

# Analysis of Factors that Influence Labors' Productivity in the Construction Project of Students' Lab Work at SMK Nasional Malang

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**Abstract**— Education is the most important thing for young people today, as the main capital in facing global changes in the fields of science and technology. To address this, Malang National Vocational School seeks to facilitate their students by procuring lab work so that students can implement the theories learned. The lab work of Malang National Vocational School students is a construction project in which the characteristics of a project are they have limited time, funds and also specifications. Based on field observations, there are factors that are considered to be able to influence the productivity of labors and also affect the success of the project. From some of these factors then make a research variable consisting of material availability (X1), material location (X2), tools used (X3), weather (X4), image changes (X5), and foreman leadership style (X6) and factors internal consisting of: work motivation (X7), work discipline (X8) and work skills (X9). This study uses a quantitative analysis method by capturing the opinions, experiences and attitudes of respondents to obtain primary data through a questionnaire as a means of collecting data from populations taken as samples and their numbers. The results of the analysis showed that the factors that influence the productivity of the labors were weather factor (X4) = 3.102, work motivation factors (X7) = 0.934, material location factor (X2) = 0.326, tools used factor (X3) = 0.287. These positive factors together or simultaneously affect labor productivity (Y) with the value of  $F_{count} = 11,970 > F_{table} = 2,40$ . While the dominant factor affecting labors' productivity is weather factor (X4) with test results  $t_{hitung} = 3,102 > t_{table} = 2,0639$  and the value of  $\beta = 0,082$ , so it can be concluded that the hypothesis of  $H_a$  is accepted and  $H_0$  is rejected.

**Keywords**— Construction, labors' productivity, projects, school buildings.

## I. INTRODUCTION

Education today is an important thing for young people in preparing themselves to face global challenges in science and technology, thus at the level of High School or Vocational School they continue to strive to facilitate their students with various learning facilities and infrastructure so that they can equip themselves before continuing to levels such as universities or those who will directly serve the community or become entrepreneurs. The development of the lab work of Malang Nasional Vocational School students is a manifestation of the school management in addressing these global challenges.

The construction of Malang Nasional Vocational School lab work includes a building construction project where the project is a temporary activity that has clear goals and objectives, takes place in a limited period of time, with the allocation of certain resources [1]. human resources, materials, tools and methods play an important role in the success of a project. The project is said to be successful if it is on time, right on cost, right on quality [2], therefore the need for good resource management so as not to hamper the success of the project.

Human resources are the most important factor in a project activity because humans are managing or controlling all activities in a project. As a result of the lack of good human resource management it would impact on the success of each stage of the project. Based on observations in the field, there are some irregularities that can affect the productivity of labors including labors being absent often from work, lack of tools for labors, rain, lack of material supplies. Decreased labor productivity in a project often occurs which is influenced

by several factors in research [3], which describes several variables in his research including motivation, skills, discipline, and education. While in thesis research [4], described the variables that affect the productivity of labors are the location of the material, weather, land conditions, material availability, changes in the image, and the relationship between the foreman and the handyman. Thus in this study it is going to analyze how much influence do factors affecting the productivity of labors and also analyze the dominant factors affecting the productivity of labors in the lab work project construction at SMA Nasional Malang.

## II. THEORETICAL FRAMEWORK

### A. Project Construction

A project is an activity carried out with limited time and resources to achieve a predetermined final result, in achieving the final result, project activities are limited by budget, schedule, and quality, known as three constraints or triple constraints [5].

construction project is a project related to the construction of a building and infrastructure which generally involves the main work included in the fields of civil and architectural engineering, besides it also involves other fields of science such as industrial engineering, mechanical engineering, electrical engineering, geotechnical engineering and landscape [1]. The characteristics of a project are:

- Has goals and objectives in the form of an end product.
- Projects have a temporary nature, ie clear starting and final points.
- Costs, time and quality in achieving these goals and objectives have been determined.

- Type and identity of activities change throughout the project, causing the project to be non-repetitive.

#### B. Project Management

Project management is a process of planning, organizing, leading and controlling company resources to achieve short-term goals that have been determined. Project management grows because of the urge to look for a management approach that suits the demands and nature of project activities, an activity that is dynamic and different from routine operational activities [5].

The success of a project requires a careful planning, good coordination and accuracy in supervision of the work, because the project is defined as an activity that is not repeated or once happened and its success is determined by a coordination of a number of parties involved both internal or external stakeholders. [5].

#### C. Productivity

Productivity has various meanings for individuals. Basically productivity is defined as the relationship between tangible and physical results (goods or services) with actual input. For example, "productivity" is a measure of productive efficiency. A comparison between outputs and inputs [6].

#### D. Labor Productivity

Observation towards productivity is usually related to labor, therefore according to [7], labor productivity is every person who is able to do work to produce goods or services both to meet their own needs and society.

The following is the translation of labor tasks based on their expertise as follows:

- A foreman is a person who has special expertise regarding a particular job. The foreman supervises the labors.
- The head builder is a person who has expertise in the area of carpentry for certain types of work and giving the instructions to the craftsmen who related to the type of work.
- A handyman is a person who directly does work in the field in a certain field according to the head worker's visit. These people usually have few skills.
- A worker or laborer is a person who helps a handyman or chief craftsman for all types of work without having to have expertise in certain jobs.

#### E. Population and Sample

Population is a collection of all measurements, objects, or individuals studied. While sample is a part or a subset of a population [8].

Meanwhile, according to [9], population is a generation area that consists of subjects that have certain qualities and characteristics determined by researchers to be studied and then drawn conclusions. So the population is not only people, but also objects and other natural objects. The population is also not just the amount that exists on the object / subject studied, but includes all the characteristics / traits that are owned by the subject or the sample being studied.

Sample is part of the number and characteristics possessed by the population. If the population is large, and researchers may not study everything in the population, for example due to limited funds, manpower and time, then researchers can use samples taken from that population. What is learned from the sample, the conclusion can be applied to the population, for that the sample must be truly representative (represent) [9].

The sampling technique in this study uses the type of saturated sampling, i.e this type of sampling technique is used if the population is relatively small, or less than 100 people, or researchers who want to make generalizations with very small errors [10].

### III. RESEARCH METHODOLOGY

#### A. Research Type

This study uses quantitative research method by capturing the opinions, experiences and attitudes of respondents to obtain primary data through a questionnaire as a means of collecting data from populations used as samples that have been determined in number. Quantitative research method is defined as a research method based on the philosophy of positivism, used to examine populations or specific samples, collecting data using research instruments, quantitative / statistical data analysis, with the aim to test the hypotheses that have been set. [10]. The population in this study were all workers in the construction project of lab work at SMK Malang students, amounting to 32 people and used as samples for this study. To determine the number of research samples, used the Solving formula:

$$n = \frac{N}{1 + Ne^2} \quad (1)$$

with:

- n = total sample
- N = total population
- d = precision value (0,1)

#### B. Research Variable

Research variables consist of two forms [10], namely:

1. Independent variables, are stimulus, input, predictor and antecedent variables which are referred to as independent variables. The independent variable is the variable that is the cause of the occurrence or change of the dependent variable. The independent variable in this study consists of:
  - Material availability (X1)
  - Location of material (X2)
  - Tools used (X3)
  - Weather (X4)
  - Image changes (X5)
  - Foreman leadership style (X6)
  - Work motivation (X7)
  - Work discipline (X8)
  - Work skills (X9), and
2. Dependant Variable,  
The dependent variable in this study is the Craftment's productivity (Y)

**C. Research Variable Measurement Scale**

The measurement scale of the variables on the questionnaire uses Likert scale, in which this scale makes it easy for respondents to provide answers to each item of question or statement in the questionnaire [11].

**D. Questionnaire Validity Test Results**

The following results of the questionnaire data validity test can be seen in the following table:

TABLE I. Questionnaire Validity Test Results

Variable	Value of r <sub>count</sub>	Value of r <sub>table</sub>	Results
Material availability (X1)	0,451	0,3610	Valid
	0,488	0,3610	Valid
	0,824	0,3610	Valid
	0,622	0,3610	Valid
Material Location (X2)	0,776	0,3610	Valid
	0,767	0,3610	Valid
	0,670	0,3610	Valid
Tools used (X3)	0,660	0,3610	Valid
	0,741	0,3610	Valid
	0,716	0,3610	valid
Weather (X4)	0,722	0,3610	Valid
	0,911	0,3610	Valid
	0,918	0,3610	Valid
	0,739	0,3610	Valid
Image change (X5)	0,725	0,3610	Valid
	0,549	0,3610	Valid
	0,886	0,3610	Valid
Foreman leadership style (X6)	0,684	0,3610	Valid
	0,848	0,3610	Valid
	0,729	0,3610	Valid
	0,766	0,3610	Valid
Work motivation (X7)	0,521	0,3610	Valid
	0,731	0,3610	Valid
	0,683	0,3610	Valid
	0,497	0,3610	Valid
	0,518	0,3610	Valid
	0,688	0,3610	Valid
Work discipline (X8)	0,751	0,3610	Valid
	0,893	0,3610	Valid
	0,871	0,3610	Valid
	0,883	0,3610	Valid
	0,815	0,3610	Valid
Skills (X9)	0,613	0,3610	Valid
	0,880	0,3610	Valid
	0,860	0,3610	Valid
	0,817	0,3610	Valid
	0,610	0,3610	Valid

**E. Data Reliability Test Results**

The results of the questionnaire data reliability test can be seen in the following table:

TABLE II. Questionnaire Reliability Test Results

Variable	Cronbach Alpha	Results
Material availability (X1)	0,337	Unreliable
Material Location (X2)	0,792	Reliable
Tools used (X3)	0,773	Reliable
Weather (X4)	0,831	Reliable
Image change (X5)	0,544	Unreliable
Foreman leadership style (X6)	0,748	Reliable
Work motivation (X7)	0,663	Reliable
Work discipline (X8)	0,867	Reliable
Skills (X9)	0,801	Reliable

**F. Respondents' Profile**

The percentage of respondents' profiles are in the following table:

- Respondents' Age  
The percentage of respondents' age can be seen in the table below:

TABLE III. Percentage of Respondents' Age

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 30-40 years	18	56.3	56.3	56.3
> 40-50 years	8	25.0	25.0	81.3
> 50 years	6	18.8	18.8	100.0
Total	32	100.0	100.0	

- Respondents' Work Experience  
Presentation of Respondents' Work Experience can be seen in the table below:

TABLE IV. Percentage of Respondents' Work Experience

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid <10 years	11	34.4	34.4	34.4
>10-20 years	15	46.9	46.9	81.3
>20 years	6	18.8	18.8	100.0
Total	32	100.0	100.0	

- Respondents' Wage  
Percentage of Respondents' Wages can be seen in the table below:

TABLE V. Percentage of Respondents' Wage

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid <75.000/ days	8	25.0	25.0	25.0
>75.000-85.000/ days	2	6.3	6.3	31.3
>85.000/days	22	68.8	68.8	100.0
Total	32	100.0	100.0	

- Percentage of Respondents' Education  
Percentage of Respondents' Education can be seen in the table below:

TABLE VI. Percentage of Respondents' Education

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid SD	14	43.8	43.8	43.8
SMP	14	43.8	43.8	87.5
SMA	4	12.5	12.5	100.0
Total	32	100.0	100.0	

**G. Results of Multiple Linear Regression Analysis**

Multiple regression analysis was used by the researcher, if the researcher intends to predict how the condition (ups and downs) of the dependent variable (criterion), if two or more independent variables as predictor factors are manipulated (increased in value). So a double regression analysis will be carried out if the number of independent variables is at least 2 [8].

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3, \dots, + b_nX_n \quad (2)$$

with :

- Y = Subjects in the predicted dependent variable
- X<sub>n</sub> = Subject of independent variable with certain value
- a = Price of Y if X = 0 (Constant Price)
- b<sub>n</sub> = The direction number or regression coefficient which indicates an increase or decrease in the independent variable based on the independent variable.

The following are the results of multiple linear regression analysis:

TABLE VII. Results of Multiple Linear Regression Analysis

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (constant)	13.624	3.329		4.093	.000
Material Location (X2)	.052	.159	.071	.326	.747
Tools used (X3)	.079	.276	.068	.287	.777
Weather (X4)	.082	.074	.233	3.102	.002
Foreman leadership style (Xa6)	-.045	.137	-.081	-.329	.745
Work motivation (Xb1)	.146	.156	.311	.934	.360
Work discipline (Xb2)	-.155	.114	-.418	-1.366	.185
Work Skills (Xb3)	-.082	.138	-.159	-.591	.560

From the results of the analysis in the above table, you can determine the multiple linear regression equation as follows:  
 $Y = 13,624 + 0,052X_2 + 0,079X_3 + 0,082X_4 + -0,045X_6 + 0,146X_7 + -0,155X_8 + -0,082X_9$

Based on the analysis results in the table above, there is a weather variable that has the largest value (B) of 0.082, which means that the weather factor most influences the worker's productivity (Y).

#### H. Results of Hypothesis Analysis

The results of testing the hypothesis using simultaneous significance test or Fisher's exact test (F test) with the F<sub>count</sub> test results are in the following table:

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	17.967	7	2.567	11.970	.000 <sup>b</sup>
Residual	63.533	24	2.647		
Total	81.500	31			

a. Dependent Variable: (Y)

b. Predictors: (Constant), X9, X6, X3, X4, X2, X8, X7

From the results of the hypothesis test in the table above, it can be explained that the F<sub>count</sub> value was 11.970 and the F<sub>table</sub> value obtained was 2.40, which means the F<sub>count</sub> value > F<sub>table</sub> thus the initial Hypothesis (Ho) is rejected and the first Hypothesis (Ha) is accepted. The conclusion from the results of this analysis are independent variables consisting of material location factor (X2), factor tools used (X3), weather

factor (X4), foreman leadership style factor (X6), work motivation (X7), work discipline (X8), and work skills (X9) together have a significant positive and negative effect on the dependent variable or worker productivity.

Thus the problems related to the decline in labor or workers' productivity in the lab work construction project of SMK Nasional Malang students is the influence of weather factors, material location factors, foreman leadership style, work motivation, tools used, work skills, and work discipline, this should be used as evaluation material to minimize the impact on the sustainability of the project.

#### IV. CONCLUSIONS AND SUGGESTIONS

##### A. Conclusion

From the results of data analysis, it can be concluded that:

- Factors that influence the productivity of workers in the lab work project construction at SMA Nasional Malang students are the weather factor (X4) with t<sub>count</sub> = 3.102, work motivation factor (X7) with t<sub>count</sub> = 0.934, material location factor (X2) with t<sub>count</sub> = 0.326, tools used factor (X3) with a t<sub>count</sub> = 0.287. These factors are positively or simultaneously affecting the labor productivity (Y) with a value of F<sub>count</sub> = 11.970 > F<sub>table</sub> = 2.40.
- The most dominant factor influencing is the weather factor seen in multiple linear regression testing with a value of β = 0.082, so it can be concluded that the hypothesis H<sub>a</sub> is acceptable and H<sub>0</sub> is rejected.

##### B. Suggestions

- To increase labor productivity in the construction sector, the contractor must pay attention to the factors that affect the productivity of workers by providing shelter from rain and lightning and also taking into account the welfare of workers.
- It is recommended for further research that the topography of each region is different so that it can conduct similar research in other areas and add other variables considered to affect labor productivity.

#### REFERENCES

- [1] Widiasanti, I dan Lenggogeni. 2013." Manajemen Konstruksi". Bandung: Remaja Rosdakarya.
- [2] Kerzner, Harold, 2006. "Project Management: A System Approach to Planning, Scheduling and Controlling", Van Nostrand Reinhold.
- [3] Tjaturono, Nadjadji A., Indrasurya, B.M., Maziah Ismail, (2005), "The Development of Actual Labour Productivity Measurement Model for Medium Cost Housing in Malang, East Java, Indonesia", Jurnal Sains & Teknologi Kejuruteraan, KUITTHO, 2005.
- [4] Sibarani, Mahadin. 2008. "Pengaruh Faktor-Faktor Eksternal Terhadap Produktivitas Tenaga Kerja Pasang Dinding Pada Bangunan Gedung Di Kabupaten Manggarai Propinsi Nusa Tenggara Timur". Manggarai: Tesis Program Studi Teknik Sipil, Institut Teknologi Nasional Malang.
- [5] Rani, A., H. 2016. "Manajemen Proyek Konstruksi". Cetakan Pertama. Yogyakarta: Budi Utama.
- [6] H. P. Josua, Sibi. Mochtar, I. L. Revo, "Analisis Produktivitas Tenaga Kerja Konstruksi pada pekerjaan pasangan lantai keramik dan plesteran dinding menggunakan metode Work Sampling (Studi Kasus: Bangunan Gedung Pendidikan Fakultas Kedokteran)", Jurnal Sipil Statik, Vol. 5 No. 4, Juni, 2017.
- [7] Republik Indonesia, Undang-Undang Republik Indonesia, Nomor 13, Tahun 2003 tentang Ketenagakerjaan, Jakarta, 2003.



- [8] Widodo, A. dan Kwardiniya, A. 2017. *Pengantar Statistika*. Cetakan pertama. Malang.: UB Press.
- [9] Sugiyono. 2012. *Statistika Untuk Penelitian*. Edisi ke-21. Bandung: Alfabeta.
- [10] Sugiyono. 2011. *Metode Penelitian Kuantitatif, kualitatif dan R&D*. Edisi ke-14. Bandung: Alfabeta.
- [11] McDaniel, Carl dan Roger Gates. "Marketing Research (10th edition)". Sussex : John Wiley & Sons Ltd. 2015.