The Use of Quality Metric To Control Quality Of Telecommunication Project (Case Study: Regional Metro Junction)

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Abstract. Regional Metro Junction is known as a telecommunication network project which connects one city to another city/village. This project has specific quality requirement to be achieved. However, the project executor didn’t meet the quality requirement from project owner because there’s no quality guideline in the planning process of the project, so it caused several quality problems in the execution process such as 2,700 meters twisted cable, 76 poles wrong location and 35 poles tilted. In addition to that, this paper aimed to design quality metric using internal control method as a guideline to control quality of the project in order to minimize the potential of rework. The step of making this quality metric is identifying the possible issue of each activity, creating the critical success criteria of each activity based on requirement documentation then identifying the resources needed for each activity. The result shows that the number of defect is decreasing as much 750 meters for the twisted cable, 44 wrong pole location and 27 tilted pole. At the end, this quality metric guideline is useful to minimize the defect of the project and can be lesson learned for another project.

1. Introduction
According to PMI (2017), project is an interim effort of making a unique output. There are a lot of things to do that can make a successful project, one of them is to make sure the quality implementation of the project is good. Project quality management itself has three process which are plan quality management, manage quality and control quality (PMI, 2017). According to that, there is a metric which will help the implementation of quality management in every project, named quality metric. Based on project quality management process on (PMI, 2017), quality metric is an output of plan quality and an input of manage quality and control quality. It will help to make quality procedure in the manage quality process and will help to verify quality requirement in the control quality process.

There are many projects developed in Indonesia, one of them is telecommunication project. In order to expand telecommunication network, especially fiber optic cable to the villages and the cities, it is needed to do the Regional Metro Junction (RMJ) project. RMJ project is a backbone which connect one city to another city or village. By doing an RMJ project, the villagers could use the telecommunication
network as fast as in the city because the fiber optic has several benefits such as bigger bandwidth and deliver information faster than others (Royani, et al., 2013).

However, PT ABC, a well-known telecommunication company in Indonesia wants to expand their telecommunication network to the villages. In addition to that, PT ABC chose its subsidiary named PT XYZ to do the RMJ project. In this case, PT XYZ who is responsible as project executor didn’t meet the quality criteria given by PT ABC. The results of the installation shown at the Table 1 below:

| Defect Installation          | Total Defect |
|------------------------------|--------------|
| Twisted cable                | 2,700 meters |
| Wrong pole location          | 76 poles     |
| Tilted pole                  | 35 poles     |

From the total defect shown in Table 1, it is stated that there are three main problems of the project which are twisted cable, wrong pole location and tilted pole. Those quality problems will affect another problem such as delivery time, cost increased and lack of customer trust (Pradip, 2017). In order to minimize those problems, project executor made quality metrics of the project. According to PMI (2017), quality metrics is a metric that describe a project or product which made in plan quality management and will be verified in control quality process. The plan quality management itself is a process of defining quality requirement into a quality guideline and control quality is a process of verifying the work (PMI, 2017). According to research by Mufti, et al. (2017), there are a lot of research talk about quality metric but the best method to make it is internal control method. Internal control is a method to increase effectivity and efficiency the business process of the project because it identifies the possible issues occur and define how to solve it (Page, 2010). After knowing error activity in the project, we can self control the project and the potential errors will be minimized (Mufti, et al., 2017).

There are another research talk about quality such as Ketmanto, et al. (2018) about making project management plan of e-learning content. One of the discussion of that research is about making quality metric by internal control method started with defining scope such as making SMART goals, scope statement, WBS, then quality metric itself. After that, a research by Karklina & Pirta (2018) explain about describing quality requirement based on project objective then it will be measured by goals question metric. However, making a quality metric can not be separated from making the critical success criteria, so does a research by Asmoni, et al. (2015) which explain the making of critical success factors of project quality management systems for Malaysian construction industry. Finally, Daniel & Draghici (2015), explain about the flow process of collecting customer requirement until it is separated into deliverables each processes of the project. However, research by Mufti, et al (2017) is only discuss about how to make the quality metric but didn’t show the effect after using it. Combined with another quality researches above, this research aimed to show the process of making quality metric and show the result after its implementation.

2. Literature Studies

2.1. Quality Metric
Quality metric is a specific metric which help describing the quality criteria of the project and will be verified in control quality process (PMI, 2017).

2.2. Scope Baseline
Scope baseline is an approved combination of project scope statement, work breakdown structure and work breakdown structure dictionary (PMI, 2017).
2.2.1. Project Scope Statement. Based on PMI (2017), project scope statement is a document which classify the detail scope of the project. In the research made by Ketmanto, et al. (2018), it is consist of project name, approved by, date, product scope description, project scope, project deliverables and acceptance criteria.

2.2.2. Work Breakdown Structure (WBS). A classification of hierarchical decomposition of the project work is known as work breakdown structure (PMI, 2017). It decomposed the project into more specific work package.

2.2.3. Work Breakdown Structure (WBS) Dictionary. After the project work has been structured then it will be described on WBS dictionary (PMI, 2017). It describe about how the project will be done, schedule, and acceptance criteria each work package.

2.3. Internal Control
Explained in Page (2010), internal control is a method to efficient the business process by knowing its possible issue, critical success criteria and resources each work package. Based on research by Mufti, et al. (2017), the method itself is consist of work package, possible issue, critical success criteria and resources. The resources is classified into tools, man, doc, method and specification.

3. Research Methodology
The procedures of making quality metrics in this research are as follow:

Based on Figure 1, the research started with collecting all requirements. After that, those requirements defined into project scope statement, WBS and WBS dictionary on scope baseline. With the help of internal control method, the scope baseline is converted to be quality metric with possible issue, critical success criteria and resources each work package. Finally, quality metric will be verified in control quality process.

4. Results & Discussion
The result of this research are as follows:

4.1. Requirements Documentation
This process produce the scope requirement and quality requirement for RMJ project. The scope requirement is include the scope of work, schedule and cost of the RMJ project. Next the quality requirement is include the material needed, procedure, and acceptance criteria for the RMJ project.

4.2. Scope Baseline
This process produce the approved combination of scope statement, WBS and WBS Dictionary. After all requirements collected, then it will be generated into project scope statement. Project scope statement of this research is shown in Table 2 below.
Table 2. Project Scope Statement

| Project name          | Regional Metro Junction |
|-----------------------|-------------------------|
| Approved by           | Project Manager         |
| Date                  | October 2018 – February 2019 |
| Product scope description (product, service, result) | This project has 25km length, 634 poles and targeted 120 days done with budget 2.1 billion |
| Project scope         | This project consist of preparation, material procurement, installation and closing. |
| Project deliverables  | This project includes licensing, installation of pole, pipe and cable, and handover document |
| Acceptance criteria   | All the works meet the quality criteria |

After making the scope statement as shown in Table 2, then it will be decomposed in WBS shown in Figure 2 below:

Figure 2. WBS of RMJ Project

From the Figure 2 above, RMJ project is classified into four work packages which are preparation, material procurement, installation and closing. After that, the WBS will be described in WBS dictionary shown in Table 3 below:

Table 3. WBS Dictionary

| WBS Name             | WBS Description                             | Duration (Days) | Acceptance Criteria                        |
|----------------------|---------------------------------------------|-----------------|--------------------------------------------|
| Preparation          | Process of collecting document to start the project | 31              | Have finished DRM and get permission       |
| Material Procurement | Process of buying and delivering materials  | 30              | Have deliver all materials                 |
| Installation         | Process of installing all the materials     | 79              | Have install all the project work          |
| Closing              | Process of handovering project to project owner | 10              | Passed the commissioning & acceptance test |

4.3. Quality Metrics

After scope baseline is created then it will be combined with the quality requirement from requirements documentation process to make the quality metric. The quality metric is generated per work package alongside with the quality requirement. The summary of quality metric in this research is shown in Table 4. below:
Table 4. Quality Metrics

| WB S No. | Work Package | Possible Issue                                                                 | Critical Success Criteria                                                                 | Resources                  |
|----------|--------------|--------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|----------------------------|
|          | Preparation  | 1. There is no representative of survey team / PM at Design Review Meeting (DRM) | 1. The representative of survey team / PM is come to DRM                                 | Ms. Word Survey team, project manager Minutes of meeting, APD, Bill of Quantity (BoQ) Focus group discussion, brainstorming Focus group discussion, brainstorming |
| 1.1      |              | 2. The document needed for DRM is incomplete                                    | 2. All document needed for DRM is complete                                                 |                            |
|          |              | 3. Didn’t get permission                                                        | 3. Get the permission from the villagers and Ministry of Public Works                     |                            |
| 1.2      | Material Procurement | 1. Material delay of delivery                                                  | 1. Material delivery is on time                                                          | Ms. Word, Logistic team BoQ, Plan of Work (PoW) Monitor schedule, follow up vendor, crosscheck material specification and delivery address Install all the work | Detail oriented, good negotiation |
|          |              | 2. Wrong material specification                                                | 2. The material specification of material coming is accurate                               |                            |
| 1.3      | Installation | 1. Wrong pole location                                                          | 1. The pole location is accurate based on As Plan Drawing (APD)                           | Ms. Word, Google Earth, Pole replication, portable stairs, safety equipment, paint roller, pipe cutter, walking meter |
|          |              | 2. Wrong pole depth                                                            | 2. The pole depth is 1.8 m                                                                |                            |
|          |              | 3. The pondation is not strong                                                  | 3. The pondation is full covered in the soil                                             |                            |
|          |              | 4. Wrong pole painting                                                          | 4. The pole painting is accurate (red, silver and black)                                  |                            |
|          |              | 5. Wrong pole accessories                                                       | 5. The accessories installation is right based on field condition                         |                            |
|          |              | 6. Twisted cable                                                               | 6. The cable is straight                                                                  |                            |
|          |              | 7. FO cable installation isn’t neat                                             | 7. The cable installation is neat                                                         |                            |
|          |              | 8. Tilted pole                                                                 | 8. Perpendicular pole                                                                    |                            |
| 1.4      | Closing      | 1. There are missed & wrong installation                                        | 1. All works have been installed and accurate                                            | Ms. Word, walking meter, power link budget PM, Site PM PoW, BoQ, APD, Acceptance test checklist Final Check of installation against Contract | Detail oriented, good negotiation |
|          |              | 2. The link budget is more than 0,22 dB                                         | 2. The link budget is less than 0,22 dB                                                   |                            |

4.4. Analysis
After the quality metric has been defined, then it will be verified in the control quality process. There are differences of result before and after implementing the quality metric. The differences of the result shown in Figure 3, 4 and 5 below:
As we know that at the first, the project executor start the project without quality guideline then it caused major defect such as twisted cable, wrong pole location and tilted pole. Although they only have short duration to complete the project, they still have to minimize the quality problem occur on the project in order to keep satisfy the customer. According to that, before entering the closing process, they made quality metric in order to minimize the quality problem as mentioned. Although they didn’t make it in the planning process, the result from Figure 3, 4 and 5 above shown that the number of defect is still decreasing after implementing the quality metric such as 750 meters twisted cable, 44 poles wrong location and 27 tilted poles.

5. Conclusion
First, it is important to make the quality metric in planning process as a quality guideline to avoid defect at the project since it is an output of plan quality management process and an input in control quality process. The quality metric can be verified in control quality process whether the project work is passed the quality criteria or not. This research has proved that the use of quality metric is useful to minimize potential of defect. Furthermore, for the next research we recommend to analyze the relationship between impact of using quality metric against successful project with annova table.

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