Use of Software Engineering on the Project Implementation Schedule of Lamreung Limpok Bridge

Abdul Muhyi¹, Miftahul Hamzi²*, Busra¹

¹ Civil Engineering Department, Politeknik Negeri Lhokseumawe, Aceh, Indonesia
² Geopolymer and Green Technology Research Center, Aceh, Indonesia

Email: Aidil.muhyi@gmail.com

Abstract. The development of technology is growing along with the time. It affects on development of construction management which several application programs are offered to facilitate construction management in term of implementing schedule and project data. The application program had facilitated the management to entry project data, manage project activities, project reports and control of project activities on lamreung limpok bridge, Lamgapang, Aceh besar, Aceh, Indonesia. The bridge incurred the expense of Rp.27.179.501.000.00 which it was supported by Aceh government budget 2018. The bridge connected the area of ulee kareng and limpok which the duration of project was 141 working days. This project consisted of 8 parameters in the activity that is the general work, drainage, work relate to land, aggregate pavement, asphalt pavement, structure, finishig, and maintenance. The issue of this study was the reach of project implementation schedule. This study will redesign the project schedule with the use of Microsoft Project 2013. The result showed that the duration of project was 122 working. Furthermore, the Gantt Chart and PDM had referred to the standard.

1. Introduction

The use of computer application programs has facilitated project managers to entry the project data, managing and controlling the project activities that had related to resources on the project. Microsoft project is an application on the processing time of a construction engineering having the ability to plan an activity, organizing, controlling time and cost. This study was conducted using the software application to facilitate the managing of construction project especially the schedule of project implementation on the bridge of Lamreung-Limpok. The length of the bridge is 276.61m with the width of 7m which it cross flood flow of the krueng aceh. The schedule of project implementation was considered as the issue so that the use of microsoft project 2013 on the project management was expected to be able to facilitate this issue.

The construction management aimed that the involvement of resources in the construction projects can be applied by the project manager. The resources of construction projects consisted of manpower, materials, machines, money and methods. The characteristic of construction project had three dimensions that was unique, resources and organization. Whereas, the process of finishing had three constraints consisted of the standard specifications, time schedule and cost[2].

The schedule of project was the determine of project activities schedule from the preparation work until finishing including material, labour and duration of activities. The parameters of in this study were gantt chart, PERT (Project Evaluation and Review Technique), and CPM (Critical Path Method). There were four process of project schedule in the precedence diagram method (PDM) such as description of work, the list of work, duration of work and PDM network [1].
Furthermore, the PDM network should link with the arrangement of plan node that described the number of activities with the relevant duration, finishing of the PDM diagram by completing the attributes and symbols, connecting the nodes with the arrows that described the interdependence between activities, figuring the earliest start (ES), earliest finish (EF), latest start (LS) and latest finish (LF) that identified the critical activities, critical paths, float and project completion duration [3].

The software of Microsoft Project was used to create and manage the project designs. Due to the facilities with the amazing benefits of this software to entry the project data, so that often caused by the operator. The Microsoft Project was used to manage the schedule of activity so that the construction project was evaluated throughout the stages of project task. Microsoft Project 2010 has advantages such as the ability to handle the activity schedule, organizing, controlling the time and cost that converted data input into an data output [5].

The Microsoft project provided the elements of project management by the combination of facilitated, capability, and flexibility so that was able to manage projects more efficiently and effectively. We got the information, control project work, schedules, financial reports, and control the team work of the project. Microsoft Project is one of the software provided which is a project administration software used to plan, manage, monitor and report data from a project [4].

2. Methodology

The location of project was in Lamreung Langgapang, Krueng Barona Jaya, Aceh Besar, Aceh. The collection of data was carried out by literature and field study. The secondary data from PT. PRIMA MANDIRI PERAPEN was used as the data in this study. The processing of data was done by using the Microsoft project application with the schedule techniques of Gantt charts and PDM. However, analysis of work duration data should be calculated by manual. Then, the item of activity and duration data was inputted to Microsoft project 2013.

3. Results and discussion

Figure 1. The schedule of project completion from task Information Summary

Figure 2. The schedule of finishing project from project summary task on PDM
Based on the analysis of Microsoft Project 2013, the result shows that the bridge project of Lamreung Limpok was finished by 103 working days compared to the secondary data (122 working days). This result was obtained by the display of task information and project tasks summary on PDM as seen in Figure 1 and Figure 2.

Table 1. The schedule to use resource of equipment in the bridge of Lamreung Limpok

| No | Resource Name                        | Work |
|----|--------------------------------------|------|
| 1  | asphalt mixing plant                 | 40 hrs |
| 2  | asphalt finisher                     | 40 hrs |
| 3  | asphalt sprayer                      | 16 hrs |
| 5  | compressor 4000-6500 Nm              | 24 hrs |
| 6  | concrete mixer 0.3-0.6 m³            | 72 hrs |
| 7  | crane 10-15 ton                      | 2.184 hrs |
| 8  | dump truck 3.5 ton                   | 928 hrs |
| 9  | excavator 80-140 hp                  | 24 hrs |
| 10 | generator set                        | 40 hrs |
| 11 | motor grader >100 hp                 | 96 hrs |
| 12 | wheel loader 1.0-1.6 m³              | 72 hrs |
| 13 | three wheel roller 6-8 t.            | 32 hrs |
| 14 | tandem roller 6-8 t.                 | 40 hrs |
| 15 | tire roller 8-10 t.                  | 8 hrs |
| 16 | vibratory roller 5-8 t.              | 96 hrs |
| 17 | water pump 70-100 mm                 | 1.272 hrs |
| 18 | water tanker 3000-4500 l.             | 1.016 hrs |
| 19 | welding set                          | 224 hrs |
| 20 | asphalt distributor                   | 16 hrs |
| 21 | base camp                            | 128 hrs |
| 22 | truck concrete mixer                 | 2.544 hrs |
| 23 | batching plant                       | 1.272 hrs |

Table 2. The schedule to use resource of labour in the bridge of Lamreung Limpok

| No | Resource Name       | Work  |
|----|---------------------|-------|
| 1  | Pekerja             | 35.078 hrs |
| 2  | Tukang              | 1.936 hrs |
| 3  | Mandor              | 1.960 hrs |
| 4  | Operator            | 5.720 hrs |
| 5  | Pembantu Operator   | 5.792 hrs |
| 6  | Sopir / Driver      | 3.880 hrs |
| 7  | Pembantu Sopir I Driver | 3.824 hrs |
Table 3. The schedule to use resource of material in the bridge of Lamreueng Limpok

| NO | Resource Name                        | Work          |
|----|--------------------------------------|---------------|
| 1  | Pasir                                | 13.749.77 M³  |
| 2  | Agregat Kelas A                     | 84.37 M³      |
| 3  | Agregat Kelas B                     | 112.5 M³      |
| 4  | Batu Gunung/Kali                    | 211.22 M³     |
| 5  | Timbunan Tanah                      | 1.056 M³      |
| 6  | Timbunan Pilihan                    | 105.6 M³      |
| 7  | As pal                               | 332.35 kg     |
| 8  | Kerosen I Minyak Tanah              | 151.52 liter  |
| 9  | Semen I PC (50kg)                   | 1.092.100.16 kg|
| 10 | Laston AC – WC                      | 172.03 ton    |
| 11 | Laston AC – BC                      | 31.32 ton     |
| 12 | Baja Tulangan Polos                 | 3.870.35 kg   |
| 13 | Baja Tulangan Ulir                  | 83.914.03 kg  |
| 14 | Kawat Seton                          | 83.984.4 kg   |
| 15 | Pipa Baja Diameter 100 MM           | 36 M³         |
| 16 | Pipa PVC                             | 1.116 M³      |
| 17 | Paku                                 | 4.146.51 kg   |
| 18 | Kayu Perancah                        | 518.31 M³     |
| 19 | Expansion Joint Asphaltic Plug Tipe Fixed | 61 M³'     |
| 20 | Marmer                               | 2 buah        |
| 21 | Adukan Semen                         | 2             |
| 22 | Sandaran (Railling)                 | 558 M³'       |
| 23 | Elastomerik Sintetis                | 64 buah       |
| 24 | Agregat Kasar                       | 3.255.11 M³   |
| 25 | Agregat Halus                       | 2.021.07 M³   |
| 26 | Unit Pracetak Gelagar Tipe I bentang 31,6 meter | 36 buah |
| 27 | Seton Diafragma                      | 324 M³        |
| 28 | Panel full deph slab                | 1.377 buah    |
| 29 | Cat Marka                            | 614.25 kg     |
| 30 | Thinner                              | 330.75 liter  |
| 31 | Blass Bit                            | 141.75 kg     |
| 32 | Patok Pengarah                       | 50 buah       |
| 33 | Kerb Pracetak                        | 200 M1        |
| 34 | Lampu Penerangan Jalan Lengan Tunggal | 20 uah     |

4. Conclusion
Efforts to improve the quality of schedule plan on a project provided the increasing of project performance. The use of Microsoft project 2013 on the management project provided the short time and was able to reschedule the duration if the job has been delayed from the first schedule.
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[5] Wijaya, G. D., Marsiano, F., & Limanto, S. (2010). studi kasus penjadwalan proyek pada proyek rumah toko x menggunakan microsoft project 2010 Pada studi kasus ini dibantu software Microsoft Project 2010 untuk merencanakan jadwal proyek dan meneliti metode CPM untuk mengetahui durasi proyek diluar dari pek, 1–8.