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ANALYSIS OF THE PIECEWORK PAY SYSTEM IN IMPROVING WORK PERFORMANCE PRODUCTIVITY IN THE CONSTRUCTION OF SMK SCHOOL BUILDINGS IN CARUBAN DISTRICT, MADIUN REGENCY

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ABSTRACT

The application of the piece-rate wage system in construction projects has the potential to influence project timeliness and worker motivation. This study examines the effect of the piece-rate wage system on the completion efficiency of the SMK school building project in Caruban District, Madiun Regency. A quantitative approach was used, with multiple linear regression analysis conducted on data collected from 40 construction workers via questionnaires. The study analyzed the impact of wage systems, work communication, and work environment on labor productivity and motivation. The results showed that these three factors significantly influence the timely completion of construction work, with the piece-rate wage system playing a crucial role in enhancing worker performance. The findings highlight that implementing a structured piece-rate payment model, improving communication between workers and supervisors, and ensuring a conducive work environment can optimize labor efficiency. This study suggests that contractors and project managers should adopt clear wage agreements, provide incentives for quality work, and establish monitoring mechanisms to balance productivity with work quality.

Keywords: *labor productivity; piece-rate wage system; work motivation*

INTRODUCTION

In the increasingly competitive construction industry, increasing productivity is key to project efficiency and success, where the wage system plays an important role in influencing worker motivation and performance (Layek & Koodamara, 2024; Pham et al., 2024; Rowen et al., 2022; Smeddinck et al., 2019). One widely applied system is the piece-rate system, which allows the foreman to determine the amount of labor and estimate the execution time according to his team's capabilities (Savandha et al., 2024). This system can increase worker motivation due to the direct correlation between wages and work results, as explained in König & Longmuir (2025) research and in line with Skinner's Reinforcement Theory. With higher wages as a positive consequence, workers are encouraged to complete work more quickly and efficiently, reducing the contractor's salary burden and improving project cost efficiency (Kolawole et al., 2018). However, this system also has challenges, such as the risk of quality degradation due to an excessive focus on work speed by Olsen & Tomlin (2020) and external constraints such as project design changes that can hinder performance if not matched with time and cost adjustments (Blomsma et al., 2023). Therefore, effective project management and good communication between contractors, foremen, and project owners are necessary for the piecework system to run optimally without compromising the quality of work.

Empirical studies have shown that properly implemented piece-rate wage systems can significantly increase productivity. Tabassum et al. (2021) in his research on construction projects in Indonesia found that piece-rate workers could complete work at a 20% higher speed than workers who were paid daily. A similar study by Mansur et al. (2017) also found that workers who received piece-rate wages showed higher motivation than workers with wage systems, other productivity. Performance in construction projects is a crucial aspect that affects project success, especially in terms of achieving time, cost, and quality targets. As a sector that is highly dependent on labor, one way to optimize productivity is through the implementation of an effective wage system (Wasti et al., 2007). A piece-rate wage system is one of the approaches widely used in construction projects to boost labor productivity. In this system, wages are calculated based on the agreed volume or work results, in contrast to the daily wage system which calculates wages based on working time (Ferreira et al., 2025).

The piece-rate wage system offers various benefits to both contractors and workers. For contractors, this system helps in more definite budget planning as wages are paid according to the results achieved (Bouazizi et al., 2024). In addition, piece-rate wages tend to motivate workers to work harder and faster as they are directly incentivized to get the job done faster (Ajslev et al., 2015). On the other hand, for workers, this system allows them to earn higher wages if they can complete more work or faster, per the initial agreement (Nawawi et al., 2015). Labor performance productivity is one of the key factors in the success of construction projects. In the construction industry, high productivity is necessary to achieve project time, cost, and quality targets. The wage system is one of the important instruments in motivating labor and increasing their productivity. One of the commonly applied wage systems is the piece-rate system. This system is known to encourage labor to work faster and more efficiently because the wages received by workers depend on the work results achieved (Xing & Xiaofeng, 2021).

The implementation of a piece-rate system in construction projects has proven to be effective in increasing productivity because it provides direct incentives to workers based on the work they achieve (Okoye et al., 2022). This system encourages the efficiency of working time because workers have the urge to complete work as quickly as possible without neglecting quality (Erik et al., 2023). In addition, the piece-rate system allows contractors to have clearer cost planning because wages are calculated based on the volume or results of work agreed upon in advance (Rani, 2017).

In addition, productivity in the piece-rate system is also strongly influenced by other factors, such as labor skills and experience, availability of materials and equipment, and effective project management (Soper, 2020). Azzahra et al. (2024) explains that the combination of a piece-rate wage system with good training can improve labor skills, which in turn contributes to increased productivity. Although the piece-rate system has several advantages, challenges such as potential conflicts between contractors and workers regarding the determination of work volume and wage fairness issues also need attention. A study by Savandha & Fitriyani (2025) found that good communication between contractors and workers, as well as a clear understanding of the scope of work, are key to reducing potential conflicts in the piece-rate system.

Starting from the problems faced in the construction project of SMK school buildings in Caruban District, Madiun Regency, related to labor productivity and work time efficiency. In construction projects, especially those involving educational facilities such as school buildings, there is a demand to complete the work within a limited time with good quality. However, in the field, worker productivity often decreases, resulting in delays in project completion and inefficient use of the budget. In the implementation of the SMK school building project in Caruban District, Madiun Regency, a number of problems were found related to worker performance and time efficiency. One of the main challenges faced was low work productivity, which affected the quality and speed of project completion. Workers who are paid a daily wage tend to lack the drive to complete tasks faster or with better quality, as their wages do not depend on the amount of work completed. The piece-rate system, which is commonly used in construction projects, offers a potential solution to this problem. In a piece-rate system, workers are paid based on the volume of work completed, which is expected to encourage them to work more quickly and efficiently. However, implementing this system also poses its own challenges, such as ensuring that workers maintain quality despite the push to work faster. This study was chosen to analyze in depth the effect of the piece-rate wage system on the productivity and performance of the SMK school building project. By identifying the factors that influence the success of the piecework system, this research is expected to provide solutions to the productivity problems faced and provide recommendations for project managers in choosing a more appropriate wage system to improve efficiency and work output in similar projects.

While extensive research exists on the piece-rate wage system in construction, a notable gap persists in understanding its nuanced impact within the specific context of SMK (Sekolah Menengah Kejuruan – Vocational High School) school building construction in the Caruban District, Madiun Regency. This research uniquely addresses this gap by providing an empirical analysis of the piece-rate system's effectiveness in enhancing work performance productivity specifically within these projects. By focusing on this specific sector and region, this study offers a more granular and contextually relevant understanding of the factors influencing the success (or failure) of piece-rate implementation, considering the unique challenges and characteristics of SMK school building projects in this particular district. Furthermore, this research investigates not only productivity, but also explores worker motivation and the role of communication and work environment. The "so what?" is that this study aims to provide targeted, actionable recommendations for project managers in Caruban District and similar regions, enabling them to optimize the piece-rate system and improve the efficiency and quality of future SMK school building projects. This study aims to determine the effect of the implementation of a piece-rate wage system on the timeliness of completion of each stage of a vocational school building project in Caruban District, Madiun Regency. In addition, this study also aims to analyze how the piece-rate wage system affects the level of labor motivation, as measured by the rate of work completion per shift on the same project.

METHOD

This study employs a quantitative approach to analyze the effect of the piece-rate wage system on labor productivity in the construction of SMK school buildings in Caruban District, Madiun Regency. The research was conducted at a project managed by PT Panca Putri, covering several vocational school construction sites. The study population included all workers involved in the project, and a random sampling technique was used to select 40 respondents to ensure a representative sample. Data collection was conducted through questionnaires, interviews, and direct field observations to assess the impact of wage systems, work communication, and work environment on productivity and motivation.

The collected data were analyzed using multiple linear regression analysis to examine the relationship between independent variables (wage system, work communication, and work environment) and dependent variables (productivity and work motivation). Before performing regression analysis, several assumption tests were conducted to ensure the validity of the model. Normality testing was performed using the Kolmogorov-Smirnov test, ensuring that the residuals followed a normal distribution. Homoscedasticity testing was carried out using the Breusch-Pagan test to check for constant variance in the error terms. Multicollinearity was assessed through Variance Inflation Factor (VIF) values, ensuring that the independent variables were not highly correlated. Additionally, an autocorrelation test using the Durbin-Watson statistic was conducted to verify that residuals were not serially correlated. A random sampling technique was used to select participants from the population of construction workers, aiming to minimize selection bias and enhance the sample's representativeness. While this method provides equal opportunity for participation, potential limitations include sampling error, which may result in a sample that does not perfectly reflect the population, and practical challenges in contacting and recruiting all selected workers on active construction sites, potentially leading to non-response bias.

All statistical analyses were conducted using SPSS 27, and significance levels were set at 0.05. The results of these tests confirmed that the data met the required assumptions for regression analysis, ensuring the reliability and accuracy of the findings. The validated regression model was then used to derive conclusions on how the piece-rate wage system impacts work efficiency and labor motivation, providing practical insights for construction project managers.

RESULTS AND DISCUSSION

Research Results

The results of this study were processed and analyzed according to the methods used. The findings are interpreted to answer the research questions, by linking the data to the objectives and related theories, in order to provide an in-depth understanding of the implications of the research.

Variable Validity Test

This validity was carried out to determine the extent to which each statement item in the questionnaire was able to measure what should be measured by involving 40 respondents, the correlation value between the score of each statement item and the total score was calculated. test

At the 5% significance level, the r table value for 40 respondents is 0.312.

Hypothesis tested

- **H. $_0$**: **rcount** <0.312, which means that the questionnaire statement items are invalid
- **H_1**: **rcount** ≥0.312, which means the questionnaire statement items are valid

Table 1. Item Validity Test

Factor	Variables	Question	rcount	Description

Wage System X1	X1.1	Are you satisfied with the piece-rate wage system applied in this project?	0,928	Valid
	X1.2	How often do you receive your wages on time?	0,775	Valid
	X1.3	Do you feel that the wages you receive are commensurate with the amount of work you complete?	0,882	Valid
	X1.4	How much does the piece-rate system affect your job satisfaction?	0,794	Valid
Wage System X1	X1.5	How important do you consider the piece-rate system to the success of the project?	0,706	Valid
	X1.6	Do you feel there is sufficient quality control of the work done?	0,708	Valid
Communication X2	X2.1	How good was the communication between the project manager and workers on this project?	0,919	Valid
	X2.2	Do you get constructive feedback from your boss about your work?	0,913	Valid
Work Environment X3	X3.1	Do working conditions at the project site affect your productivity?	0,878	Valid
	X3.2	How much impact does your work environment have on your performance?	0,734	Valid
	X3.3	How good was the teamwork among workers on this project?	0,749	Valid
Productivity and Work Motivation Y	Y2.1	Do you feel that the piece-rate system motivates you to work more productively?	0,809	Valid
	Y2.2	Have you experienced an increase in work productivity since the implementation of the piece-rate system?	0,793	Valid
	Y2.3	How often do you feel burdened by work targets in this piece-rate system?	0,661	Valid

Source: Processed by Researcher, 2024

Based on table 4.6, the results of the validity test of the statement variables using the method Pearson Correlation Product Moment in the SPSS 27 program, involving 40 respondents and a level of significance 5% (r table = 0.312), it was found that all statement items had a value of r count ≥ 0.312, thus meeting the validity criteria. Thus, all statement items are declared valid and suitable for research use because they correlate significantly with the total score.

Item Reliability Test

This reliability was carried out to determine the extent to which the statement items in the questionnaire gave consistent results if measured repeatedly, in this study, the questionnaire was tested on 40 respondents for the questionnaire statement item test with a value of the questionnaire test Cronbach's Alpha 0.70 calculated to determine the good level. Based on the guidelines for interpreting the reliability value like this

- Cronbach's Alpha ≥ 0.70 indicates that the questionnaire has good reliability.
- Cronbach's Alpha <0.70 indicates that the questionnaire is not good enough

Table 3. Item reliability test

Factor	Crobach's alpha	rcritical	Description
Wage System X1	0,865	0,7	Reliable
X2 Communication	0,815	0,7	Reliable
Work Environment X3	0,824	0,7	Reliable
Productivity and Work Motivation Y	0,829	0,7	Reliable

Source: Processed by Researcher, 2024

The analysis results show that the value of Cronbach's Alpha for this questionnaire is above 0.70, so all statement items are declared reliable. This means that the questionnaire is able to provide consistent and reliable measurement results for further research.

Descriptive Statistical Test

This analysis aims to determine the tendency of data through statistical values such as mean (average), median, standard deviation, minimum, and maximum for each statement item, in this study, each statement item was analyzed using the SPSS 27 program, and the descriptive results can be seen in the following table.

Table 4. Descriptive Statistics Test

Factor	N	Min	Max	Mean	Std. Deviation
Total Wage System (X1)	40	14	30	23.55	4.248
Total Work communication (X2)	40	5	10	7.93	1.607
Total Work Environment (X3)	40	7	15	11.68	1.940
Total Productivity and Work Motivation (Y)	40	8	15	12.08	1.886
Valid N (listwise)	40				

Source: Processed by Researcher, 2024

The analysis results show that most statement items have a high mean**,** which indicates a tendency for positive responses from respondents. The relatively low standard deviation indicates that the data tends to be homogeneous, or respondents' answers are relatively consistent.

Correlation Test

This test was carried out to determine the level of relationship between two or more variables. In this study, the correlation test was carried out to analyze the strength and direction of the relationship between the X and Y variables.

Table 5. Correlation Test

		Total Wage System (X1)	Total Work communication (X2)	Total Work Environment (X3)	Total Productivity and Work Motivation (Y)
Total Wage System (X1)	Pearson Correlation	1	.907**	.797**	.788**
	Sig. (2-tailed)		.000	.000	.000
	N	40	40	40	40
Total Work communication (X2)	Pearson Correlation	.907**	1	.740**	.738**
	Sig. (2-tailed)	.000		.000	.000
	N	40	40	40	40
Total Work Environment (X3)	Pearson Correlation	.797**	.740**	1	.602**
	Sig. (2-tailed)	.000	.000		.000
	N	40	40	40	40
Total Productivity and Work Motivation (Y)	Pearson Correlation	.788**	.738**	.602**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	40	40	40	40

**. Correlation is significant at the 0.01 level (2-tailed).

Source: Processed by Researcher, 2024

Table 6. Correlation test guide

Value Interval r	Interpretation
0.00 - 0.19	Very weak relationship
0.20 - 0.39	Weak relationship
0.40 - 0.59	Medium relationship
0.60 - 0.79	Strong relationship
0.80 - 1.00	Very strong relationship
-0.19 - 0.00	Very weak (negative) relationship

-0.39 - -0.20	Weak (negative) relationship
-0.59 - -0.40	Moderate (negative) relationship
-0.79 - -0.60	Strong (negative) relationship
-1.00 - -0.80	Very strong (negative) relationship

Source: Field, A. (2016)

In the table, the value r is within the range of 0.80 - 1.00, this indicates a very strong relationship between the two variables tested. A positive interpretation indicates a direct relationship (the two variables move hand in hand).

Multiple Regression Test

Regression tests are carried out to test the relationship between the independent (predictor) and the, in this study, regression analysis was carried out using the SPSS 27 program to determine how much the independent variable contributed to predicting the dependent variable. For the method using:

Table 7. Multiple Regression Results

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	4.090	1.199		3.412	.002		
	Total Wage System (X1)	.323	.120	.728	2.691	.011	.142	7.039
	Total Work communication (X2)	.158	.285	.134	.553	.584	.176	5.682
	Total Work Environment (X3)	-.075	.164	-.077	-.454	.652	.363	2.753

Coefficients[a]

a. Dependent Variable: Total Productivity and Work Motivation (Y)

Source: Processed by Researcher, 2024

From the test results above, the regression equation can be formed as follows:

$$Y = a + b1X1 + b2X2 + b3X3 + b4X4 + e$$
$$Y = 4.090 + 0.323\ (X1) + 0.158\ (X2) + 0.075\ (X3) + e$$

From the table above, the results for multiple regression results can be concluded as follows:

a. Analysis of the influence between X1 and Y based on the value constant (a) results in 4.090 while the value of X1 is 0.323. It can be interpreted that the regression coefficient value of the X1 variable is 0.323, so that the t value of 2.691 is obtained, and the significance value is 0.011 <0.05, so that it means that the variable factor of the piece-rate wage system has a significant effect on work productivity and motivates workers.
b. Analysis of the effect between X2 and Y is based on the results of the value constant (a) of 4.090 while the value of X2 is 0.158. It can be interpreted that the regression coefficient value of the X2 variable is 0.158, so that the t value is 0.553 and the significance value is 0.584> 0.05, meaning that the communication variable between workers has no significant effect on work productivity and motivates workers.
c. Analysis of the influence between X3 and Y based on the value constant (a) results of 4.090 while the value of X3 is 0.075. It can be interpreted that the regression coefficient value of the X2 variable is 0.075, the t value is -0.454 and the significance value is 0.652> 0.05, meaning that the work environment variable has no significant effect on the work productivity variable and motivates workers.

Testing together (F test)

The F test is conducted to determine whether the independent variables together or simultaneously have a relationship or influence on the dependent variable.

Table 8. F Test Regression Results

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	86.910	3	28.970	20.108	.000[b]
	Residuals	51.865	36	1.441		
	Total	138.775	39			
a. Dependent Variable: Total Productivity and Work Motivation (Y)						
b. Predictors: (Constant), Total Work Environment (X3), Total Work Communication (X2), Total Wage System (X1)						

Source: Processed by Researcher, 2024

Calculation Steps:

1. Number of Research Samples (n) : 40
2. Number of independent variables (k) : 3
3. Constant : 1
4. Degree of freedom (numerator) = k = 3
5. Degree of freedom (denominator) = n - k - 1
   a. = 40 - 3- 1=36
6. Based on the calculation, the value of F_{table}
7. numerator df = 3
8. denominator df = 36 is 2.8663.

Analysis Result

Based on the table, the value of F count = 20.108> F table = 2.86637 with significant = 0.000 <0.05 Simultaneously, the variables of independent Wage System (X1), Work Communication (X2), and Work Environment (X3) have a significant influence on the dependent variable Productivity and Work Motivation (Y) From the table above, the calculated F value is 20.108 with a significant value so that Ha is accepted and Ho is rejected. With this value, it can be concluded that there is a simultaneous influence between the variables of the wage system, work communication, and work environment on productivity and work motivation

Determination test (R2)

By using the coefficient of determination (R2) to measure the ability of the regression model to explain the value of the variation in the dependent variable.

Table 9. Regression results of determination test (R2)

Model Summary									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.791[a]	.626	.595	1.200	.626	20.108	3	36	.000
a. Predictors: (Constant), Total Work Environment (X3), Total Work Communication (X2), Total Wage System (X1)									

Source: Processed by Researcher, 2024

Based on the table above results, the value Adjusted R Square is 0.626 or 62.6%. This value shows the level of ability of the independent variables, namely the variable wage system (X1), work communication (X2), and work environment (X3) on productivity and work motivation. can be explained by this equation by 62.6% while the remaining 37.4% can be influenced by other variables outside this research model.

Analysis and Interpretation of Results

Based on the F test results, the calculated F value with a value of 20,108 is greater than the F table with a value of 2,86637 with a significance of 0.000 which is smaller than 0.05. This shows that the three variables tested, namely the wage system, work communication, and work environment, significantly influence overall productivity and work motivation. In other words, the piece-rate wage system plays an important role in improving the timeliness of completion of each project stage.

CONCLUSION

The findings of this study confirm that the piece-rate wage system has a significant effect on improving productivity and project timeliness in the construction of SMK school buildings in Caruban District, Madiun Regency. Based on the F-test results, the wage system, work communication, and work environment collectively influence worker motivation and productivity. The regression analysis further indicates that among these factors, the piece-rate wage system plays a crucial role in accelerating project completion. Workers who are compensated based on their output tend to work more efficiently, reducing delays and optimizing resource utilization. However, while this system enhances productivity, there is a potential risk of quality degradation if workers focus solely on speed rather than maintaining construction standards.

To effectively implement the piece-rate wage system, project managers should establish clear work agreements that define expected quality benchmarks alongside productivity targets. Implementing a dual-incentive structure—where workers receive bonuses for both speed and adherence to quality—can help balance efficiency and workmanship. Additionally, routine quality inspections should be integrated into daily project workflows to ensure compliance with construction standards. Providing training programs on proper building techniques and efficient work methods can further enhance worker competency, reducing the risk of substandard work. Strengthening communication between supervisors and workers is also essential to address any concerns or misunderstandings regarding task expectations and wage distribution.

Despite its contributions, this study has several limitations. The sample size was limited to one construction project, which may restrict the generalizability of findings to other projects with different conditions. Future research could explore longitudinal studies to assess the long-term impact of piece-rate wages on productivity and worker well-being. Additionally, further studies could examine how technology integration, such as digital work tracking systems, can optimize wage-based performance monitoring. By addressing these aspects, future research can provide more comprehensive insights into improving labor efficiency in construction projects.

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