Analysis Of The Impact Of The Covid-19 Pandemic On The Construction Industry Sector (A Case Study Of The Construction Project Rsud Soedono Madiun)

Liliana Hannes, Julistyana Tistogondo
Civil Engineering Departments, Faculty of Engineering, Narotama University
Surabaya, Indonesia
lilianahannes99@gmail.com, julistyana.tistogondo@gmail.com

Abstract

Accelerating infrastructure development in Indonesia is a good thing, but this is not without problems. The COVID-19 pandemic is a problem that has a large and global impact, not least in Indonesia, especially in the construction industry sector. The construction project of the Soedono Madiun Hospital is one of the construction projects that have experienced the direct impact of the COVID-19 pandemic. Therefore, the purpose of this study is to review and analyze the impact of the covid-19 pandemic on construction projects in the case study of the construction project of the Soedono Madiun Hospital, and to find out the biggest impact of the covid-19 pandemic which has the most influence on construction projects in the case study of the construction project of the Soedono Hospital. The research method used to determine the biggest impact of the covid-19 pandemic on the cost and time aspects is the multiple linear regression analysis method with the help of Microsoft Excel. The other data analysis methods used in this study were the validity and reliability tests used in testing the questionnaire. The results of data analysis conducted in this study indicate that there are seven independent variables affect the dependent variable, namely the suitability of planning and project realization with the equation \( y = 94.186 - 0.376x_1 - 0.108x_2 - 1.014x_3 + 0.873x_4 \) for the time aspect, and the equation \( y = 87.009 - 0.006x_5 - 0.001x_6 - 0.0002x_7 \) for the cost aspect. With this equation, it can be seen that the independent variable that has the most influence on the dependent variable on the time aspect is the independent variable \( x_3 \), namely the change in the time schedule due to delays in the arrival of construction materials by 1.014, while in the cost aspect is the independent variable \( x_6 \), namely changes in costs due to instability, the price of construction materials is 0.001. So, it is hoped that there will be a project management handling that focuses on the most influential variable, namely construction materials.

Keywords:
Construction Projects, Covid-19 Pandemic, Project Management, Infrastructure, Materials Construction

1. Introduction

As a country that occupies the fourth-highest position in terms of population density, Indonesia is still not fully developed as a developed country. Some of the conditions that make a country not yet fully developed include the following characteristics: low income, low standard of living, low community productivity, high population growth rate, dependence on foreign parties, and high unemployment, the majority of the population depends on the primary and agricultural product sectors, is weak in the aspect of international relations, the lack of capital used for development, the availability of work land and labor is not balanced, the application of technology that is not suitable with the situation and conditions in the local country, and so on. Therefore, various efforts have been made to make Indonesia better, and to make Indonesia a developed country following Indonesia's vision of 2045.

The first requirement for Indonesia to be able to become a developed country is to provide adequate infrastructure to support mobility and support development Antara and Widyastuti (2019). The acceleration of infrastructure development is not only meant to catch up but also to grow new economic centers that can provide added value to regions throughout the country Kusuma (2018). However, in practice, infrastructure development in Indonesia is also inseparable from various problems.

In 2020, Indonesia and other countries around the world will feel the COVID-19 pandemic. This also has an impact on the construction industry sector, namely on infrastructure development in Indonesia. Any impact or influence caused by the problem must be immediately identified and the level of influence analyzed so that the priority of handling problems that occur will be right on target and problems can be resolved immediately. Therefore, the author decided to conduct a study with the title "Analysis of the Impact of the Covid-19 Pandemic on the Construction Industry Sector (A Case Study of the Soedono Madiun Hospital Development Project)".

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In this study, several basic theories and formulas were used as references and writing references, including the suitability of planning and realization of construction projects, validity test Santoso (2012), reliable test Arikunto (1996), multiple regression analysis method Ahmadien, Iskandar & Syarkanti (2019) as stated below:

\[ \text{suitability of planning & realization} = 100\% - \% \text{ difference between realization and planning} \] ............(1)

\[ \% \text{ difference between realization and planning} = \left( \frac{\text{difference duration realization and planning}}{\text{total planning duration}} \times 100\% \right) \] ............(2)

\[ \% \text{ difference between realization and planning} = \left( \frac{\text{difference cost realization and planning}}{\text{total planning cost}} \times 100\% \right) \] ............(3)

\[ r = \frac{n\Sigma xy - \Sigma x\Sigma y}{\sqrt{[n\Sigma x^2 - (\Sigma x)^2][n\Sigma y^2 - (\Sigma y)^2]}} \] ............(4)

\[ t_{\text{count}} = \frac{r \sqrt{n-2}}{\sqrt{1-r^2}} \] ............(5)

\[ \Sigma ab^2 = \frac{\Sigma x^2 - (\Sigma x)^2}{n} \] ............(6)

\[ at^2 = \frac{\Sigma y^2 - (\Sigma y)^2}{n} \] ............(7)

\[ r_n = \left( \frac{k}{k-1} \right) \left( 1 - \frac{\Sigma ab^2}{at^2} \right) \] ............(8)

\[ \Sigma x^2 = \Sigma xi^2 - \left( \frac{\Sigma xi \Sigma y}{n} \right)^2 \] ............(9)

\[ b = \frac{[(\Sigma x^2)\Sigma xy] - (\Sigma x\Sigma x)\Sigma y}{[(\Sigma x^2)\Sigma y^2] - (\Sigma x\Sigma x)(\Sigma y)^2} \] ............(10)

\[ a = \frac{\Sigma y - (b1\Sigma xi) - (b2\Sigma x2) - \ldots - (bn\Sigma x n)}{n} \] ............(11)

\[ Y = a + b1X1 + b2X2 + \ldots + bnXn \] ............(12)

\[ r : \text{ correlation coefficient} \]
\[ Y : \text{ dependent variable} \]
\[ Xi : \text{ independent variable element} \]
\[ n : \text{ number of respondents} \]
\[ r_n : \text{ instrument reliability (coefficient)} \]
\[ k : \text{ number of questions} \]
\[ \Sigma ab^2 : \text{ number of item variants} \]
\[ at^2 : \text{ total variance} \]
\[ \Sigma XI : \text{ total score of the variables reviewed} \]
\[ Y : \text{ dependent variable} \]
\[ X1, X2 : \text{ independent variable} \]
\[ a : \text{ constant} \]
\[ b1, b2 : \text{ regression coefficient (increase or decrease value)} \]

2. Methodology

The method used in this study is the multiple regression analysis method as stated in the introduction, but this chapter will explain several things that also support this method, namely research variables, and data collection techniques. The variables used in this study are based on construction project problems that occurred as a result of the COVID-19 pandemic on the Soedono Hospital construction project and can be explained as follows:

1. The independent variable or also known as the independent variable (X) in the form of changes in the time schedule due to the physical distancing policy made by the government (X1), changes in the time schedule due to delays in the arrival of workers (X2), changes in the time schedule due to delay in the arrival of construction materials (X3), changes in the time schedule due to delays in the arrival of construction equipment (X4), budget reduction provided by the government (X5), changes in costs due to instability in construction material prices (X6), changes in costs due to increases in equipment rental prices construction (X7)

2. The dependent variable or also known as the dependent variable (Y) is the suitability of planning and project realization. The suitability of the intended project planning and realization is described in the form of a percentage that represents conformity with the initial planning, in terms of both cost and time aspects.

3. The data collection techniques used in this research are:
4. Literature study, namely collecting data from lecture materials, textbooks, reference books, and journals to obtain information and basic theories related to research

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5. Interviews, namely data collection with questions and answers conducted with Mr. Anang, as the project manager of the contractor implementing the construction of RSUD Soedono Madiun, namely PT. Jaya Semanggi Engineering and 4 other people from the implementing subcontractors (Pak Iqbal, Pak Didik, Pak Udin, Pak Hadi, Pak Joko) to determine construction project problems.

6. Dissemination of Questionnaires, namely data collection by distributing a list of written questions to the parties involved in the construction project of RSUD Soedono Madiun which had been carefully prepared in advance to meet the needs of researchers in obtaining information in the form of data to be processed and analyzed. As for this distribution, it uses the Google Form site tool in its distribution. The google form site that is used can be accessed via the link: bit.ly/Impact of Pandemi Pada Construction. There are several stages carried out by researchers in distributing questionnaires, namely researchers asking respondents' consent to fill out questionnaires, researchers explaining the purpose and general description of the questions asked, researchers explaining procedures for filling out questionnaires that have been distributed, and providing opportunities for questionnaires to study and ask if there are things that are not understood in the questionnaire, the researcher will collect answers from respondents to be processed and analyzed as material for considering the impact of covid-19 which has the most influence on the construction project of the Soedono Madiun Hospital. Each answer choice listed on the questionnaire has a different weight, this can be explained in the table below:

| No | Answer Choices | Score |
|----|----------------|-------|
| 1  | Strongly Agree | 4     |
| 2  | Agree          | 3     |
| 3  | Less Agree     | 2     |
| 4  | Disagree       | 1     |

3. Result and Discussion

The first step in this research is the validity test. In the study, all the questions listed in the questionnaire will pass the validity test stage. The validity test is carried out in several stages. Several of these stages were carried out on all question items that represented the independent variables. Based on the results of the validity test for all questions that represent the independent variables in this study, it can be seen that all statement items have a higher t_count value when compared to t_table. So, it can be concluded that all question items are declared valid. Because all variables have passed the validity test stage and are declared valid in their calculations, the accuracy level of all variables to be used in this data reveals that the variables are efficient and appropriate, and are suitable for use as research material.
Table 2. Validity Test

| Question Number | n  | ΣXY | ΣX | ΣY | ΣX^2 | ΣY^2 | r  | t count | r count | t table | Result |
|-----------------|----|-----|----|----|------|------|----|---------|---------|---------|--------|
| 1               | 17 | 4316| 53 | 1374| 189  | 112150| 0.2002411| 0.791562 | 0.482   | Valid   |
| 2               | 17 | 3891| 48 | 1374| 162  | 112150| 0.0672682| 0.52224  | 0.482   | Valid   |
| 3               | 17 | 3376| 41 | 1374| 121  | 112150| 0.3992759| 1.686668 | 0.482   | Valid   |
| 4               | 17 | 3909| 48 | 1374| 158  | 112150| 0.1875804| 0.739624 | 0.482   | Valid   |
| 5               | 17 | 4492| 55 | 1374| 189  | 112150| 0.4237629| 1.811962 | 0.482   | Valid   |
| 6               | 17 | 4265| 52 | 1374| 176  | 112150| 0.455785 | 1.983224 | 0.482   | Valid   |
| 7               | 17 | 4235| 52 | 1374| 164  | 112150| 0.4367461| 1.880323 | 0.482   | Valid   |
| 8               | 17 | 4355| 53 | 1374| 181  | 112150| 0.542219 | 2.4993   | 0.482   | Valid   |
| 9               | 17 | 4885| 60 | 1374| 216  | 112150| 0.5217596| 2.368754 | 0.482   | Valid   |
| 10              | 17 | 4973| 61 | 1374| 225  | 112150| 0.5216738| 2.368219 | 0.482   | Valid   |
| 11              | 17 | 4636| 57 | 1374| 195  | 112150| 0.4449757| 1.924401 | 0.482   | Valid   |
| 12              | 17 | 4826| 59 | 1374| 213  | 112150| 0.6036249| 2.932298 | 0.482   | Valid   |
| 13              | 17 | 4590| 57 | 1374| 201  | 112150| -0.162599| 0.638239 | 0.482   | Valid   |
| 14              | 17 | 4900| 60 | 1374| 220  | 112150| 0.5318826| 2.432603 | 0.482   | Valid   |
| 15              | 17 | 4900| 60 | 1374| 220  | 112150| 0.5318826| 2.432603 | 0.482   | Valid   |
| 16              | 17 | 4609| 57 | 1374| 197  | 112150| 0.0256123| 0.496144 | 0.482   | Valid   |
| 17              | 17 | 4557| 56 | 1374| 192  | 112150| 0.3395749| 1.398254 | 0.482   | Valid   |
| 18              | 17 | 3593| 44 | 1374| 126  | 112150| 0.3186601| 1.302042 | 0.482   | Valid   |
| 19              | 17 | 3883| 48 | 1374| 142  | 112150| 0.0411658| 0.797849 | 0.482   | Valid   |
| 20              | 17 | 3509| 43 | 1374| 123  | 112150| 0.2686023| 1.07998  | 0.482   | Valid   |
| 21              | 17 | 4580| 56 | 1374| 192  | 112150| 0.5924774| 2.848426 | 0.482   | Valid   |
| 22              | 17 | 4092| 50 | 1374| 160  | 112150| 0.426269 | 1.825049 | 0.482   | Valid   |
| 23              | 17 | 3895| 48 | 1374| 146  | 112150| 0.1442537| 0.564598 | 0.482   | Valid   |
| 24              | 17 | 4100| 50 | 1374| 158  | 112150| 0.5365681| 2.462644 | 0.482   | Valid   |
| 25              | 17 | 4580| 56 | 1374| 192  | 112150| 0.5924774| 2.848426 | 0.482   | Valid   |
| 26              | 17 | 4177| 51 | 1374| 161  | 112150| 0.58671  | 2.806034 | 0.482   | Valid   |
| 27              | 17 | 3658| 45 | 1374| 131  | 112150| 0.1832971| 0.722142 | 0.482   | Valid   |
| 28              | 17 | 4100| 50 | 1374| 158  | 112150| 0.5365681| 2.462644 | 0.482   | Valid   |

The reliability test was carried out after conducting the validity test. Broadly speaking, this reliability test is carried out in three stages, starting from finding the value of \( r \) as the alpha coefficient, comparing it with the value of \( r_{\text{table}} \), then determining the reliability decision of each data being tested. Based on the results of the reliability test for all questions that represent the independent variables in this study, it can be seen that all statement items have a greater \( r \) value when compared to \( r_{\text{table}} \). So, it can be concluded that all question items are declared reliable. Because all variables have passed the reliability test stage and are declared reliable in the proof and calculations, the accuracy of all the variables that will be used in this data reveals that the variables can be trusted and deserve to be used as research material.
Furthermore, the calculation of the percentage of suitability of the planning and project realization that will be used as the dependent variable in multiple linear regression analysis with an error correction factor of 5% as follows:

\[
\text{Suitability of Planning\&Realization} = 100\% - \% \frac{\text{Difference Planning\&Realization}}{\text{Total planning cost}} \times 100\%
\]

\[
\text{Suitability of Planning\&Realization} = 100\% - \frac{\text{Difference Planning\&Realization}}{\text{Total planning duration}} \times 100\%
\]

The next stage is multiple linear regression analysis. Multiple linear regression analysis is used to determine the effect of time changes on the time schedule due to the physical distancing policy made by the government (X1), changes in the time schedule due to delays in the arrival of workers (X2), changes in the time schedule due to delays in the arrival of construction materials. (X3), changes in the time schedule due to delays...
in the arrival of construction equipment (X4), budget reduction provided by the government (X5), changes in costs due to instability in construction material prices (X6), changes in costs due to increases in construction equipment rental prices (X7) on the dependent variable (Y) in the form of the suitability of planning and project realization. Several stages are carried out in making multiple regression linear analysis calculations, which can be described as follows:

1. Determine the value of constants and regression coefficients

The calculation is divided into two, namely the cost and time aspects. While the value of each variable to be calculated is taken from the sum of the scores from the answers to the questionnaire questions that support these variables.

Table 4. Recapitulation of Total Variable Values and Multiplication of Time Aspects

| N | Y   | x1 | x2 | x3 | x4 | x1² | x2² | x3² | x4² | Y²  | X1 X2 X3 X4 | X1 Y | X2 Y | X3 Y | X4 Y |
|---|-----|----|----|----|----|-----|-----|-----|-----|-----|---------------|------|------|------|------|------|
| 1 | 82.5| 12 | 15 | 16 | 14 | 144 | 196 | 225 | 196 | 6806.3 | 35280          | 990 | 1155 | 1238 | 1155 |
| 2 | 83.5| 11 | 14 | 12 | 11 | 121 | 144 | 196 | 121 | 6972.3 | 20328          | 918.5 | 1002 | 1169 | 918.5 |
| 3 | 84.5| 16 | 16 | 16 | 16 | 256 | 256 | 256 | 256 | 7140.3 | 65536          | 1352 | 1352 | 1352 | 1352 |
| 4 | 85.5| 13 | 15 | 15 | 15 | 169 | 225 | 225 | 225 | 7310.3 | 43875          | 1112 | 1283 | 1283 | 1283 |
| 5 | 86.5| 13 | 12 | 12 | 12 | 169 | 144 | 144 | 144 | 7482.3 | 22464          | 1125 | 1038 | 1038 | 1038 |
| 6 | 87.5| 7  | 15 | 15 | 15 | 49  | 225 | 225 | 225 | 7656.3 | 25200          | 612.5 | 1313 | 1400 | 1313 |
| 7 | 88.5| 8  | 13 | 13 | 16 | 64  | 169 | 169 | 256 | 7832.3 | 21632          | 708  | 1151 | 1151 | 1416 |
| 8 | 89.5| 14 | 15 | 10 | 10 | 196 | 225 | 100 | 100 | 8010.3 | 21000          | 1253 | 1343 | 895  | 895  |
| 9 | 90.5| 13 | 9  | 15 | 16 | 169 | 81  | 225 | 256 | 8190.3 | 28080          | 1177 | 814.5 | 1358 | 1448 |
| 10| 91.5| 12 | 15 | 16 | 16 | 144 | 225 | 256 | 256 | 8372.3 | 46080          | 1098 | 1373 | 1464 | 1464 |
| 11| 92.5| 7  | 11 | 12 | 13 | 49  | 121 | 144 | 169 | 8556.3 | 12012          | 647.5 | 1018 | 1110 | 1203 |
| 12| 82.5| 16 | 16 | 16 | 16 | 256 | 256 | 256 | 256 | 6806.3 | 65536          | 1320 | 1320 | 1320 | 1320 |
| 13| 83.5| 13 | 9  | 12 | 12 | 169 | 81  | 144 | 144 | 6972.3 | 16848          | 1086 | 751.5 | 1002 | 1002 |
| 14| 84.5| 16 | 16 | 16 | 12 | 256 | 256 | 256 | 144 | 7140.3 | 49152          | 1352 | 1352 | 1352 | 1352 |
| 15| 85.5| 10 | 10 | 11 | 10 | 100 | 100 | 100 | 100 | 7310.3 | 11000          | 855  | 855  | 940.5 | 855 |
| 16| 86.5| 5  | 8  | 16 | 16 | 25  | 64  | 256 | 256 | 7482.3 | 10240          | 432.5 | 692  | 1384 | 1384 |
| 17| 87.5| 4  | 6  | 12 | 14 | 16  | 36  | 144 | 196 | 7656.3 | 4032           | 350  | 525  | 1050 | 1225 |
| Σ | 1473| 212|237 |234 |235 |2528 |304 |3373 |3300 |127696 |498295          | 16387|18335 |20505 |20284 |

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So the Multiple Linear Regression equation which states the effect of the independent variable on the dependent variable in the aspect of time is:

\[ Y = 94.186 - 0.367x1 - 0.108x2 - 1.014x3 + 0.873x4 \]

So the Multiple Linear Regression equation which states the effect of the independent variable in the cost aspect is:

\[ Y = 87.009 - 0.0006x5 - 0.001x6 - 0.0002x7 \]

From the recapitulation table above and all calculations that have been done, it can be seen that all independent variables influence the dependent variable. The magnitude of the influence of each independent variable is different. The level of suitability of planning and project realization on the time aspect based on the secondary data discussed in chapter 4.3.1 is 87.5% while the level of suitability of planning and realization on the time aspect is based on the calculation of multiple linear regression analysis is 76.38%. Meanwhile, the level of suitability of planning and project realization on the cost aspect based on secondary data discussed in chapter 4.3.1 is 87.8708%, while the level of suitability of planning and realization on the cost aspect based on the calculation of multiple linear regression analysis is 99.982%.

It should be noted that the total percentage of the level of conformity of planning and project realization in the time aspect discussed in this chapter when compared with the calculation of the percentage level of conformity with the planning and realization of the project in the time aspect discussed in chapter 4.3.1 can give different results due to the percentage of the total effect of the variable. The freebies discussed in this chapter only pay attention to the impact of the COVID-19 pandemic. So that the researchers did not discuss and calculate other factors that also occurred during the construction of the Soedono Madiun Hospital and allow changes to the level of suitability of planning and realization in the aspect of time as a dependent variable outside the impact of the COVID-19 pandemic, such as delays in the implementation of casting work due to weather, inaccuracy in ordering materials, shortage of equipment, and so on in addition to the 4 independent variables (X1, X2, X3, and X4) that affect the time aspect and have been mentioned previously.

Meanwhile, it should also be noted that the total percentage of conformity level of planning and project realization on the cost aspect discussed in this chapter when compared with the calculation of the percentage level of conformity of the planning and project realization on the cost aspect discussed in chapter 4.3.1 may give different results because the percentage The total effect of the independent variables discussed in this chapter only considers the impact of the COVID-19 pandemic. So that the researchers did not discuss and calculate other factors that also occurred during the construction of the Soedono Madiun Hospital project and allow changes to the level of suitability of planning and realization on the cost aspect as a dependent variable outside the impact of the COVID-19 pandemic such as damage to materials in storage areas, shortage of equipment, and so on in addition to the 3 independent variables (X5, X6, and X7) that affect the cost aspect and have been mentioned previously.

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4. Conclusion

Based on the results of research and data analysis that has been done, it can be concluded as follows:

1. The impact of the covid-19 pandemic on construction projects (A case study construction project RSUD Soedono Madiun) are all independent variables. In the time aspect, there is a change in the time schedule due to the physical distancing policy made by the government (X1), a change in the time schedule due to delays in the arrival of workers (X2), a change in the time schedule due to the delay in arrival of construction materials (X3), a change in the time schedule due to delay in the arrival of construction equipment (X4), while in the aspect of costs are a reduction in the budget provided by the government (X5), changes in costs due to instability in construction material prices (X6), changes in costs due to increases in construction equipment rental prices (X7). All of the independent variables that have been mentioned, both those that affect the time and cost aspects, affect the suitability of planning and project realization as the dependent variable (Y)

2. The biggest impact of the covid-19 pandemic that has the most influence on construction projects (A case study construction project RSUD Soedono Madiun) was obtained from the independent variable (X) which has the highest influence on the dependent variable on the time aspect is the independent variable X3, namely the change in time. on the time schedule due to the late arrival of construction materials of 1.014, while in the cost aspect is the independent variable X6, namely changes in costs due to the instability of construction material prices of 0.001. This was obtained through the process of multiple linear regression analysis of the distribution of questionnaires that have been answered by the parties directly involved in the construction project of RSUD Soedono Madiun

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