Designing Risk Qualitative Assessment on Fiber Optic Instalation Project in Indonesia

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Abstract— A project always has risks that can lead to project failure. In the project, a risk analysis is required to provide an evaluation for the project to proceed as planned. In the event of inadequate planning and ineffective control, it will result in irregularities identified as a risk to the project. This study aims to analyze the qualitative risk on Fiber Optic Installation project in Sukabumi, West Java, Indonesia. In addition, risk assessment is undertaken on project implementation. Assessment of risk using the impact and probability to measure the impact of risk occurrence. The impacts are more detailed by classified by time impact, cost impact, quality impact, safety and security impact, proximity. The result is there are 36 risk that may occur and mostly risks are associated by quality and safety/security impact.

Keywords— risk assessment, qualitative analysis, Project, fiber optic.

I. INTRODUCTION

Infrastructure is one of the main prerequisites for achieving high and sustainable economic growth (Simanjuntak & Widiaistuti, 2014). The availability of infrastructure reflects on equitable investment reflecting the existence of adequate infrastructure development that able to serve the economic movement. Infrastructure project include buildings, bridges, dams, roads, tunnels, pipes, and airports. It also indicates the advancement of human civilization and also the quality of science and technology growth of a country. One of the infrastructure that support the current economic movement is optical cable or called fiber optic.

Fiber optic is a glass fiber cable equipped with advanced technology and also has faster data transfer speeds than copper cables. Fiber optic cable network in Indonesia is still slightly rare compared to copper cable network. Fiber optic cable network is used only in some big cities in Indonesia which has a lot of internet users.

The internet user in Indonesia has accelerated increasing year by year (Sumber: Asosiasi Penyelenggara Jasa Internet Indonesia Tahun 1998-2015). This demand has caused the big project for government to fill this request. ABC company has been assigned as the provider to develop fiber optic installation project. This project aimed to increase the data speed from 10 Mbps to 80 Mbps. Since copper cable was already settled down and can not accommodate the high speed data then the changing network line into fiber optic cable is urgently needed.

However, this project is very risky because the network which had been installed long time ago will be opened again and changed into new network. At the same time, the customer requests are booming. So the short time project will be the main issue that must be faced by the company. Beside the tight schedule there are also several threats that will impact on project success including unreadable location, difficult site location, weather, limited equipment and wrong design.

This project has been started on February 2017 and will be finished on 31 May 2017. During the execution, the risk control must be conducted to know the correctness of project execution toward project baseline. Unfortunately, the risk management are not properly enough to be planned by this company. The ABC company hasn’t set the risk management plan including investigating risk that will be happened when project started, risk assessment, risk responses and controlling procedure.

Based on PMBOK 5 edition, the Risk Management plan should not be studied while the project is currently on going, however the controlling risk should be applied in whole life cycle.
II. RELATED WORKS

Risk is inevitable and sometime gain advantage on it. Many researchers investigate dealing with project risk. Study from Baghdadi & Kishk (2015), risk associated with Saudi Arabian Aviation comprise 54 risk which categorized by internal risk, external risk and unpredictable risk. The authors said that aviation sector is very important to Saudi because yearly ritual moslem held. Government of Saudi Arabian has spent abundant resources including project budget in managing aviation project since the safety is the main factor. The risk was collected by plotting the risk’s consequence and probability which also known qualitative approach.

Risk has close relationship with safety issue which has been investigated by Wicaksono & Singgih (2011). They used AS/NZS 4360:2004 Risk Management Standard to evaluate risk in apartment construction project they also applied root cause analysis (RCA) to analyze further all the cause of risk. There are 5 big risk which will be impact on the project as a whole. Most of the risk is associated with the construction technique and really useful for those who manage the construction project.

There are two methods for managing the risk, quantitative and qualitative. Qualitative method has plus and also minus. The advantage of qualitative method is the visual representation which assist the analyst to give the quick judgment compare to quantitative method. However, quantitave method is more firm because it less subjective and the result depends on numerical parameter. Research about quantitative method on risk management is also investigated by Gladysz et al (2015), Muriana & Vicinni. They used PERT (Program Evaluation Review Technique) to determine the amount of risk and their impact on project.

In this study, the project will conduct risk response by adopting qualitative method. The main reason of the research objective is about time. Qualitative research gives quicker judgment and also response which suitable for this project. The limited timeframe of the project pushes the analyst to select easier and fast method. The disadvantage of the method is minimized by choosing the appropriate key person who will be given the questionnaire and also deep interview. The key person should be the one who are experiencing in managing the same and current project.

III. METHODOLOGY

The project took place in Sukabumi, West Java, Indonesia at one Sentral Telephone otomate. This project comprised 2 part including the pre-development and migration stage. Task that must be done in the pre-development and migration stages such as site survey, create cost budget proposals, execute procurement processes and analyzing contract amendments. Meanwhile, on development and migration includes feeder development, distribution, Optical Distribution Cabinet (ODC) addition and migration.

Qualitative risk analysis has been chose as the methodology of this research. Using PMBOK 5 edition (PMI, 2013) as the guidance, the first process is investigating the risk that may occur in the project. To know further the all risk in the project, investigating risk in the work break down structure is very useful for the first iteration. In this time the output of first iteration is risk register. To support complete risk register, there are several data that should be put in the register including the statement of work as the high-level project summary, project schedule and also stakeholder register.

![Risk Management Process](image_url)

After all the risk has been collected then the next step is categorizing the risk based on probability impact matrix. This is the main characteristic of qualitative analysis because risk categorization based on expert judgement. The expert are 2 project managers who are engaged in the same project. The expert itself has more than 5 years experiencing project task. Thus their voices are assumed more convincing to produce.

The next step is giving response to all risks. The response itself will be categorizing by probability and

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impact matrix again. This process aimed to anticipate whether the responses are feasibly to run. Risk register now is equipped with more important information such as risk owner, risk categorization, impact, and risk response.

IV. RESULT AND DISCUSSION

According to PMBOK (PMI, 2013), one of the input of creating risk management plan including scope baseline. Scope baseline has 3 item for instance work breakdown structure, WBS dictionary and Scope Statement. According to another process in the project, risk management plan has many input. Almost all the project resources support the creation of risk management plan. Beside WBS, there is also item that should be in creation of Risk management plan.

Risk Breakdown structure is an output of risk management plan. It helps project manager to identify all possible risk by categorizing the risk. The structure has similar with WBS. The RBS is classified by the structure of WBS. Thus, this research follow work break down structure in the project to identify the main risk.

### Tabel 1
Activity List

| ID  | Activity                          | Duration (day) | Predecessor |
|-----|-----------------------------------|----------------|-------------|
| 1.1 | Survey                            | 11             | -           |
| 1.2 | The evaluation of survey          | 7              | 1.1         |
| 1.3 | Official memo for work order      | 2              | 1.2         |
| 1.4 | Budgeting proposal                | 7              | 1.2         |
| 1.5 | Release Budgeting                 | 30             | 1.4         |
| 1.6 | Official memo for procurement     | 2              | 1.5         |
| 1.7 | Procurement process               | 7              | 1.6         |
| 1.8 | Amendement                        | 7              | 1.7         |
| 2.1.1| Digging Soil                      | 6              | 1.2         |
| 2.1.2| Pulling Subduct                   | 6              | 2.1.1       |
| 2.1.3| Pulling FO                        | 6              | 2.1.2       |
| 2.1.4| PODC Foundation                   | 6              | 2.1.1       |
| 2.1.5| ODC Installation                 | 6              | 2.1.4       |
| 2.1.6| Jointing/Termination              | 2              | 2.1.3; 2.1.5|
| 2.2.1| Accessories installation in the pole | 7              | 1.2         |
| 2.2.2| Pulling FO cable distribution     | 10             | 2.2.1       |
| 2.2.3| ODP and Splitter Installation     | 10             | 2.2.2       |
| 2.2.5| Labeling                          | 10             | 2.1.6       |
| 2.3.1| Permit completion                 | 7              | 1.3         |
| 2.3.2| Stacking                          | 7              | 1.3         |
| 2.3.3| SITAC (ODC)                       | 7              | 2.3.2       |
| 2.3.4| Order Material                    | 2              | 1.3         |
| 2.3.5| Delivery FO cable                 | 7              | 2.3.4       |
| 2.3.6| Delivery ODC                      | 7              | 2.3.4       |
| 2.3.7| Delivery Material                 | 7              | 2.3.4       |
| 2.3.8| Delivery Material ODP and Splitter| 7              | 2.3.4       |
| 2.3.9| Delivery Material Akseorsis       | 7              | 2.3.4       |
| 2.3.10| Pole and accessoried installation | 5              | 2.3.7; 2.3.9|
| 2.3.15| Grounding installation            | 7              | 2.1.5       |
| 2.6.1| Record the customer data and physical configuration | 3 | 1.3 |
| 2.6.4| Delivery Material FO Drop Cable   | 3              | 2.3.4       |
| 2.6.5| Delivery Material ONT             | 3              | 2.3.4       |
| 2.6.6| Delivery Material IKR/IKG and Cable Power | 4 | 2.3.4 |
| 2.6.7| Pulling FO Cable and Drop Cable   | 76             | 2.6.6       |
| 2.6.9| IKR/IKG installation              | 76             | 2.6.6       |
| 2.6.10| ONT installation                  | 76             | 2.6.6       |
| 2.6.11| Activation and migration          | 76             | 2.6.6       |
| 2.6.12| Commissioning Test                | 76             | 2.6.11      |
| 2.6.13| Acceptance test                   | 76             | 2.6.11      |
There are 16 workpackage and each workpackage is decomposed into the lowest level “activity”. After all the activity is identified then all possible risk is tracked by the activities. the PM and the team works together for identifying the risk. There are 36 possible risk that may be happened to this project.

After all the risk is identified then every risk is qualifying by its possibility and impact. We use probability impact calculation from Vargas (2013). Since qualitative is very subjective, using this tool will minimize this problem. A person who examine the risk is the Project Manager who has more than 5 years experiencing the telco project especially fiber optic installation project.

In this study, we only focus on negative risk which can hamper the project success. The matrix is classified into 3 types of severity. Red quadrant identifies very urgent risk that needs quick response since the impact is catastrophic and the occurrence is always certain. Yellow quadrant is for medium risk which has medium impact and the occurrence is almost certain. The green quadrant is for the risk which has rare occurrence and insignificant impact on the project.

Table 2. Risk Level

| level    | score | Color code |
|----------|-------|------------|
| very high| 5     | red        |
| high     | 4     | orange     |
| medium   | 3     | yellow     |
| low      | 2     | green      |
| very low | 1     | green      |

Beside categorizing the risk level, we also adapt probability level, impact level including time impact, cost impact, quality impact, proximity impact form Vargas (2013) with several adjustments reflect to the scope of project.

Time Impact means risk that will impact on the schedule of the project. It can cause the project will take longer or ahead time. Since the duration of FO installation project is 3 months with variation range almost 6 months then the level of the time impact will adjust to the project duration.

Cost Impact means risk that will impact on the project budget. It can cause the real cost of the project will be over budget or under budget. The range or variation of the real cost of project is Rp. 25,000,000. Quality impact means risk that will impact on the project scope for instance the deliverable meets the expectation (customer satisfied). If the deliverable does not match with the specification, the owner will ask the vendor to give corrective action depends on the severity of the deliverable.

Safety and security impact is risk that will impact on the safety, security and environmental issue. It also reflects to the stakeholder reaction about the risk impact. Since the project is connected to the use of the land, the project will last the residu left in the ground. This residu is very explicit and will cause safety and environmental issue.

Proximity means risk that will impact on the time horizon. The effect of the risk sometime will be happening immediately or long time depends on the severity level. After all the probability and impact categories are already introduced to the expert, then he may assess the risk according to each level by giving scale from 1 to 5. The bigger score means the bigger impact of the risk or more important risk.

Table 3. Risk Probability Level

| level    | score | Description                  |
|----------|-------|------------------------------|
| very high| 5     | The event will certainly occur|
| high     | 4     | The event has a great probability to occur |
| medium   | 3     | The event may occur          |
| low      | 2     | The event rarely occur       |
| very low | 1     | Very rarely the event to be occurred, almost never |

Table 4. Time Impact Level

| level    | score | Description                  |
|----------|-------|------------------------------|
| very high| 5     | The project will delay more than 6 months |
| high     | 4     | The project will delay 3 - 6 months |
| medium   | 3     | The project will delay 1 - 3 months |
| low      | 2     | The project will delay 2 weeks - 4 weeks |
| very low | 1     | The project will delay less than 2 weeks |

Table 5. Cost Impact Level

| level    | score | Description                  |
|----------|-------|------------------------------|
| very high| 5     | The budget will be over more than Rp. 100,000,000 |
| high     | 4     | The budget will be over from Rp. 50,000,000 to Rp. 100,000,000 |
| medium   | 3     | The budget will be over from Rp. 25,000,000 to Rp. 50,000,000 |
| low      | 2     | The budget will be over from Rp. 10,000,000 to Rp. 25,000,000 |
| very low | 1     | The budget will be over less than Rp. 10,000,000 |
There is also total impact which sums of any used impact on this project. Expected value is the result of the qualitative assessment using probability and impact equation. The bigger value of expected value means the more important the risk are. Thus they will have to give response immediately to mitigate or avoid the risk will be occurred. The number of the expected value then will be ranked from the most important risk to the less important risk.

| level         | score | Description                      |
|---------------|-------|----------------------------------|
| very high     | 5     | Clients decline the projects deliverable |
| high          | 4     | Clients push to hold corrective action as soon as possible |
| medium        | 3     | Client notice the defect and urge to give corrective action |
| low           | 2     | Client notice the defect but forgive. No corrective action is needed |
| very low      | 1     | Client almost do not notice the defect |

| level         | score | Description                                                                 |
|---------------|-------|-----------------------------------------------------------------------------|
| very high     | 5     | Catastrophic, project will get double trouble                                |
| high          | 4     | The evident has immediate impact on environmental and safety and security issue |
| medium        | 3     | The evident exist and gain stakeholder consideration                         |
| low           | 2     | The evident exist and gain very little stakeholder consideration              |
| very low      | 1     | No impact on environmental and safety and security issue                     |

| level         | score | Description                                                                 |
|---------------|-------|-----------------------------------------------------------------------------|
| very high     | 5     | Event can occur immediately within next 15 days                             |
| high          | 4     | Event can occur from range 15 days to 3 months                              |
| medium        | 3     | Event can occur from range 3 to 6 months                                   |
| low           | 2     | Event can occur from range 6 to a year                                      |
| very low      | 1     | Event can occur more than a year                                           |

V. ANALYSIS

The next step for creating risk management plan is giving response in each risk. Risk are registered and divided by their risk owner, risk event, risk severity, risk, risk category and risk response. Risk owner are person who person in charge while the risk is happened. Within this project, the risk owner is grouped by 2 party, owner of the project and vendor who execute or produced the deliverable. Risk severity draws the condition of the risk if that may occur in the project.
| Risk Category/ number | Risk Event | Severity/ effect/loss | Risk Owner/ | Score | expected value | risk rank | Risk Response | remarks |
|-----------------------|------------|-----------------------|-------------|-------|----------------|-----------|---------------|---------|
| Inherent Risk         |            |                       |             |       | probability    | impact time | impact cost | impact quality | impact on S&S | Proximity | total impact |
|                       |            |                       |             |       |                |            |             |                |                |           |             |
| 1                     | Design of positioning ODP, ODC, Rosette and cable is not correct | Uncovered demand | Vendor | 2 | 1 | 1 | 3 | 1 | 4 | 2.37 | 4.74 | 34 | Mitigate | A coordination between engineering sale and project team to improve route design (design review meeting) |
| 2                     | BOQ estimation is not correct | The actual work is not yet illustrated. It will cause work item loss | Vendor | 3 | 1 | 1 | 4 | 1 | 5 | 2.97 | 8.91 | 21 | Mitigate | Result of the survey should be detailed including the BOQ estimation with the expert |
| 3                     | The schedule of survey is not match | Reschedule survey that will affect installation will be delayed | Owner and vendor | 4 | 2 | 1 | 3 | 1 | 5 | 2.83 | 11.32 | 8 | Mitigate | Vendor and owner should monitor the survey process based on written schedule and give reminder by phone or direct visit (face to face meeting) |
| 4                     | Data for survey is not valid | Re-survey the data again, delay in installation process | Owner | 4 | 1 | 1 | 4 | 1 | 5 | 2.97 | 11.88 | 4 | Mitigate | Owner should confirm and validate the data that used for survey is the newest and make sure the data has already gain departments approval |
| 5                     | Request for conducting survey is not match with the schedule | Survey process will be behind schedule again | Vendor and owner | 4 | 1 | 1 | 3 | 1 | 5 | 2.73 | 10.92 | 10 | Mitigate | Owner should give reminder to the vendor for issuing application letter for survey by phone or direct visit (face to face meeting) |
| 6                     | There is a gap between existing data and data survey | Candidate customer is not connected to new network | Vendor | 4 | 2 | 1 | 4 | 1 | 5 | 3.07 | 12.28 | 1 | Mitigate | When the evaluation meeting, each representative from vendor and owner should be responsible to discuss the variance and how to minimize the variance (corrective action) |
| 7                     | The survey team doesn’t present while holding survey evaluation | The evaluation time will take longer since the communication media is only by phone (the noise will be greater) | Vendor | 4 | 1 | 1 | 3 | 1 | 5 | 2.73 | 10.92 | 11 | Mitigate | Vendor should give notice to survey team that they should attend in evaluation team |
| Risk Category/ Risk number | Risk Event                                                                 | Inherent Risk | Score | expected value | risk rank | Risk Response | remarks                                                                 |
|---------------------------|---------------------------------------------------------------------------|---------------|-------|----------------|-----------|---------------|-------------------------------------------------------------------------|
|                           | The Evaluation Process will be delayed because the required info is incomplete so the development process is delayed as well |               |       | 2.97           | 8.91      | Mitigate      | Vendor should check the required data for evaluation process           |
|                           | Delay in construction and migration phase                                 |               |       | 2.97           | 11.88     | Mitigate      | Vendor should remind her team to finish the technical drawing based on written schedule, and give additional team for drawing process |
|                           | Delay in construction and migration phase                                 | Owner and vendor |       | 2.73           | 10.92     | Mitigate      | Both owner vendor should monitor the evaluation process based on schedule. |
|                           | Delay in construction and migration phase                                 | Owner         |       | 2.37           | 9.48      | Mitigate      | Vendor should give reminder to owner for issuing official memo of work order. Fast track survey process and always give reminder for inspector to check the official memo by phone |
|                           | Blurred information, future work is left behind                           |               |       | 2.37           | 7.11      | Mitigate      | Use owners template for work order official memo                        |
|                           | Vendor can not start to work                                               |               |       | 2.73           | 10.92     | Mitigate      | Coordinate with fulfillment department, intensively giving reminder. The previous activity must be on time it means this activity critical path. Everybody must pay attention to this activity. |
|                           | Rework in Digging soil process, planted cables are not perfectly protected | Vendor        |       | 2.37           | 11.85     | Avoid         | Both owner and vendor should monitor intensively and push to report the progress of the activity. |
| Risk Category/ Risk number | Risk Event | Severity/ effect/loss | Risk Owner/ Score | Inherent Risk Score | expected value | risk rank | Risk Respo nse | remarks |
|---------------------------|------------|------------------------|-------------------|---------------------|----------------|----------|--------------|--------|
|                           |            |                        |                   |                     | probability impact time impact cost impact quality impact on S&S Proximit y total impact |          |            |               |        |
| 15                        | Digging soil process is not as timely as scheduled | Delay in construction and migration phase | 5 2 1 4 1 5 | 2.37 | 11.85 | 7 | Mitig ate | Previous work must be on time, make sure the availability of resources and tool for excavation process including: hoe, bucket, water, truck. Add this activity to quality checklist. |
| 16                        | Subduct placement does not conform to standard | Rework and defect in subduct process | vendor 3 3 3 4 1 1 | 2.37 | 7.11 | 29 | Avoid | Both owner and vendor should monitor intensively and push to report the progress of the activity. Add this activity to acceptance test requirement. |
| 17                        | Pulling subduct is not as timely as scheduled | Delay in construction and migration phase | 4 3 1 4 1 5 | 2.37 | 9.48 | 15 | Mitig ate | Previous work must be on time, make sure the availability of resources and tool for excavation process including: driller, rope. Add this activity to quality checklist. |
| 18                        | Procedure of pulling FO does not conform to standard | Defect in FO | vendor 2 3 3 4 1 1 | 2.69 | 5.38 | 32 | Avoid | Socialize the SOP for pulling FO, use expert while pulling FO. |
| 19                        | Pulling FO is not as timely as scheduled | Delay in construction and migration phase | 4 3 1 4 1 5 | 2.37 | 9.48 | 16 | Mitig ate | Previous work must be on time, make sure the availability of resources and tool for excavation process including: gloves, rope, lubricant. Adding this activity to acceptance test requirement. |
| 20                        | Dimension of ODC foundation does not meet the standards | ODC can’t be installed | Vendor 2 1 1 4 1 5 | 2.37 | 4.74 | 35 | Avoid | Integration team should be actively coordinate with installation team. |
| Risk Category/ | Risk number | Risk Event | Severity/ effect/loss | Risk Owner/ | Score | expected value | risk rank | Risk Response | remarks |
|---------------|-------------|------------|-----------------------|-------------|-------|----------------|----------|---------------|--------|
|               |             |            |                       |             |       |                |          |               | Integration team should has capability for reading the As-plan drawing |
|               |             |            |                       |             |       |                |          |               | Previous work must be on time, make sure the availability of resources and tool for excavation process including: hoe, cement, sand, water, scope |
|               |             |            |                       |             |       |                |          |               | Adding this activity to acceptance test requirement |
| Inherent Risk |             |            |                       |             |       |                |          |               | Previous work must be on time, make sure the availability of resources and tool for excavation process including: vendor |
|               |             |            |                       |             |       |                |          |               | Previous work must be on time, make sure the availability of resources and tool for excavation process including: vendor |
|               |             |            |                       |             |       |                |          |               | Previous work must be on time, make sure the availability of resources and tool for excavation process including: vendor |
|               |             |            |                       |             |       |                |          |               | Previous work must be on time, make sure the availability of resources and tool for excavation process including: vendor |
|               |             |            |                       |             |       |                |          |               | Previous work must be on time, make sure the availability of resources and tool for excavation process including: vendor |
|               |             |            |                       |             |       |                |          |               | Previous work must be on time, make sure the availability of resources and tool for excavation process including: vendor |
|               |             |            |                       |             |       |                |          |               | Previous work must be on time, make sure the availability of resources and tool for excavation process including: vendor |
|               |             |            |                       |             |       |                |          |               | Previous work must be on time, make sure the availability of resources and tool for excavation process including: vendor |

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| Risk Category/number | Risk number | Risk Event | Severity/ effect/loss | Risk Owner/ Score | Inherent Risk | Score expected | risk rank | Risk Response | remarks |
|---------------------|-------------|------------|------------------------|------------------|--------------|----------------|-----------|---------------|---------|
| ODP installation and splitter | 27          | Type of ODP does not meet the order | Disfunction | Vendor | 2 | 2 | 1 | 4 | 1 | 4 | 2.76 | 5.52 | 31 | Mitigate |
|                        |             | installer team should has capability for reading the As-plan drawing |
|                       | 28          | Wrong label | Product activation is not working | Vendor | 2 | 1 | 1 | 4 | 1 | 4 | 2.65 | 5.3 | 33 | Avoid  |
|                       |             | installer team should has capability for reading the As-plan drawing |
| Permit               | 29          | Permit for locating ODC is not gaining approval from land owner | The location of ODC is changing Delay in schedule | Vendor | 4 | 2 | 1 | 4 | 1 | 4 | 2.37 | 9.48 | 19 | Mitigate |
|                       |             | Gaining neighborhood leader attention, satisfied community needs |
| Material delivery     | 30          | The delivery of material does not meet the schedule | Delay | Vendor | 4 | 2 | 1 | 4 | 1 | 5 | 3.07 | 12.28 | 2 | Mitigate |
|                       |             | Review should be conducted as soon as possible and Resend standard of FO cable and its specification |
|                       | 31          | Data validation doesn’t meet the technical data (the onsite data is different with the database) | Delay in migration | Owner | 4 | 2 | 1 | 4 | 1 | 5 | 3.07 | 12.28 | 3 | Avoid  |
|                       |             | Owner should make sure the given data is valid |
|                       | 32          | ODP that will be used for migration is full | Delay in migration | Owner | 3 | 2 | 1 | 4 | 1 | 5 | 3.07 | 9.21 | 20 | Mitigate |
|                       |             | Vendor Should conduct survey more detail |
|                       | 33          | Application to activate the system is down | Delay in migration | Vendor | 3 | 1 | 1 | 4 | 1 | 5 | 2.97 | 8.91 | 24 | Mitigate |
|                       |             | Regular maintenance and engineering on site always available |
| Commissioning test   | 34          | Vendor do not bring equipment, data or tool while doing the commissioning test | Delay ini commissioning test | Vendor | 3 | 1 | 1 | 4 | 1 | 5 | 2.97 | 8.91 | 25 | Mitigate |
|                       |             | Vendor and owner should has cek list for commissioning tes requirement and owner should remind the vendor about commissioning test requirement tha should be brought |
|                       | 35          | Vendor do not bring equipment, data or tool while doing the acceptance test | Delay ini acceptance test | Vendor | 3 | 1 | 1 | 4 | 1 | 5 | 2.97 | 8.91 | 26 | Mitigate |
|                       |             | Vendor and owner should has cek list for commissioning tes requirement and owner should remind the vendor about commissioning test requirement tha should be brought |
| Risk Category/ Risk number | Risk Event | Severity/ effect/loss | Risk Owner/ Score | expected value | risk rank | Risk Response | remarks |
|---------------------------|------------|-----------------------|-------------------|----------------|-----------|---------------|---------|
| Rework until meet the owner specification | Vendor | 3 2 5 4 1 5 3.77 11.31 9 | Mitigate | Vendor should know the owner specification before conduct the installation and vendor should always coordinate to the owner about the specification. |
From Table 9, all the risk had been evaluated and ranked by its number of expected value. Expected value is gain by multiplying the probability and impact. Since the impacts are classified by time, quality, cost, proximity, safe and security, we must proceed the sum of the impacts by using the equation. The equation for calculating total impact is squareroot of total impact of times square, quality square, cost square, proximity square, safe and security square, divided by number of used impact (Vargas, 2013). In this case the used impact is 5.

The distribution of risk impact is carried out to investigate the severity of the risk. in level very high (score 5) is mostly found in proximity impact. It means the effect of the risk will occur soon after the risk is happened. The risk response of this category should be avoided by asking corrective and preventive action. For those risk impact in high level are mostly found in quality impact. The risk response of this category should be avoided by asking corrective and preventive as well since it will be moment of the truth. Although these two category are not cost and time impact that will caused overudget and project completion, proximity and quality impact will be indirectly associated with project budget and scheduling also.

| level       | score | impact time | impact cost | impact quality | impact S&S | Proximity |
|-------------|-------|-------------|-------------|----------------|------------|-----------|
| very high   | 5     | 0           | 2           | 0              | 0          | 27        |
| high        | 4     | 0           | 0           | 29             | 0          | 6         |
| medium      | 3     | 5           | 2           | 7              | 1          | 0         |
| low         | 2     | 9           | 0           | 0              | 0          | 0         |
| very low    | 1     | 22          | 32          | 0              | 35         | 3         |

Only few risk happen in medium to low level. However, the remaining risk (very low level) will be mostly found in cost impact and safe&security impact. In this level the effect of risk is minor to the project success and it can be neglected since it is easier to find the corrective solution and execution.

Top ten expected value of the risk which indicate of the most important risk among others is risk associated by survey process and digging soil. This risk will impact most of budget of the project, schedule, and quality.

Critical path used to evaluate the risk also. In critical path method, the longest path will be critical activity to the project. In this project the critical activities are survey, releasing official memo for survey, collecting the customer data, logic and physical configuration, order material, migration and activation, commissioning test and acceptance test. These findings tell us that almost all activites are critical that will increase the risk of the project including the delay, rework and low quality. Form qualitative risk asessment those categories are most relevant found in the critical activity.

VI. CONCLUSION

Risk asessment are needed when the project will start. Qualitative risk assessment is applied when the project must start to work, limited time or tight schedule. However, the subjectivity in the assement can be minimized by using more comprehensive measurement. In this researched all qualitative data should be need translated in numerically by some scales. From the previoud study the risk are ranked by it number of probability and impact assement. The impact is only assessed by one single factor thus we suggest impact assement by Vargas (2013) to give more comprehensive impact assement. The impact of the project now will be grouped by time impact, cost impact, quality impact, safe and security impact, proximity impact and you can also put relevant impact to the project. on the other hand, risk can be proceeded to quantitative assessment using Monte Carlo simulation to give firm and strong result which not carried out in the research.

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REFERENCES

[1] Project Management Institute. “A Guide to the Project Management Body of Knowledge (PMBOK® Guide). 5thed” Newtown Square, PA: USA: Project Management Institute, 2013.
[2] R. Mulcahy. “PMP Exam Prep”, RMC Publisher, June 2013
[3] J.M. Nicholas, H. Steyn, H., & J.M. Nicholas. Project management for engineering, business and technology (4th ed). Abingdon, Oxon: Routledge, 2012
[4] D. Pratami, L. Octaviana, I. Haryono. “Document audit design using 10 knowledge area PMBOK Edisi 5”, Prosiding Seminar Sistem Poduksi XI dan Seminar Nasional VI Manajemen Rekayasa Kualitas, in Indonesian language, pp.33–44, 2015
[5] Agoes, S. (2004). Auditing (Pemeriksaan Internal) oleh Kantor Akuntan Publik Jilid I. Jakarta: Lembaga Penerbit Fakultas Ekonomi Universitas Indonesia.
[6] Arens, & Loebbecke. (2009). Auditing Pendekatan Terbaru. Jakarta: Salemba Empat.
[7] AS/NZS. (1999). Risk Management Guideline. Sydney NSW.
[8] Asosiasi Penyelenggara Jasa Internet Indonesia. (1998-2015). https://www.apjii.or.id/content/read/39/264/Survei-Internet-APJII-2016
[9] Baghdadi, A., & Kishk, M. (2015). Saudi Arabian aviation construction projects: Identification of risks. Procedia Engineering 123, 32-40.
[10] Duffield, C., & Trigunarsyah, B. (1999). Project Management Conception to Completion. Australia: Engineering Education Australia.
[11] Fan, Z.-P., Li, Y.-H., & Zhang, Y. (2015). Generating project risk response strategies based on CBR: A case study. Expert Systems with Applications, 2870–2883.
[12] Farhey, D. (2005). Bridge Instrumentation and Monitoring for Structural Diagnostics. An International Journal, 301-308.
[13] Farhey, D. (2006). Integrated Virtual Instrumentation and Wireless Monitoring for Infrastructure Diagnostic. Structural Monitoring Journal, 129-143.
[14] Gladysz, B., Skorupka, D., Kuchta, D., & Duchaczek, A. (2015). Project risk time management – a proposed model and a case study in the construction industry. Procedia Computer Science 64, 24-31.
[15] Hendrawan, R. (2015). Berita Teknologi: Selengkapnya: https://www.beritateknologi.com/mengenal-lebih-dalam-tentang-kabel-fiber-optik/
[16] Herbert, L. (1979). Auditing the Performance of Management. California: Lifetime Learning Publications.
[17] (n.d.). Keputusan Presiden No. 80 Tahun 2003 Tentang Pedoman Pelaksanaan Pengadaan.
[18] Kerzner, H. (1995). Project management: A systems approach to planning, scheduling, and controlling. New York: Van Nostrand Reinhold.
[19] Nalewaik, A., & Mills, A. (2015). Project Performance Audit: Enhanced Protocols for Triple Bottom Line Results. Procedia - Social and Behavioral Sciences 194, 134-145.
[20] PMI. (2013). A Guide to The Project Management Body of Knowledge (PMBOK). Newtown Square: Project Management Institute.
[21] Santosa, B. (2009). Manajemen Proyek: Konsep dan Implementasi. Yogyakarta: Graha Ilmu.
[22] Simanjuntak, E., & Widiastuti, H. (2014). Peluang Investasi Infrastruktur Bidang Pekerjaan Umum. Jakarta: Pusat Kajian Strategis Sektor Sektoral Kementerian Pekerjaan Umum.
[23] Wicaksono, I. K., & Singgih, M. L. (2011). MANAJEMEN RISIKO K3 (KESELAMATAN DAN KESEHATAN. Prosiding Seminar Nasional Manajemen Teknologi XIII.
[24] Vargas, Ricardo Viana. (2013). Process to Quantify the Qualitative Risk Analysis. PMI Global Congress Proceedings, pp 1-9

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