, distribute and quantify construction materials becomes very important.

Material management is a system that coordinates activities to plan and supervise the volume and time of material procurement through acceptance / recovery, shifting and transfer of raw materials, materials in process and finished materials [8].

- **Equipment Resources**

Implementing a construction project means combining resources to produce the desired end product. Construction equipment is one of the most important resources that can support the achievement of a desired goal, on a construction project the need for equipment is between 7 - 15% of project cost [2]. In the construction phase, one of the cost elements is the cost of heavy equipment. Looking at the scale of work and the technical requirements of implementation in building construction, the use of heavy equipment is a must, although it will require considerable funding in its implementation [7].

- **Method of Construction Implementation**

The definition of work methods is a series of activities needed to process or change a set of input into a number of output which has added value. Changes that occur here can be physical or non-physical, where the change can occur to the shape, dimensions and properties. The added value in question is the value of the increased output in terms of functional value (usability) and / or economic value [8].

The construction work method is the sequence and timeline of building activities combined with contract requirements (drawings, specifications, schedules, completion etc.), availability of resources (such as labor, materials, equipment, funds) and environmental conditions of project implementation (such as weather, soil condition, social, economic and political conditions) [5].

The problem with the construction resources management is influenced by several things both from internal contractor and external (owner and environment). So this is a particular concern on research that raises the effect of management variables on contractor performance.

B. Research Methods

This study uses statistical analysis of regression and correlation to know what matters that affect the project resources management to the contractor performance. In addition, the sampling data were collected using primary data in the form of questionnaires consisting of project stakeholders ie foundation, supervisory consultant, and main contractor.

III. Result*3.1. Validity and Reliability Instruments Test*

Validity indicates the extent to which the measuring instrument to measure the validity of an instrument item can be known by comparing the correlation index of product moment pearson at 5% significance level with r_{table} value of 0.361 with the number of samples $n-2 = 28$ samples. If the value of r_{count} obtained at the sub-indicator value greater than the r_{table} of 0.361 then the item is declared valid and vice versa if lower than r_{table} declared invalid.

Table no 1: Validity Instruments Test Result

Variables	Points	Result
X1 (Human Resources)	10	Valid
X2 (Materials)	4	Valid
X3 (Equipments)	2	Valid
X4 (Working Method)	3	Valid
X5 (External Variables)	7	Valid

The results of valid variables are then tested its reliability by using SPSS 25.0 program that produces data reliability. Reliability test is done by looking at the value of Alfa Cronbach coefficient. An instrument can be said to be reliable in retrieving the desired data if the value of Alfa Cronbach coefficient derived from data greater than 0.6.

Table no 2: Reliability Instruments Test Result

Variables	Points	Alpha Coef	Result
X1 (Human Resources)	10	0.680	Reliabel
X2 (Materials)	4	0.704	Reliabel
X3 (Equipments)	2	0.731	Reliabel
X4 (Working Method)	3	0.810	Reliabel
X5 (External Variables)	7	0.659	Reliabel

3.2. Correlation Analysis

X1.7 as an indicator of the ineffectiveness or the absence of quality management procedures has a value of -0.450 where this indicates the dominance of strong enough indicators that impact on the decline in value of contractor performance.

Table 3. Summary of Pearson correlation test results with dominant factors

No	Code	Indicator	Coefficient Correlation
3	X _{1.7}	the ineffectiveness or the absence of quality management procedures	-0,450

3.3. Regression Analysis and Hypothesis Testing

Furthermore, regression analysis is used to obtain the effect of independent variables X_1 (Human Resources), X_2 (Material), X_3 (Equipment), X_4 (Working Method), and X_5 (External Variables) to variable Y (Contractor Performance).

Tabel no 4: Summary of Regression Results

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	53,410	21,426		2,493	,020
	X ₁	-,396	,296	-,256	-1,340	,193
	X ₂	1,603	,651	,537	2,461	,021
	X ₃	-,165	,870	-,035	-,190	,851
	X ₄	-,154	,512	-,063	-,301	,766
	X ₅	,537	,412	,226	1,302	,205

a. Dependent Variable: Contractor Performance

The effect of X_1 , X_2 , X_3 , X_4 , and X_5 together on the Y variable can be expressed by the equation below:

$$Y = 53.410 - 0.396 X_1 + 1.603 X_2 - 0.165 X_3 - 0.154 X_4 + 0.537 X_5$$

The meaning of the multiple regression equation can be interpreted as follows:

- Constant value = 53,383 is the value of the contractor's performance on the construction project if $X_1 = X_2 = X_3 = 0$
- The value of b_1 is -0.396; is the value of regression coefficient X_1 which means every increase of human resource value by one point, it will decrease contractor performance value equal to 0396 points.
- The value of b_2 is 1,603; is the value of the regression coefficient X_2 which means any increase in the value of material resources by one point, it will raise the contractor's performance value by 1,603 points.
- The value of b_3 is -0.650; is the value of X_3 regression coefficient which means each increase of the value of equipment resources by one point, it will decrease the contractor's performance value by 0.650 points.
- The value of b_4 is -0.154; is the value of the regression coefficient X_4 which means any increase in value of the implementation method by one point, it will decrease the value of contractor performance by 0154 points.
- The value of b_5 is 0.537; is the value of the regression coefficient X_5 which means any increase in value of the external variable by one point, it will raise the value of contractor's performance by 0241 points.

To prove whether the effect is significant or not, a significance test is done through F test, provided that if $F_{count} > F_{table}$, then H_0 is rejected and H_a is accepted, and vice versa. Value of significance of 0.05%.

Tabel no 5: Summary of F Test Results

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	336,859	5	67,372	2,128	,097 ^b
	Residual	759,807	24	31,659		

Total	1096,667	29
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a. Dependent Variable: Kinerja Kontraktor

b. Predictors: (Constant), X₁, X₂, X₃, X₄, X₅

F Value Analysis :

- Value of F_{count} = 2.128
- Denominator (Sampel-variabel) = 30 - 2
- Numerator (variabel-1) = 5 - 1
- Value of F_{tabel} = 2.60

$F_{table} > F_{count} = 2,128 > 2,60$ then H_0 accepted means that simultaneously, independent variables are X₁ (Human resources), X₂ (Material), X₃ (Tools), X₄ (Working Method), and X₅ (external variable) have an insignificant effect on variable Y (Contractor Performance).

Next, to test the effect of partial / each variable X to variable Y used t test, that is by comparing tcount with ttable, or significance value with α 5% or 0.05. with the number of samples 30, then the t_{table} of 2.063. Hypothesis that can be drawn is H_0 rejected if sig value < 0.05, or $t_{count} > t_{table}$ then there is influence from variable X to variable Y (performance of contractor).

Tabel no 6: Summary of T Test Result

Coefficients ^a		
Model	t	Sig.
		,020
X ₁	-1,340	,193
X ₂	2,461	,021
X ₃	-,190	,851
X ₄	-,301	,766
X ₅	1,302	,205

a. Dependent Variable: Contractor Performance

This test indicates that H_0 is received on the variables X₁, X₃, X₄, X₅ which means that the variable has no significant effect because $t_{count} < t_{table}$. However, on X₂ has a significant effect and positive effect on contractor performance. This is because $t_{count} > t_{table} = 2,461 > 2.063$ or sig value. of 0.21 < 0.05.

For determination value R square can be seen in table below:

Tabel no 7: Value of R² or Coefficient of Determination

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,554 ^a	,307	,163	5,62660

a. Predictors: (Constant) X_1 , X_2 , X_3 , X_4 , X_5

The coefficient of determination (R Square) is 0.307. These results explain the contribution of the independent variables X_1 (Human Resources), X_2 (Material), X_3 (Tools), X_4 (Work Implementation Method), and X_5 (External Variables) are included in the regression equation to variable Y (Contractor Performance) is 30.7%, while the other 69.03% is contributed by other variables not included in this research.

IV. CONCLUSION

After performing analysis and statistical testing of the influence of project resources on contractor performance on Al Azhar Central Office Project II Campus II Tazkia IIBS, Kab. Malang, it is found that the most dominant factor is the ineffectiveness or the absence of quality management procedures that negatively affect. Where this preventive action must be considered by the contractor in order to increase the contractor's performance value in the project. Material resources that play an important role that significantly affect the performance of contractors with the value of $t_{\text{count}} > t_{\text{table}} = 2.461 > 2.063$ with significance value of $= 0.021 < 0.05$. While the construction project resources management in Al Azhar Campus II case study has an effect of 30.7% contractor performance. While 69.03% is another factor contributed by other problems that occur in the development project.

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