JOURNAL OF MODERN MANUFACTURING SYSTEMS AND TECHNOLOGY (JMMST)
e-ISSN: 2636-9575
VOL. 5, ISSUE 2, 52 – 58
DOI: https://doi.org/10.15282/jmmst.v5i2.6852

ORIGINAL ARTICLE

Risk Management: Identification and Mitigation in Maintenance Project During COVID-19 Outbreak (A Case Study in Telco Maintenance Project)

W. Tripiawan[1,*], W. F. Frestikawati[2]

[1]School of Industrial Engineering, Telkom University, Indonesia.
[2]Production Engineering – PT Inti, Indonesia

ABSTRACT – The continuity and smooth running of the telecommunications system plays an important role during this pandemic. The smooth running of the telecommunications system cannot be separated from the maintenance function of the equipment used to support the telecommunications system. PT. HIJ is one of the partners of the company PT. Telekomunikasi Indonesia, which is engaged in the maintenance of telecommunications equipment. One of the projects handled by PT. HIJ is a telecommunications equipment maintenance project in the East Java area network. As is known, in a telecommunications equipment maintenance project there are several risks that have an impact on the completion of the project. The results of the identified risk assessment will be developed further into risk mitigation, i.e. actions that can reduce the identified risk. As a result of the research, five risk aspects were identified: maintenance, finance and accounting, human resources (HR), procurement, and operational. According to the risk assessment result, there are 19 risks that can be classified based on risk level, with 7 in the moderate level of risk, 5 in the high level of risk, and 7 in the extreme level of risk. As a result of the research, it is suggested that risk mitigation be implemented for 5 risks with a high level of risk and 7 risks with an extreme level of risk.

ARTICLE HISTORY
Revised: 9th August 2021
Accepted: 24th August 2021

KEYWORDS
Risk Management
Risk Mitigation
Project Maintenance

INTRODUCTION

The COVID-19 pandemic has proven the crucial role that telecommunications infrastructure plays in keeping businesses, governments, and society linked and running, maybe more than any other event in human history. People from throughout the world rely on technology for knowledge, social isolation, and working from home as a result of the pandemic's economic and social devastation [1]. Companies' and businesses' internet usage has increased by 50 percent to 100 percent since the COVID-19 outbreak, compared to before the pandemic. The Retail & FMCG industry (66.7 percent) and the Telecommunications industry accounted for the majority of the growth (40.0 percent). Due to the rapid increase in internet traffic caused by the COVID-19 pandemic, the number of customer complaints on digital platforms held by firms / businesses increased by 25% to 50%. Customer complaints were on the rise for many firms in the technology application and e-commerce industries (57.1%). Traffic to video conferencing climbed by 2.7 times, game traffic jumped by 81%, and e-commerce traffic increased by 13%. To support the enormous volume of traffic, the telecommunications industry must quickly integrate vertically. [2].

During this pandemic, the reliability and seamless operation of the telecommunications system is critical. The maintenance role of the equipment used to support the telecommunications system is inextricably linked to the proper operation of the telecommunications system. As one of the one of the partners of the company PT. Telekomunikasi Indonesia, which is engaged in the maintenance of telecommunications equipment, PT HIJ run the project of maintaining the telecommunication equipment in East Java area. In maintaining the telecommunication equipment, Project schedule delays and inconsistencies might have a negative impact on the project that PT HIJ working on, especially during the pandemic. Most likely, it will raise the expense of working on the project / overrunning it, as well as prompt requests from the project owner to finish on time.

Project risk management has evolved into a must-have requirement. Hazard identification, risk assessment, and risk control are all part of the risk management process. Risk management is the systematic process of identifying, analyzing, and responding to project risk, and it includes maximizing the probability and consequences of positive attributes while minimizing the probability and consequences of negative attributes [3]. Risk is something that can happen and continues to appear during the project period, it can be in the form of negative and positive risks. For negative risks, you can do an avoid strategy (avoid), transfer (move), and mitigate (reduce). As for the positive risks, it can be done by exploiting, sharing and enhancing strategies. And for negative and positive risk strategies, you can use escalate (increase) and accept (accept) [4].

*CORRESPONDING AUTHOR | W. Tripiawan | ✉ wawantripiawan@telkomuniversity.ac.id

In this research, the maintenance project were take place in East Java area network, with the current condition, PT HIJ need to quickly get more data to make Risk Management Plan for this maintenance project.

From the project, we gathered data from January – March 2021 in East Java area, that are grouped in 8 specific area: Babat, Jember, Blitar, Ngawi, Malang, Probolinggo, Surabaya, dan Kertosono. From each area, the project team found the total number of problem in telecommunication maintenance woerk. Table 1. Show the total number of problem that occur.

Table 1. Number of Problem Occur

No.	Basecamp	January	February	March
1	Babat	9	9	13
2	Jember	1	2	0
3	Blitar	0	0	1
4	Ngawi	10	0	1
5	Malang	1	3	1
6	Probolinggo	4	5	4
7	Surabaya	8	9	10
8	Kertosono	0	0	1
	Total	33	28	31

(data surce: project data)

The rootcause of the problem then summarized into 12 rootcause, as shown in the table 2.

Table 2. Problem Category

No.	Rootcause	January	February	March
1	Bad Core	4	2	1
2	Force Majeur	5	3	4
3	Degraded Closure	1	1	1
4	Animal Attack	1	3	3
5	Flicker	1	2	1
6	Fire	1	1	1
7	Bad Patch Cord	3	1	2
8	Electricity	1	2	1
9	Vendor	3	2	10
10	ISP Module Problem	1	1	1
11	Hit by Car	1	2	2
12	Vandalisme	11	8	4
	TOTAL	33	28	31

(data surce: project data)

The purpose of this study is to determine risk management in the project using qualitative approaches, which will provide risk assessment to determine risks in the maintenance project, as well as risk mitigation based on the risk assessment results on the maintenance project.

METHOD

Qualitative Method

There are two methods for risk management: quantitative and qualitative. The qualitative method has advantages and disadvantages. The advantage of the qualitative method is the visual representation, which allows the analyst to make a quick decision when compared to the quantitative method [5]. This study will assess risks using a qualitative approach to arrive at a conclusion. The primary reason for the research objective is time. Qualitative research provides quicker judgment and responses, which are appropriate for this project. According to [2,] the process begins with a review of the plan's risk management. The next step is to identify the risk, then to conduct qualitative risk analysis with risk assessment and risk mitigation, and finally to generate monitor risks.

Risk Identification

Risk identification can be defined as the process of identifying, assessing, and categorizing the initial importance of construction project risks. With the aid of diverse tools and methods, risk identification process can be achieved [22]. These tools and techniques include: brainstorming, Delphi method, interview, cause analysis, SWOT analysis, and presumption analysis [6]. This research using brainstorming method, as it be of use for projects involving new risks, new management arrangements or for developing initial checklists. However, if enough data is available, it can produce objective results. In contrast, the qualitative method is influenced by personal experience, intuition, and judgment. As a result, the outcomes can differ significantly from one analyst to the next.

Risk Metrics

Risk matrices are a common tool in risk management. They are an essential component of various risk management standards and guidelines, as well as official criteria for accepting business risk. However, scientific publications addressing the risk matrix's flaws have only recently emerged [6]. Table 3 displays a sample of risk Metrics.

Table 3. Risk Metrics Template

			Impact			
			Acceptable	Supplementary	Issue	Unacceptable
			Little or no effect	Effect is felt but no critical	Serious impact to Course of Action and Outcome	Could result in disaster
Likelihood	Improbable	Risk unlikely to occur				
	Possible	Risk will likely to occur				
	Probable	Risk will occur				

In the risk template, the risk level has been classified into four risk levels: extreme risk level 13-20, which is almost certain to occur and can have disastrous consequences, high risk level 8-12, which is likely to occur and have serious consequences, moderate risk occurs when 4-7 events occur with moderate consequences, while low risk occurs when 1-3 events occur with negligible or minor consequences. The risk level category (color map) can be seen in Figure 1 below.

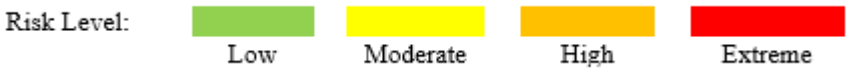

Figure 1. Risk Level

Risk Mitigation

The process or step of monitoring, assessing, preventing, and controlling the occurrence of a risk is known as risk mitigation. Risk levels can be reduced with proper management without affecting resources, business operations, or recurring risks [2]. Risk mitigation measures entail devising a strategy for managing, eliminating, or reducing risk to a manageable level. Once a strategy is implemented, it is continually monitored to determine its effectiveness and, if necessary, to revise activities. The Delphi approach will be used to do this task.

RESULTS AND DISCUSSION

Risk Identification Result

We generated two main results during the risk identification process: risk metrics and risk level. All risks must be identified and classified at the appropriate level. . Here is the outcome of risk identification, which we have organized into five risk aspects; Maintenance Aspect, Finance & Accounting Aspect, Human Resouce (HR) Aspect, Procurement Aspect, and Operational Aspect. The five risk aspects identified in the project are shown in Table 4.

Table 4. Risk Aspects – Risk Profile

Risk Aspect	Risk ID	Risk Profile	Source of Risk
Maintenance Aspect	MA-01	Process Risk	Lack of Quality Assurance & Control (QAC)
	MA-02	Risk Tool/Equipment	Broken device
	MA-03		Device performance decreased
	MA-04		Lack of Equipment
	MA-05		Lack of Sparepart
	MA-06	Material Risk	Not according to specifications
	MA-07		Bad Quality
	MA-08	Infrastructure Risk	Insufficient
Finance & Accounting Aspect	FA-01	Receivable Risk	Payment methods that cause long cash flow
	FA-02	Budgeting Risk	Limited funds/budget
HR Aspect	HR-01	Work Accident Risk	Falling, slipping, tripping / electrocuted
	HR-02		Being exposed to COVID while working in the field
Procurement Aspect	PA-01	Purchase Risk	Long buying process
Operational Aspect	OA-01	Implementation Risk	Security Disruption
	OA-02		Licensing/legal constraints
	OA-03		Travel Obstacle
	OA-04		Work over SLA
	OA-05		Work late due to material
	OA-06		No resources available on time and in the right amount

Risk assessment entails calculating the magnitude of potential consequences (impact levels) and the likelihood (probability levels) of these consequences occurring.

Risk = Consequence x Likelihood

Where (i) Likelihood is the probability of an environmental impact occurring, and (ii) Consequence is the environmental impact if an event occurs. The result will generate the level of the risk, as shown in Table 5.

Table 5. Risk Level

Risk ID	Source of Risk	RESIDUAL RISK VALUE			
		VALUE		TOTAL (L*C)	RISK LEVEL
		L	C		
MA-01	Lack of Quality Assurance & Control (QAC)	4	4	16	Extreme
MA-02	Broken device	4	4	16	Extreme
MA-03	Device performance decreased	2	3	6	Moderate
MA-04	Lack of Equipment	2	4	8	High
MA-05	Lack of Sparepart	4	3	12	High
MA-06	Not according to specifications	4	4	16	Extreme
MA-07	Bad Quality	4	5	20	Extreme

Risk ID	Source of Risk	RESIDUAL RISK VALUE			
		VALUE		TOTAL (L*C)	RISK LEVEL
		L	C		
MA-08	Insufficient	2	3	6	Moderate
FA-01	Payment methods that cause long cash flow	2	3	6	Moderate
FA-02	Limited funds/budget	3	4	12	Extreme
HR-01	Falling, slipping, tripping / electrocuted	2	3	6	Moderate
HR-02	Being exposed to COVID while working in the field	2	3	6	Moderate
PA-01	Long buying process	4	4	16	Extreme
OA-01	Security Disruption	3	3	9	High
OA-02	Licensing/legal constraints	3	3	9	High
OA-03	Travel Obstacle	2	3	6	Moderate
OA-04	Work over SLA	3	3	9	High
OA-05	Work late due to material	4	5	20	Extreme
OA-06	No resources available on time and in the right amount	2	3	6	Moderate

Risk Metric Result

From the previous calculation and get the level of each risk, we generate risk metrics as a result of the risk assessment. Table 6 shows the correlation of each risk in terms of likelihood and impact. The impact is also proportional to the level of each risk, as indicated by the color.

Table 6. Risk Metrics

			Impact			
			Acceptable	Supplementary	Issue	Unacceptable
			Little or no effect	Effect is felt but no critical	Serious impact to Course of Action and Outcome	Could result in disaster
Likelihood	Improbable	Risk Unlikely to occur		MA-03,MA-08,FA-01,HR-01,HR-02,OA-03,OA-06	MA-03,MA-08,FA-01,HR-01,HR-02,OA-03,OA-06	MA-04, MA-05, OA-01, OA-02, OA-04
	Possible	Risk will likely to occur		MA-03,MA-08,FA-01,HR-01,HR-02,OA-03,OA-06	MA-04, MA-05, OA-01, OA-02, OA-04	MA-01, MA-02, MA-06, MA-07, PA-01, OA-05, FA-02
	Probable	Risk will occur	MA-03,MA-08,FA-01,HR-01,HR-02,OA-03,OA-06	MA-04, MA-05, OA-01, OA-02, OA-04	MA-04, MA-05, OA-01, OA-02, OA-04	MA-01, MA-02, MA-06, MA-07, PA-01, OA-05, FA-02

Risk Mitigation Result

The outcome of the risk assessment will then be used to develop a risk mitigation plan. The research in this project will be limited to two levels of risk: high and extreme. According to the Risk Metrics results, the low level of risk has little or no effect (green color) – as in Acceptable Impact – and the moderate level has little effect but no critical impact (yellow color) - as in Supplementary Impact. While the high level has a significant impact on the course of action and outcome (orange color) – as in Issue Impact – the extreme level can result in disaster (red color) – as in Unacceptable Impact. The Delphi method was used to generate risk mitigation, in which several experts and project stakeholders were interviewed and provided feedback without any discretion. The outcome of risk mitigation is shown in Table 7.

Table 7. Risk Mitigation

No	Risk Level	Risk Profile	Source of Risk	Mitigation
1	Extreme	Process Risk	Lack of Quality Assurance & Control (QAC)	1. Making telecommunication network maintenance work procedures 2. Implementing Quality Control on each type of treatment 3. Periodically control the ongoing maintenance process
2	Extreme	Process Risk	Broken device	1. Carry out preventive actions, namely checking fiber optic cables regularly (monthly) 2. Classify fiber optic cable damage 3. Take corrective actions, namely repairing fiber optic cables according to the category/level of damage
3	High	Risk Tool/Equipment	Lack of Equipment	1. Provide backup tools by considering the number of equipment needs in a specified area
4	High	Material Risk	Lack of Sparepart	1. Provide stock of spare material/spare parts by considering the amount of material/spare part needs within a certain period of time
5	Extreme	Material Risk	Not according to specifications	1. Determine the specifications of the fiber optic cable used. 2. Provide fiber optic cable material according to the specified specifications
6	Extreme	Material Risk	Bad Quality	1. Carry out preventive actions, namely checking fiber optic cables regularly (monthly) 2. Classify fiber optic cable damage 3. Take corrective actions, namely repairing fiber optic cables according to the category/level of damage
7	Extreme	Budgeting Risk	Limited funds/budget	1. Maximum management of available funds for future operations and settlement of pending disbursement payments. 2. Make a priority scale for funding needs while maintaining SBU operations and marketing activities to run.
8	Extreme	Purchase Risk	Long buying process	Manage the maximum availability of funds for the procurement process
9	High	Implementation Risk	Security Disruption	Issues will be transferred to the network owner (project owner). To solve it in a fast time, payment is made in advance by the vendor
10	High	Implementation Risk	Licensing/legal constraints	Issues will be transferred to the network owner (project owner). To solve it in a fast time, payment is made in advance by the vendor
11	High	Implementation Risk	Work over SLA	1. Negotiation and justification of delay. 2. The delay is not more than 4 hours.
12	Extreme	Implementation Risk	Work late due to material	Using temporary material, during the recovery process it is replaced with new material.

Recommendation for the project

As recommendation for this project, the risk mitigation result should be implemented for 5 risks with a high level of risk and 7 risks with an extreme level of risk. The total risk from high and extreme level are 12 risks, and if this risks are mitigate correctly, it can make the maintenance project running properly.

CONCLUSION

This project's identified risk is classified into five risk aspects, namely: Maintenance Aspect, Finance & Accounting Aspect, Human Resouce (HR) Aspect, Procurement Aspect, and Operational Aspect. According to the risk assessment, there are 9 risk profiles and 19 risks that can be classified based on risk level, with 7 in the moderate level of risk, 5 in the high level of risk, and 7 in the extreme level of risk. With a total of 12 risk profiles, the risk mitigation generated was focused on risks with high and extreme levels of risk.

REFERENCES

[1] N. Veligura, K. Ka-Ki Chan, F. van Ingen, and G. Cufre, "*COVID-19's Impact on the Global Telecommunications Industry*". International Financial Corporation (IFC). 2020. Retrieved from [https://www.ifc.org/wps/wcm/connect/industry_ext_content/ifc_external_corporate_site/infrastructure/resources/covid-19+impact+on+the+global+telecommunications+industry]

[2] Telin Insight (2020). *How To Manage Traffic Explosion and Gain User Conversion During The Pandemic*.[White paper]

[3] M. S. B. Ahmed Abd El-Karim, O. A. M. El Nawawy & A. M. Abdel-Alim (2017), "*Identification and assessment of risk factors affecting construction projects*," HBRC Journal, 13:2, 202-216.

[4] Project Management Institute. 2017. A Guide to the Project Management Body of Knowledge (PMBOK). United States: PMI Publications.

[5] D. Pratami, F. Fadlillah, I. Haryono, A. R. Bermano (2018), "*Designing Risk Qualitative Assessment on Fiber Optic Instalation Project in Indonesia*", International Journal of Innovation in Enterprise System. Vol. 2 No. 2, pp 44-56.

[6] R A Bahamid and S I Doh (2017), " A review of risk management process in construction projects of developing countries", IOP Conf. Ser.: Mater. Sci. Eng. Vol. 271. 012042.