ICETIA – 2020

Digital Transformation As A Cornerstone To Unlock The Circular Economy's Potential Of The Nation In The New Normal

Certificate of Presenter

Awarded to Qomarun from UMS has participated in the 7th **International Conference on Engineering, Technology, and Industrial Application** at ***a webinar*** with the title: *'Evaluation of Factors Causing the Construction Project Delay: Case Study of PT Jagat Konstruksi?s Projects 2016-2019'* organized by Fakultas Teknik - Universitas Muhammadiyah Surakarta, from 8 – 9 December 2020.

Ir. Sri Sunarjono MT. PhD.
Dean

Dr. Muhammad Kusban
General Chair

Evaluation of Factors Causing the Construction Project Delay: Case Study of PT Jagat Konstruksi's Projects, 2016-2019

Yan Anggitia Fajerin, Mochamad Solikin and Qomarun
Civil Engineering Master Program, School of Postgraduate, Universitas Muhammadiyah Surakarta

E-mail: qomarun@ums.ac.id

Abstract. Construction projects generally have a planned and scheduled time. However, in the reality there are still obstacles in project work delays, such as in PT Jagat Konstruksi, Jakarta. This article will discuss about project delays. The purpose of this study is to find the main causes of project delays and to identify and classify the causes of the delay. The research was conducted by a case study method on 5 projects handled by PT Jagat Konstruksi during 2016-2019. To analyze the delay (Mean, Average, Relative Index, Factor Analysis), it is done with statistical tools, such as Excel and SPSS. The delay in the construction project was caused by a chain reaction, from one factor to another. This research finds that the shortage of labour aspect is the strongest factor. Meanwhile, the research results show that there are 4 groups project delay factors: (1) resources availability; (2) internal limitation; (3) external limitation; and (4) financial.

Keywords: delay, construction, project, factor

1. Introduction

Construction business actors claim to be affected by the spread of the Covid-19 in Indonesia during 2020. Chairperson of the Indonesian National Construction business Association (GAPENSI) Iskandar Z Hartawi said that one of the most impacts of corona in the construction industry is delay in project completion. The emergency conditions caused by Covid-19 have implications for the impossibility of the project being able to run normally, effectively, good quality and on time. It is categorized as force majeure. The delay in project completion is not only in force majeure, but also in normal situation. The project aims to create facilities that can be used by the user/communities within condition of safe, comfort, productive and sustainable. According to Suharto (1995) project activity can be interpreted as a temporary activity that takes place in a limited period of time, with the allocation of certain sources of funds and is intended to carry out its duties and objectives have been clearly outlined [1]. In general, construction projects have a plan and time schedule for implementation in order to get the project completion. But in reality there are still many internal problems on construction projects that are not in accordance with the plans and schedules. One of the obstacles that occur is delays in construction projects. Delays in construction projects also occur for private contractors, such as in PT Jagat Konstruksi, Jakarta. According to Praboyo (1999), project delays often occur due to changes in planning during the implementation process, poor management in the contracting organization, work plans that are not well structured / integrated, or failure of contractors in carrying out work [2]. Delays in project work result in losses to both service providers and service users. The most dominant incurred losses are cost overruns. For service providers, this can result in reduced profits or even no

profit at all. Presidential Decree No. 61/2004 states that fines (financial sanctions) can be imposed on service providers if they are unable to carry out the project according to the time available in the contract. For service users, delays in work on construction projects result in delayed project completion schedules, so that the use of project development results is delayed from the original plan. This article discuss about the causes of delays in construction projects at PT Jagat Konstruksi. With this article, the contractor can find out the main ranking of the causes of the delay and identify or classify the groups causing the delay. This can be useful for the management team by PT Jagat Konstruksi is to do an evaluation so that the next project will have management improvements so that the project delays can be avoided.

Project delays are defined by Ervianto (2004) as implementation time that is not utilized in accordance with the activity plan, causing one or more following activities to be delayed or not completed according to the planned schedule [3]. According to Praboyo (1999) delays in project implementation generally always have detrimental consequences for the owner and the contractor because the impact of the delay is conflict and debate about what and who is the cause, as well as time demands and additional costs. Dipohusodo (1996) concluded that project delays often occur during the construction process [4]. How to control delays in construction projects are as follows: (a) deploy additional resources; (b) removing barriers, or other measures to ensure employment increase and bring it back to the plan line; and (c) if it is not possible on the original plan line, it is necessary to revise the schedule, which is then used as the basis for assessing the progress of the next work.

2. Methods

The research method is the case study method. This research was conducted on 5 projects that have been completed by contractors PT Jagat Konstruksi, namely: (1) Jagat Office Building; (2) House of Roman Meruya; (3) Graha Golf Apartment Surabaya; (4) Springlake Apartment Summarecon Bekasi; and (5) Binus Summarecon Bekasi. The method of data collection in this study is primary data and secondary data. Respondents have taken as many as 30 people. The respondents include respondents with the positions Project Manager, Site Manager, Q/C Supervisor, Engineer, Surveyor and Logistic. According to the previous study, there are 16 factors that causing construction delay, namely: (Q-01) the owner's design changes; (Q-02) additional work by owner; (Q-03) effect of delivery of materials; (Q-04) scarcity due to certain materials; (Q-05) delivery management error; (Q-06) shortage of labour; (Q-07) workforce experience; (Q-08) equipment productivity; (Q-09) effect of payment from owner; (Q-10) increase in material prices; (Q-11) the influence of weather on construction activities; (Q-12) error interpreting drawings/specifications; (Q-13) implementation of the project schedule that is not appropriate; (Q-14) work accident; (Q-15) postponement of the issuance of the IMB from the original plan; and (Q-16) obstruction of SLF issuance. Because the questionnaire used is in a qualitative form, a Likert scale (1-5) is used to convert it into a qualitative form so that the data obtained can be tested. The data is then processed with the following analysis calculations:

- Calculation of Rank Analysis (Mean/Average)
  The calculation of the average value (mean) can be determined from each factor by ordering from the highest average value as the first rank. This calculation uses the Statistical Program for Social Science (SPSS) program.

- Calculation of Relative Index (RI) Analysis
  Determination of Relative Index (RI) aims to determine how much influence the factors under study, where the value of this RI will range between 0 (minimum) and 1 (maximum), the closer to 1 the value of RI the more influencing these factors in the delay in carrying out construction project work. This calculation uses Microsoft Excel program.

- Factor Analysis Calculations
  Factor analysis is an analysis to identify sub-factors on each factor causing delays in the implementation of construction project work at PT. Construction Universe. The data is processed using the Statistical Program for Social Science (SPSS).

3. Discussion

During 2016-2019, there are 5 contraction project delays in PT Jagat Konstruksi, namely: (1) Jagat Office Building; (2) House of Roman Meruya; (3) Graha Golf Apartment Surabaya; (4) Springlake Summarecon Bekasi Apartment; and (5) Binus Summarecon Bekasi. The delay in implementing the project mentioned above can be seen in the table below:

Table 1. List of Construction Project Delay in PT Jagat Konstruksi

No.	Project Name	Address	Time	Delay
1.	Jagat Office Building	Jl. Tomang Raya 28, Palmerah, Jakarta	360 days	45 days
2.	House Of Roman Meruya	Jl. Meruya 15, Meruya, Jakarta	300 days	30 days
3.	Graha Golf Apartemen Surabaya	Graha Famili Dukuh Pakis, Surabaya	720 days	60 days
4.	Springlake Apartemen Summarecon	Springlake Summarecon, Bekasi	720 days	60 days
5.	Binus Summarecon Bekasi	Springlake Boulevard, Bekasi	360 days	30 days

In this study, questionnaires were distributed to 30 respondents who played a role in projects that experienced delays in work on PT Jagat Konstruksi. The respondents include the positions Project Manager, Site Manager, Q/C Supervisor, Engineer, Surveyor and Logistic. The questionnaire was used with the aim of obtaining the data used to achieve the research objectives. The questions of 16 variables (see Q01-16 above) used in this study were taken from several previous studies which discussed the factors causing delays in construction project work. The questionnaire has been tested based on the calculation of the mode of delay that often occurs. Because the questionnaire used is in a qualitative form, a Likert scale (1-5) is used to convert it into a qualitative form so that the data obtained can be tested. The data is then processed with the statistic tools calculations. Based on the calculation through Excel and SPSS, the result of Mean, Relative Index (RI) and Factor Analysis are as follows:

Table 2. List of Data: 16 Questions to 30 Respondents

Question	Not Very Effect		No Effect		Somewhat Effect		Effect		Very Effect		Total
	Frequency	%	Frequency	%	Frequency	%	Frequency	%	Frequency	%	
Q-01	0	0.0	2	6.7	4	13.3	12	40.0	12	40.0	30
Q-02	0	0.0	0	0.0	9	30.0	19	63.3	2	6.7	30
Q-03	0	0.0	0	0.0	6	20.0	15	50.0	9	30.0	30
Q-04	0	0.0	3	10.0	5	16.7	11	36.7	11	36.7	30
Q-05	0	0.0	2	6.7	7	23.3	21	70.0	0	0.0	30
Q-06	0	0.0	2	6.7	4	13.3	6	20.0	18	60.0	30
Q-07	0	0.0	5	16.7	3	10.0	19	63.3	3	10.0	30
Q-08	0	0.0	1	3.3	8	26.7	21	70.0	0	0.0	30
Q-09	0	0.0	6	20.0	7	23.3	8	26.7	9	30.0	30
Q-10	0	0.0	4	13.3	8	26.7	18	60.0	0	0.0	30
Q-11	0	0.0	4	13.3	5	16.7	11	36.7	10	33.3	30
Q-12	0	0.0	6	20.0	4	13.3	11	36.7	9	30.0	30
Q-13	0	0.0	2	6.7	2	6.7	21	70.0	5	16.7	30
Q-14	0	0.0	5	16.7	12	40.0	9	30.0	4	13.3	30
Q-15	0	0.0	2	6.7	6	20.0	17	56.7	5	16.7	30
Q-16	0	0.0	7	23.3	7	23.3	14	46.7	2	6.7	30

Table 3. List of Mean & Relative Index (RI)

Q-No	Question	Rank	Mean	Relative Index
Q06	Shortage of labour	1	4,33	0,87
Q01	The owner's design changes	2	4,13	0,83
Q03	Effect of delivery of materials	3	4,10	0,82
Q04	Scarcity due to certain materials	4	4,00	0,80
Q13	Implementation of the project schedule that is not appropriate	5	3,97	0,79
Q11	The influence of weather on construction activities	6	3,90	0,78
Q15	Postponement of the issuance of the IMB from the original plan	7	3,83	0,77
Q02	Additional work by owner	8	3,77	0,75
Q12	Error interpreting drawings/specifications	9	3,77	0,75
Q07	Workforce experience	10	3,67	0,73
Q08	Equipment productivity	11	3,67	0,73
Q09	Effect of payment from owner	12	3,67	0,73
Q05	Delivery management error	13	3,63	0,73
Q10	Increase in material prices;	14	3,47	0,69
Q14	Work accident	15	3,40	0,68
Q16	Obstruction of SLF issuance	16	3,37	0,67

Table 4. Rotated Component Matrix

	Component			
	1	2	3	4
Q01-The owner's design changes	.032	.721	.397	.308
Q02-Additional work by owner	.260	.697	.363	.009
Q03-Effect of delivery of materials	.162	.281	.865	.134
Q04-Scarcity due to certain materials	.740	.236	.252	.377
Q05-Delivery management error	.690	.244	.465	.281
Q06-Shortage of labour	.469	.381	-.105	.698
Q07-Workforce experience	.385	.259	.685	.257
Q08-Equipment productivity	.011	.809	.216	.271
Q09-Effect of payment from owner	-.005	.125	.312	.849
Q10-Increase in material prices;	.772	.287	-.003	.194
Q11-The influence of weather on const activities	.250	.555	.735	-.011
Q12-Error interpreting drawings/specifications	.824	.032	.367	.347
Q13-Implement of the project not appropriate	.379	.706	.076	.436
Q14-Work accident	.828	.014	.291	-.006
Q15-Postponement of the IMB plan	.503	.705	.175	-.151
Q16-Obstruction of SLF issuance	.859	.225	.038	-.218

Table 5. Factor Analysis Result

Factor	Variables	Group Interpretation
1	Q04-Scarcity due to certain materials	Resources Availability
	Q05-Delivery management error	
	Q10-Increase in material prices;	
	Q12-Error interpreting drawings/specifications	
	Q14-Work accident	
	Q16-Obstruction of SLF issuance	Internal Limitation
2	Q01-The owner's design changes	
	Q02-Additional work by owner	
	Q08-Equipment productivity	
	Q13-Implement of the project not appropriate	
	Q15-Postponement of the IMB plan	External Limitation
3	Q03-Effect of delivery of materials	
	Q07-Workforce experience	
	Q11-The influence of weather on const activities	
4	Q06-Shortage of labour	Financial
	Q09-Effect of payment from owner	

The main results of this research are 2 things, namely individual factor and group factor. However, construction project delay is caused by a chain reaction. The first rank of the Mean calculation is the “Shortage of Labour" factor with the highest Mean value of 4.33. Relative Value Index (RI) as the dominant factor causing delays in construction projects at PT Jagat Konstruksi is a factor of “Shortage of Labour" with the highest Relative Index value of 0.87. The results of the calculation of the Mean and the calculation of the Relative Index are the same, namely the “Shortage of Labour" factor. The results of this study have been discussed with the contractor. According to the contractor, the manpower shortage was the result of mismatching plans and the realization of other factors causing the delay. So in anticipation shortage of manpower must pay attention to the other factors causing the delay. The results of the calculation of factor analysis to identify the causes of delays in completing project work at PT Jagat Konstruksi in the factor group. The group of factors is formed by 4 factors, namely: (1) Resources Availability: Scarcity due to certain materials, mismanagement of shipping, rising material prices, errors in interpreting pictures / specifications, work accidents and obstruction of SLF issuance. (2) Internal Limitations: Design changes by the owner, additional work by the owner, equipment productivity, inconsistent implementation of project schedules and delayed IMB issuance from the original plan. (3) External Limitations: The effect of material delivery, labour experience and weather effects on construction activities. (4) Finance: Labor shortages and the influence of payment from the owner.

Many delays in construction projects occur in the construction world. The delay in working on construction projects greatly affects the cost and time of work. These three things are closely related to each other in project management. The results of this study indicate that the factor that most dominates the delay in construction projects is the “Shortage of Labour" factor. The results of this study have been discussed by researchers with several respondents PT Jagat Konstruski stated that several incidents at PT Jagat Konstruksi manpower shortages are the result of non-conformity plans and the realization of other factors causing delays. So to anticipate a shortage of manpower, we must pay attention to the other factors causing the delay. According to previous research (Dhian, 2012) with the title "Analysis of Factors Causing Delays in Construction Projects in Tabanan Regency" states that the main cause of project delays is also labour, but this is due to the lack of skills of workers [5]. Meanwhile, in the research of Shah A, et al (2010), the main cause of tardiness was also mentioned as a shortage of labour, but this was due to financial difficulties for contractors [6]. It can be concluded that the delay in construction work due to the shortage of workers in each contractor has its own reasons.

The second and third delay factors are design changes by the owner and the influence of material delivery. The design change factor by the owner resulted in changes to the schedule of work implementation by PT Jagat Konstruksi, so this factor greatly affects the delay in working on construction projects. The third factor is the influence factor of material delivery. The effect of material delivery will be closely related to the project work schedule. If the delivery of materials is late, other jobs will be delayed too. The results of this study with factor analysis showed that there were 4 group factors of delay that were formed from the extraction of the existing 16 variables. The four factors are: (1) Group-1, it includes scarcity due to certain materials, mismanagement of shipments, increased material prices, errors in interpreting pictures/specifications, work accidents and obstruction of SLF issuance; (2) Group-2, it includes the occurrence of design changes by the owner, additional work by the owner, equipment productivity, and inappropriate implementation of the project schedule and the postponement of the IMB issuance from the initial plan; (3) Group-3, it includes the effect of material delivery, work experience and weather effects on construction activities; and (4) Group-4, it includes shortages of labour and the influence of payment from the owner. These four factors are used as anticipation or prevention by the contractor PT. Jagat Konstruksi in project management with the form of delay factor grouping. Factor analysis itself functions to summarize or extract several variables into fewer variables so that the causes of delays in construction projects can be read in a simpler form of grouping. Research by Suyatno (2010) with the title "The Causes Delay Factors Analysis of Building Construction Projects (The Application of Regression Model)" with a different analysis resulted in the finding that the first ranking of the factors causing delays in construction project work was the labour shortage factor [7]. The results of research by Suyatno

(2010) support the results of research with the first rank as the cause of delays in construction projects at PT. Construction universe, namely the labour shortage factor. The similarity of the results of this study may occur with the conditions of each contractor.

Hasoloan (2012) found that the new factors formed in the Factor Analysis calculation regarding the delay in construction projects in the Surakarta district area are 3 new factors [8]. These factors include, among others, Factor 1, namely Change in Scope and work documents, Factor 2, namely Coordination, and Transportation of resources and workforce expertise, and Factor 3, namely evaluation and planning systems. The results of this study complement the results of the researchers' research with the findings of 4 groupings of delay factors. From the results of this study support the results of Dhian's research. Astina (2012) also find the same result, with the title "Analysis of Factors Causing Delays in Construction Projects in Tabanan Regency". This study resulted in the finding that the dominant factor causing delays in construction projects of the 11 factors that caused the delay was labour/labours with an RI (Relative Index) value of 0.769. Another finding by Hana (2014) entitled "Evaluation of Causes of Delays in Construction Project Completion (Case Study: Rosalia Indah Group)" resulted in the finding that the factors affecting the delay in the Rosalia Indah project used a different analysis, namely design changes by the owner [9]. This supports the results of the study because the owner's design changes in this study were ranked 2nd. Shah (2010) found that there are 3 dominant ranking factors in the delay in construction work, namely: (1) shortages of labour; (2) contractor financial difficulties; and (3) construction errors and defective work. The research is also conducted by statistics tools (Supranto, 2004) [10]. The first factor causing delays in construction work is the same as this research, namely the shortage of labour factor. So this research also supports the research results. However, for the second rank, the contractor's financial difficulties and construction errors and defective work were not the dominant factors causing delays in construction projects in this study.

Table 6. Conformity of Research Results with Previous Studies

No	Researchers	Research Result	Conformity of Research Results
1.	Suyatno, 2010	The factor of delay in the construction project which ranks first, namely factors shortage of labor.	Supports research results
2..	Hasoloan, 2012	There are 3 new factors formed in the calculation factor analysis, namely: (1) change in scope and work documents; (2) coordination and transportation of resources; as well as workforce expertise; and (3) the evaluation and planning system.	Support and complement research results
3.	Dhian, 2012	The causes of delays in construction projects are from 11 factors the cause of the delay is the factor of labor / labors with the Relative Index (RI) value of 0.769.	Supports research results
4.	Hana, 2014	Factors that affect delays in project work Relative Index using AHP analysis namely design changes by the owner.	Support and complement research result
5.	Shah, 2010	The three most important factors of tardiness are labor shortages, contractor financial difficulties and construction errors, and defective work.	Support and complement research results

4. Conclusion

The delay in the construction project was caused by a chain reaction, from one factor to another. The main results of this research are 2 things, namely individual factor and group factor. However, construction project delay is caused by a chain reaction. The first rank of the Mean calculation is the "Shortage of Labour" factor with the highest Mean value of 4.33. Relative Value Index (RI) as the dominant factor causing delays in construction projects at PT Jagat Konstruksi universe is a factor of "Shortage of Labour" with the highest Relative Index value of 0.87. The results of the calculation of

the Mean and the calculation of the Relative Index are the same, namely the "Shortage of Labour" factor. The results of this study have been discussed with the contractor. According to the contractor, the manpower shortage was the result of mismatching plans and the realization of other factors causing the delay. So in anticipation shortage of manpower must pay attention to the other factors causing the delay. The results of the calculation of factor analysis to identify the causes of delays in completing project work at PT Jagat Konstruksi in the factor group. The group of factors is formed by 4 factors, namely: (1) Resources Availability: Scarcity due to certain materials, mismanagement of shipping, rising material prices, errors in interpreting pictures / specifications, work accidents and obstruction of SLF issuance. (2) Internal Limitations: Design changes by the owner, additional work by the owner, equipment productivity, inconsistent implementation of project schedules and delayed IMB issuance from the original plan. (3) External Limitations: The effect of material delivery, labour experience and weather effects on construction activities. (4) Finance: Labor shortages and the influence of payment from the owner.

Acknowledgements

This research was fully supported financial by Kemenristek/BRIN (PTM schema No: 26/E1/KPT/2020) and facilitated administration by LPPM-UMS (SK No: 133.47/A3-III/LPPM/IV/2020).

References

[1] Soeharto, I. (1995). *Managemen Proyek dari Konseptual sampai dengan Operasional.* Jakarta: Erlangga.

[2] Praboyo. (1999). *Keterlambatan Waktu Pelaksanaan Proyek : Klasifikasi dan peringkat dari Penyebab-Penyebabnya.* Jakarta: Dimensi Teknik Sipil.

[3] Ervianto, W. (2004). *Teori Aplikasi Manajemen Proyek* . Yogyakarta: Andi.

[4] Dipohusodo, I. (1996). *Managemen Proyek Konstruksi Jilid I dan II.* Yogyakarta: Kanisius.

[5] Dhian C Nur Astina, e. a. (2012). Analisis Faktor-faktor Penyebab Keterlambatan Proyek Konstruksi di Kabupaten Tabanan. *Jurnal Universitas Udayana*.

[6] Shah A, e. a. (2010). *Persepsi Kontraktor dari Faktor yang Berkontribusi pada Keterlambatan Proyek.* Malaysia.

[7] Suyatno. (2010). *Analisis Faktor Penyebab Keterlambatan Penyelesaian Proyek Gedung Aplikasi Model Regresi.* Semarang: Universitas Diponegoro.

[8] Hasoloan, B. S. (2012). *Analisis Faktor-Faktor Penyebab Keterlambatan Pengerjaan Proyek Konstruksi Pengaruhnya Terhadap Biaya.* Surakarta: Universitas Sebelas Maret.

[9] Hana, W. P. (2014). *Evaluasi Penyebab Keterlambatan dalam Penyelesaian proyek Konstruksi(Studi Kasus : Rosalia Indah Group).* Surakarta: Universitas Sebelas Maret.

[10] Supranto, J. (2004). *Analisis Multivariant, Arti dan Interpretasi.* Jakarta: PT. Rineka Cipta.