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# Analyisis Of The Covid-19 Pandemic Impact On The Aspects Of Contruction Work In The Task Force Project Of The Railway Enginering Agency Of East Java

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**A B S T R A C T**

*The Covid-19 pandemic is a global pandemic that is currently sweeping the world with a significantly increased and sustainable spread globally. Adjustment of the way of life and strategy of each country in handling and preventing pandemics, especially health protocols and social restrictions certainly have a huge impact on all aspects of life. The construction sector as part of the economic actors also certainly felt the impact of the Covid-19 pandemic. This study analyzed the impact of the Covid-19 pandemic on construction project work with a case study of construction project work in the Working Unit of the Railway Engineering Agency (BTP) of East Java. The method used in this study uses factor analysis on aspects of construction work. From the analysis of data obtained the dominant affected variables on aspects of construction work are changing in project design, changes in organizational structure, changes in the volume of work, changes in the type of work and rescoping.*

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## INTRODUCTION

Coronavirus (CoV) is a large family of viruses that cause diseases ranging from mild to severe symptoms. There are at least two types of coronavirus known to cause diseases that can cause severe symptoms such as *Middle East Respiratory Syndrome* (MERS-CoV) and Severe Acute *Respiratory Syndrome* (SARS-CoV). Coronavirus is a zoonotic (transmitted between animals and humans). Novel corona virus (2019-nCoV) is a new type of virus that has never been identified before in humans and is not yet known to infectious animals 2019-nCoV[1], [2].

The term pandemic refers to a disease that spreads to many people in several countries at the same time. The term pandemic itself is known in the world of epidemiology or science that studies the patterns of spread of disease. In the epidemiological dictionary, outbreaks become the smallest part of disease transmission. Pandemic characteristics include a new type of virus, can infect many people easily and can spread between humans efficiently. Coronavirus has these three characteristics so that on March 11, 2020 the World Health Organization or WHO designated the coronavirus outbreak caused by sars-cov-2 virus as a global pandemic[3].

The construction services sector as part of the economic actors also certainly felt the impact of the *Covid-19* pandemic. Quoted from Suara.com, Chairman of BPP Gapensi, Iskandar Z Hartawi, said that the association he chairs houses 30,763 BUJK, 82% of the number is on the scale of MSMEs will feel the most significant impact. According to him, the emergency caused by the *Covid-19* pandemic will result in the construction process can run normally, effectively, quality and on time[4][5].

Therefore, it is considered necessary to carry out an analysis of the impact of the *Covid-19* pandemic on construction project work with a case study of construction project work in the Task Force of the Railway Engineering Agency (BTP) of East Java so that it can be known and analyzed what factors on construction work that impacted the impact of the *Covid-19* pandemic[4], [6].

## METHODS

This research is a quantitative descriptive research which means that the data obtained from the research population sample is analyzed in accordance with the statistical method used and then interpreted[7]. The research was conducted at PPI Madiun with research samples of construction project workers in BTP East Java. The stages carried out in this study include several stages as follows,


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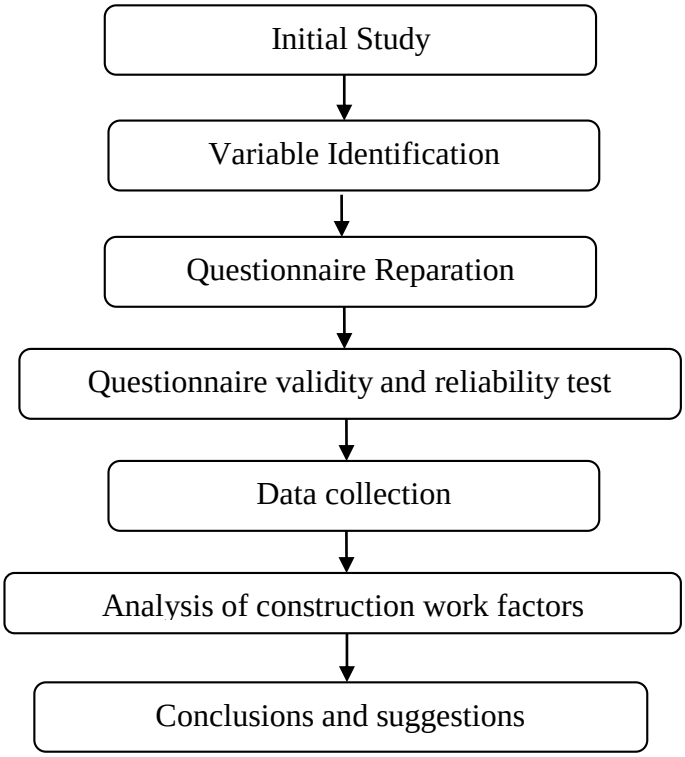


**Figure 1.** Research Method Stage Diagram

*Source: Research Data*

**Instrument Manufacturing**

The instruments used for this study are questionnaires with the following list of affected variables,

**Table 1.Variables Studied**

| No | Affected variables | Code |
|---|---|---|
| 1. | Project completion delay | Q1 |
| 2. | Organizational Structure Changes | Q2 |
| 3. | Changes in construction project work type | Q3 |
| 4. | Changes in construction implementation methods | Q4 |
| 5. | Project design changes | Q5 |
| 6. | Project activity schedule changes | Q6 |
| 7. | Change of agreement time / contract time | Q7 |
| 8. | Changes in work volume | Q8 |
| 9. | Change in quality / quality of work | Q9 |


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| No | Affected variables | Code |
|---|---|---|
| 10. | Changes in the decision-making process in the project | Q10 |
| 11. | Rescoping (reduction of work items) | Q11 |
| 12. | Added working hours to night (overtime) | Q12 |
| 13. | Acceleration of construction projects | Q13 |
| 14. | Reduced effective working time allocated for health protocol checks | Q14 |
| 15. | Specification change mechanism | Q15 |

*Source: Research Data*

The Questionnaire is a data collection technique conducted by giving a set of written statements to respondents to answer (Sugiyono.2019)[8][9]–[12][13]–[17]. Questionnaires used by researchers as research instruments are closed questionnaires. The instrument used to measure the variables of this study using a *3-point Likert* scale. Respondents answer in the form of a choice of three alternatives, namely:

1. Nothing Happens (worth 1)
2. Occurs (worth 2)
3. Very Happening (worth 3)

The samples in this study were taken with *the probability sampling* technique which is a sampling technique that provides equal opportunities for each element or member of the population to be selected as a sample member[13]–[16]. In more detail, the sampling technique uses *simple random sampling* because the sampling of sample members from the population is done randomly regardless of the strata in that population.

The results of research from Gay, LR and Diehl, PL [18], with the title of research "*Research Methods for Business and Management*" mentioned that the size of the research sample should be as large as possible[19]. The assumptions presented by Gay and Diehl are based on the larger the sample is taken, the more it represents the shape and character of the population, and the more it can be generalized. However, the exact size of the sample to be taken depends heavily on the type of research being worked on. Here are some conditions to note;

1) If the research being done is descriptive research, then the sample size is at least 10% of the total population element.
2) If the research conducted is correlated or related research, then the sample size is at least 30 subjects (sample units).


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3) If the research done is comparative research, then the recommended sample size of research is 30 subjects.
4) If the research is experimental in groups, then the recommended sample size is 15 sample groups.

The samples in this study were taken with *probability sampling techniques.* In more detail the sampling technique uses *simple random sampling* because the sampling of sample members from the population is done randomly regardless of the strata in that population. Small amount / respondents taken in this study is construction project workers in the working unit of the East Java Railway Engineering Center as many as 30 people. The project's workers include a variety of positions and from several types of ongoing projects[20].

**Testing and Analysis**

Instrument tests are conducted to validate and rehabilitate the instrument. Test the validity of the instrument using the SPSS program by using *Pearson bivariate*correlation[21]. The steps taken are as follows,

1. A performed the calculation of the total score of each variable
2. Data inputted in SPSS program
3. Performed analysis by selecting *analyze* feature then selected *correlate* and continued with *Bivariate*
4. The entire variable is moved to the *variables* box
5. In the correlation *coefficients* option selected *Pearson* type and in the test *of significance* option selected *Two-tailed*, *the description flag significant correlations* checked then press OK
6. Compare *r* count (Theresult of SPSS) with table *r* value on reference, decision making instrument items are declared valid based if the calculated r-value is greater than *table r.*

Instrument reliability test using SPSS program. The steps taken are as follows,

1. Data input in The SPSS program is performed
2. A performed analysis by selecting *analyze* feature then selected *correlate* and continued with *Bivariate*
3. A performed analysis by selecting *Analyze, Scale,* and selected *Reliability analysis*
4. All variables are inserted into items
5. Alpha-model selected mode then selected OK


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Decision-making of instrument reliability based on *Cronbach Alpha*value, if the value is > 0.6 then the instrument is considered reliable. The data analysis was used factor analysis using the SPSS program. The steps taken are as follows,

1. Data input on SPSS program results of questionnaire aspects of construction work
2. Performed analysis by selecting analyze *feature, dimension reduction* then selected *factor*
3. All variables to be analyzed are moved to the variable then selected *descriptive*
4. The next step in the dialog box is to select the initial solution, KMO and Bartlett's test of sphericity, anti image then clicked *continue*
5. On extraction options unchecked scree plot and unrotated factor solution
6. In *rotation* component selected *Varimax* then *unchecked Rotated solution*, then selected *continue*
7. In the Scores box *dialog*, *save as variable* is checked then the select method is *regression* then selected *continue* and continued with OK so that the output will be analyzed next,

## DISCUSSION

Respondents in this study were project workers in the task force of the East Java Railway Engineering Center. The number of respondents was 30 people. Respondents from various ongoing projects in the working unit of the East Java Railway Engineering Center with various positions on the project. Respondent profiles by project type are shown in Table 2 below. The most respondents were project workers from the Construction of The Double Track Cross Mojokerto-Jombang, then there is also the project Of Improvement of The Km 76+000 to Km 93+000 between Bangil - Probolinggo Lintas Surabaya - Banyuwangi, Super visit Track Madiun-Jombang-II, and Construction of the Railway across Makassar - Parepare Km. 40+400 SD Km. 44+100.


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**Table 2. Respondent Profile By Project Type**
*Source: Research Data*

| No | Project Type | Amount Respondents |
|---|---|---|
| 1 | JGMJ Development<br>Km. 70+000 to Km.73+000 | 4 |
| 2 | Improvement of Train Line Km 76+000 to Km 93+000<br>between Bangil - Probolinggo Lintas Surabaya -Banyuwangi | 4 |
| 3 | Madiun-Jombang-II Track Supervision | 4 |
| 4 | jgmj development<br>Km. 56+000 sd Km. 59+300 | 4 |
| 5 | JGMJ Development<br>Km. 59+300 to Km 61+700 | 2 |
| 6 | Construction of dual carriageway cross south java Km.76+700<br>to Km.80+000 | 3 |
| 7 | JGMJ Development<br>Km 61+700 sd Km 64+200 | 4 |
| 8 | Construction of JGMJ KM.64+200 to KM.67+000 | 3 |
| 9 | Construction of Makassar Cross Railway - Parepare Km.<br>40+400 SD Km. 44+100 | 2 |
| Number of Respondents | | 30 |

Description:

JGMJ = Double Track cross Mojokerto-Jombang

While the profile of respondents based on the position on the project is shown in Table 3 below is a table that describes the profile of respondents based on the position on the project. The largest percentage as respondents is the project site manager of 34%, then the engineering staff and admin engineer respectively by 20%, then the site engineer by 10% then 7% of respondents are project managers, and the rest are workers with other positions.

**Table 3. Respondent Profile By Job Title on Project**

| No | ***Position*** | ***Amount Respondents*** |
|---|---|---|
| 1 | Project manager | 2 |
| 2 | Site manager | 10 |
| 3 | Site engineer | 3 |
| 4 | Engineering staff | 6 |
| 5 | Admin engineer | 6 |
| 6 | Surveyor helper | 1 |
| 7 | Train watcher | 1 |
| 8 | Officer K3 | 1 |
| Number of Respondents | | 30 |

Testing the validity of the research instrument is conducted by testing the product moment through the SPSS program with the following steps, Values to determine the validity or absence


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of an instrument judging by the calculated r value in the rightmost column that is recapitulated in Table 4 below

**Table 4. Recapitulation of Instrument Validity Test Results**

| *Question code* | *Value r count* | *Value r table* | *Ket.* |
|---|---|---|---|
| Q1 | 0,403 | 0,361 | Valid |
| Q2 | 0,678 | | Valid |
| Q3 | 0,635 | | Valid |
| Q4 | -0,540 | | Invalid |
| Q5 | 0,663 | | Valid |
| Q6 | 0,506 | | Valid |
| Q7 | 0,404 | | Valid |
| Q8 | 0,689 | | Valid |
| Q9 | 0,980 | | Valid |
| Q10 | 0,366 | | Valid |
| Q11 | 0,521 | | Valid |
| Q12 | 0,694 | | Valid |
| Q13 | 0,752 | | Valid |
| Q14 | 0,466 | | Valid |
| Q15 | 0,210 | | Invalid |

The test that must be done after the validity test is a realiability test. This test is conducted to determine the level of consistency of an instrument used in research. The realiability test used is with *Alfa Cronbarch* technique through SPSS program. The output of the reliability test is shown in Table 5 below

**Table 5. Instrument Reliability Testing Output**

| *Reliability Statistics* | |
|---|---|
| Cronbach's Alpha | N of Items |
| ,791 | 15 |

Figure 5 shows *N* information stating the number of items or question items which is a total of 15 questions with an alpha value of *Cronbarch's* of 0.791. Since *Cronbarch's value* is alpha > 0.60, it is as the basis for decision-making in the reliability test it can be concluded that all 15 question items are reliable or consistent.


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Factor analysis is an analysis technique that contains information about the grouping of factor variables in a study. Factor analysis aims to filter out which variables are the most dominant of the multiple variables selected in this study. The following is done factor analysis for aspects of construction work.

Kmo and Bartlett's test output results are shown in Table 6 below

**Table 6. KMO Output and Bartlett's Test Aspects of Construction Work**

| ***KMO and Bartlett's Test*** | | |
|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | ,729 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 153,664 |
| | Df | 55 |
| | Sig. | ,000 |

Decision making is made if the MSA KMO value is 0.50 then the factor analysis technique can be continued. Based on the above output known MSA KMO value of 0.729 which means greater than 0.5 and Bartlett's test of Sphericity (sig.) < 0.05 value, this indicates that there is a correlation between variables and feasible for further processing so that the analysis of factors in this study can be continued.

The second output is *an anti-image matrice*. *Anti-image matrice* is useful for knowing and determining which variables are worth using in factor analysis. In the *Anti-image matrice Correlation* section there is a letter code (a) which means for *Measure of Sampling Adequacy* (MSA). The known MSA value of the Construction Work aspect is shown in Table 7 of the following:

**Table 7. MSA Value Aspects of Construction Work**

| NO | Affected variables | MSA value |
|---|---|---|
| 1 | Q1 | 0,547 |
| 2 | Q2 | 0,723 |
| 3 | Q3 | 0,624 |
| 4 | Q5 | 0,747 |
| 5 | Q6 | 0,573 |


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| NO | Affected variables | MSA value |
|---|---|---|
| 6 | Q7 | 0,430 |
| 7 | Q8 | 0,808 |
| 8 | Q9 | 0,366 |
| 9 | Q10 | 0,561 |
| 10 | Q11 | 0,640 |
| 11 | Q12 | 0,726 |
| 12 | Q13 | 0,828 |
| 13 | Q14 | 0,682 |

An MSA value for the variable to be processed further. magnitude should be >0.5. In the table of question items analyzed there are 2 question items that have a value of less than 0.5 i.e. Q7 and Q9 question items. The next step is to re-analyze by issuing 2 Q7 and Q9 question items. The results of the second test are shown in Table 8 below,

**Table 8. MSA values aspects of construction work on the second test**

| No | Affected variables | MSA value |
|---|---|---|
| 1 | Q1 | 0,531 |
| 2 | Q2 | 0,827 |
| 3 | Q3 | 0,812 |
| 4 | Q5 | 0,723 |
| 5 | Q6 | 0,680 |
| 7 | Q8 | 0,821 |
| 9 | Q10 | 0,547 |
| 10 | Q11 | 0,665 |
| 11 | Q12 | 0,808 |
| 12 | Q13 | 0,857 |
| 13 | Q14 | 0,674 |

Communalities *output* is expressed in Table 9 below,


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**Table 9. Output *Communalities* Aspects of Construction Work**

| Communalities | | |
|---|---|---|
| | **Initial** | **Extraction** |
| Q1 | 1,000 | ,844 |
| Q2 | 1,000 | ,682 |
| Q3 | 1,000 | ,469 |
| Q5 | 1,000 | ,852 |
| Q6 | 1,000 | ,629 |
| Q8 | 1,000 | ,740 |
| Q10 | 1,000 | ,894 |
| Q11 | 1,000 | ,440 |
| Q12 | 1,000 | ,733 |
| Q13 | 1,000 | ,675 |
| Q15 | 1,000 | ,660 |
| Extraction Method: Principal Component Analysis. | | |

The output above shows how large a variable can explain factors. For example Q1 is 0.844, meaning that the variable Q1 can explain the factor of 84.4%. Similarly, with other variables, where everything is > 50%, it can therefore be concluded that all variables can explain factors except the Q7 and Q9 question items.

**Table 10. *Total Variance* Output Explained Aspects of Construction Work**

Based on Table 10 above in the *initial column eigenvalues* that use spss program is determined the value of one variance, if 11 variables are shortened into one factor, then the variance that can be explained by one factor (*component* 1) is as follows 4.181/11 x 100 % = 38.009 %. So are the other *components.* Because the value of eigen value set is 1 then the total value to be taken >1 is component 1 to 3, thus the maximum factor that can be formed in the aspect of construction work formed is 3 factors.


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*Rotated Component Matrix* can show the distribution of variables more clearly and clearly. The results of *the Rotated Component Matrix* can be seen in Table 11 below,

**Table 11. Output *Rotated Component Matrix* Construction Work Aspects**

| ***Rotated Component Matrix[a]*** | | | |
|---|---|---|---|
| | Component | | |
| | 1 | 2 | 3 |
| Q1 | -,069 | ,904 | ,151 |
| Q2 | ,807 | ,137 | ,109 |
| Q3 | ,635 | ,199 | ,162 |
| Q5 | ,916 | -,097 | ,060 |
| Q6 | ,306 | ,707 | -,187 |
| Q8 | ,794 | -,085 | ,321 |
| Q10 | -,193 | ,887 | ,263 |
| Q11 | ,627 | -,143 | ,164 |
| Q12 | ,487 | ,036 | ,703 |
| Q13 | ,484 | ,245 | ,617 |
| Q15 | ,065 | ,060 | ,807 |
| Extraction Method: Principal Component Analysis.<br>Rotation Method: Varimax with Kaiser Normalization. [a] | | | |
| A. Rotation converged in 5 iterations. | | | |

Based on Table 11 above determining which factors can be determined by looking at the largest correlation value in this case Q1 (project work delay) the largest correlation with the factor (*component*) 2 with the amount of 0.904, as well as Q2 (Organizational Structure Change) is more correlated with the factor (*component*) 1 with the number of 0.807 then Q2 enters factor 1. Then it can be concluded that the members of each factor are as follows,

1) Factors (1) : Organizational Structure Changes, Changes in construction project work types, Project design changes, Job volume changes, Rescoping (reduction of work items)


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2) Factors (2): Delay in completion of the project, Changes in the schedule of project activities, Acceleration of construction projects
3) Factors (3) : Changes in decision-making process in the project, Addition of working hours to night (overtime), Mechanism of change of specifications

To find out the dominant factors and factors affected by the Covid-19 pandemic in construction projects in East Java BTP, the analysis was conducted by looking at the largest values of *the Rotated Component Matrix*,the dominant factors are the factors that have the largest correlation with *component* 1. Then we can determine the following are the dominant factors in the aspect of construction work affected by the Covid-19 pandemic on construction projects in East Java BTP, namely in the following order,

1) Project design changes
2) Organizational Structure Changes
3) Changes in work volume
4) Changes in construction project work type
5) Rescoping (reduction of work items)

Other factors that are not included in *Component* 1 but have a correlation value of 0.5 are included in the factors affected by the Covid-19 pandemic. Thus, factors in aspects of construction work affected by the Covid-19 pandemic on construction projects in East Java BTP are;

1) Project completion delay
2) Changes in project activity schedule
3) Acceleration of construction projects
4) Changes in the decision-making process in the project
5) Increase working hours to night (overtime)
6) Specification change mechanism
7)

## CONCLUSIONS

Based on the results of the analysis and discussion of the data, the conclusions that can be drawn from the research on the Analysis of the Impact of the Covid-19 Pandemic on construction projects in the EAST Java BTP task force are as follows,the dominant affected variables in aspects of construction work are:

1) Project design changes
2) Organizational Structure Changes


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3) Changes in work volume

4) Changes in construction project work type

5) Rescoping (reduction of work items)

Based on the conclusions drawn above, the advice that can be given by the author is that it is necessary to review other aspects that may be affected by the Covid-19 pandemic on construction projects because this research is a preliminary study that needs further research. In addition, in this study only reviewed about what variables are affected do not show a percentage so it is necessary to conduct further research on how much of these variables are affected by the Covid-19 pandemic.

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