

SCHEDULING ANALYSIS USING THE PDM METHOD IN THE SYAMSUDIN NOOR AIRPORT ACCESS ROAD CONSTRUCTION PROJECT WITH THE HELP OF MICROSOFT PROJECT

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ABSTRACT

Syamsudin Noor Airport Access Road Development Project, Landasan Ulin Sub-district, Banjarbaru City, South Kalimantan is a provincial road project carried out by the PUPR Office of South Kalimantan Province together with the Banjarmasin National Road Implementation Center. This project is carried out within 330 working days based on the schedule given in the form of Barchart. The implementation of this project should be completed in the shortest possible time, so that scheduling analysis is carried out using other methods, one of which is the Precedence Diagram Method (PDM). Through the results of the analysis in this study, it was found that the total duration of scheduling the Syamsudin Noor Airport Access Road Construction Project using the PDM method with the help of Microsoft Project was 221 working days and 270 calendar days, the total initial duration of the project was for 330 working days. The work started on September 25, 2023 and ended on 21 June, 2024.

Keywords: Project, Scheduling, PDM, Project

1. INTRODUCTION

According to Arianto (2010), in every development project, scheduling will always be needed. With scheduling, it is hoped that the implementation of the project will be carried out in accordance with the orderly sequence of activities and more efficient implementation. Scheduling is also carried out so that a project can be completed in a short period of time so that later there will be no losses both in terms of time and material to the contractor.

The Syamsudin Noor Airport Access Road Construction Project is a provincial road project carried out by the South Kalimantan Provincial PUPR Office together with the Banjarmasin National Road Implementation Center, this project is a road construction project whose cost budget is obtained from the State Budget. This project is carried out within a period of 330 working days based on the schedule given in the form of *Barchart*. The implementation of this project should be completed in the shortest time bracket, so that scheduling analysis is carried out using other methods, one of which is the

Precedence Diagram Method (PDM) method.

One way to schedule with the PDM method can be done using the help of software, namely *Microsoft Project*. This application was created to assist project implementers in planning, scheduling, organizing and tracking projects. In addition, *Microsoft Project* is useful in supervising resources, both human resources and other resources. *Microsoft Project* is used because of its ease of use and flexibility to organize projects so that they can be more effective and efficient. Nurjanah et al., 2024).

2. THEORETICAL FOUNDATIONS

Project Management

In general, Project Management can be defined as "As a science and art related to leading and coordinating resources consisting of human and material by using modern management techniques to achieve predetermined goals, namely: scope, quality, schedule, and cost, as well as fulfilling the wishes of stakeholders". In principle, project management is: The application of knowledge, skills "tools and techniques" (Teguh R, 2015).

Road Projects

A road can be defined as a transportation facility that covers the entire part of the road, including its auxiliary buildings, which is intended for traffic. These roads can be located at ground level, above ground level, below ground level, or above water level, but do not include railways and cable roads, Road Pavement Design Manual of the Ministry of Public Works and Public Works Directorate General of Highways (Number: 02/M/BM/2013).

Network Analysis

The application of work network analysis in a project aims to supervise all elements of the project in a master plan, by building a comprehensive work model to achieve the most efficient time (best) in carrying out tasks or activities. It also aims to reduce costs, minimize risks, maximize the use of resources more economically, obtain or arrange an optimal schedule, and make it easier to revise or improve the deviations that occur. (Siagian, et al. 2019).

Project Scheduling

According to Maslina (2023) Scheduling in a project is a component in its

function to provide information related to the project planning schedule and development, including resource performance as well as estimated project duration and time progress in achieving project completion.

PDM Scheduling Method

The PDM (Precedence Diagram Method) method is a type of working relationship that is included in the Activity On Node (AON) classification, where each activity is depicted in the form of a node which is usually a square, while the clue line is only used to show the relationship between related activities. (Suharto. 1999 in Arianto, 2010).

Work Breakdown Structure (WBS)

The project network is built based on information obtained from *the Work Breakdown Structure (WBS)*, which is a flow chart that describes the project work plan. WBS is a starting step in project management that differentiates work into different stages of the project. In WBS, the phases of project work are arranged in detail, with some phases depending on the previous phase, while other phases can be worked on simultaneously. Through this analysis, we can estimate the start time and completion of the project. (Suwinardi, 2015)

Microsoft Project

Microsoft Project was first advanced in 1984 under the name MS-DOS, and was later updated to run on the Windows operating system with the Microsoft Project (Harsanto) platform. According to Erizal (2007), Microsoft Project is a project management tool proposed and marketed by Microsoft and designed to assist construction implementers in preparing plans, determining resources, monitoring progress, managing financing, and analyzing workloads.

The main advantage of Microsoft Project lies in its ability to plan, organize, and control the duration and cost of projects, by effectively and efficiently transforming data into relevant outputs. In addition, the software allows the acquisition of cost information directly within a specified period, as well as making it easy to modify and prepare accurate production schedules in a relatively short time.

3. METHOD

Research Location

The Syamsudin Noor International Airport Access Road construction project has a length of about 2.8 km with an implementation period of 330 working days.

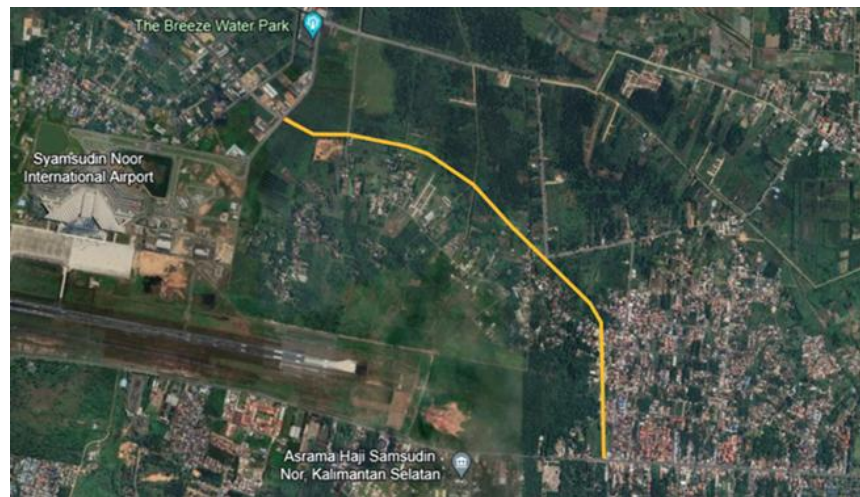


Figure 1. Research Location

Research Procedure

The beginning of this research began by collecting primary and secondary data in the form of general project data, work lists, S-curves and work processes in the field. Next, create a *Work Breakdown Structure* (WBS) based on the data obtained, then an analysis of dependencies between jobs is carried out which will be entered into the *Microsoft Project assistance application* to obtain scheduling results using the PDM method and the total duration of the entire project.

4. RESULTS AND DISCUSSION

In the Syamsudin Noor Airport Access Road Construction project, the PDM scheduling carried out only concerns physical work without paying attention to the non-physical work. Therefore, the implementation of K3, daily work and complementary work will not be included in the PDM analysis, but will still be included in the results of the scheduling analysis.

Duration of Each Job

What needs to be done to find out the duration of each work is to prepare the S-curve data that has been obtained from the project. Then the duration was simplified from the duration per week to per day. *Work Breakdown Structure (WBS)*.

WBS

Identification of work items in the RAB is needed to make a WBS, in this study, the WBS made analyzed 6 types of work, namely general, drainage, earthworks and geosynthetics, granular pavement and cement concrete pavement, asphalt pavement, and structure.

Code Assumptions

In giving the assumption code, chapters and subchapters are observed in the job description, then a numerical code is given to each division and subdivision. For example, in the General division, a number code (1) is given, and in the Mobilization sub-chapter, a number code (2) is given, and so on in the next work.

Dependency Between Jobs

The first thing done in analyzing job dependencies is to analyze the relationships between jobs based on the S curve and make observations in the field. Then compare the observation results with the S-curve data. Next, make a logical table of the dependency relationship between one job and another and make a description of Lag Time and Lead Time that explains the difference in duration between interrelated jobs. The following is a table of the results of the analysis of dependencies between jobs.

Table 1. Analysis of Job Dependency Relationship Based on PDM Method

Code	Description	Duration (day)	Dependency	Predecessors
1	CONSTRUCTION OF SYAMSUDIN NOOR AIRPORT ACCESS ROAD			
2	DIVISION 1. COMMON			
3	Phase 1 Mobilization	16	Start	
4	Phase 2 Mobilization	6	33	SF
5	Phase 3 Mobilization	10	22	SS+48 <i>DAYS</i>
6	DIVISION 2. DRAINAGE			
7	Excavations for Drainage Ditches and Waterways	126	12	SS+14 <i>DAYS</i>
8	Pair of Stone with Mortar	174	7; 27	SS+3 <i>DAYS</i> ; FF
9	Culvert Reinforced Concrete Box, size 100 x 100 cm; 50 x 50 cm	30	28; 7	SS; SS+14 <i>DAYS</i>
10	Culvert Reinforced Concrete Box, size 200 cm x 200 cm deep	60	29	SS+ 6 <i>DAYS</i>

Code	Description	Duration (day)	Dependency	Predecessors
11	DIVISION 3. EARTHWORKS AND GEOSYNTHETICS			
12	Land Clearing and Stripping	48	3	SS
13	Common Mines	156	3	SS+3 <i>DAYS</i>
14	Pile Selection from excavation source 1	114	13	SS+10 <i>DAYS</i>
15	Class 1 Geotextile Separator	126	26	SS+36 <i>DAYS</i> ; FF
16	Pile Selection from excavation source 2	114	14	SS+60 <i>DAYS</i>
17	Road Body Preparation	84	16	SS+30 <i>DAYS</i>
18	DIVISION 5. GRANULAR PAVEMENT AND CEMENT CONCRETE PAVEMENT			
19	Class A Aggregate Foundation Layer	78	17	SS+6 <i>DAYS</i>
20	DIVISION 6. ASPHALT PAVEMENT			
21	Absorbent Layer Fasteners - Liquid Asphalt	36	19; 22	SS+54 <i>DAYS</i> ; SS
22	Asphalt Pavement Coating	56	21; 23	SS; FF
23	Adhesive Coating - Liquid Asphalt	36	21; 22; 22	SS+18 <i>DAYS</i> ; SS+18 <i>DAYS</i> ; FF
24	DIVISION 7. STRUCTURE			
25	Concrete demolition phase 1	12	3	SS+3 <i>DAYS</i>
26	Piling Foundation, Preparation and Piling	162	15; 25	FF; FS
27	Stone Pair	180	7; 8	SS; FF
28	Concrete demolition phase 2	18	9; 29	SS; FF
29	Concrete, fc'10 MPa	12	9; 28	SS+6 <i>DAYS</i> ; SS+6 <i>DAYS</i>
30	Plain Rebar Steel-BjTP 280	30	10	SS
31	Structural concrete, fc'30 MPa 1	48	30	SS+6 <i>DAYS</i>
32	Baja Tulgan Sirip BJTS 420A	48	30	FS
33	Structural concrete, fc'30 MPa 2	48	4; 32	SF; SS+6 <i>DAYS</i>

Data Input with *Microsoft Project Programs*

The stages in data input are divided into the preparation stage which is the stage of inputting general information about the start time of the project, the number of working days, the determination of holidays and workers' working hours; the data input stage for the PDM scheduling process. The data entered is a list of jobs, duration and dependencies that have been created; *Output* results that will provide multiple views of scheduling results and critical trajectories on the project being worked on. The results of the overall project duration can be seen in the *project information* in the *Microsoft project program*.

	Start	Finish
Current	Mon 9/25/23	Fri 6/21/24
Baseline	NA	NA
Actual	NA	NA
Variance	0d	0d

	Duration	Work	Cost
Current	221d	0h	\$0.00
Baseline	0d	0h	\$0.00
Actual	0d	0h	\$0.00
Remaining	221d	0h	\$0.00

Percent complete:

Duration: 0%

Work: 0%

Close

Figure 2. Overall Duration Results

5. CONCLUSION

Based on the results of the case study research on the Syamsudin Noor Airport Access Road Construction project, the following results were obtained:

1. From the results of the dependency analysis, several dependency relationships were obtained, namely there were 2 jobs that had FS dependence, there were 22 jobs that had SS dependency, 6 jobs that had FF dependency, there was 1 job that had SF dependency and some lag time on SS dependence.
2. The results of the scheduling analysis of the Syamsudin Noor Airport Access Road Construction Project using the PDM method with the help of *Microsoft Project* were carried out for 221 working days and 270 calendar days starting on September 25, 2023 and ending on June 21, 2024.

3. From the scheduling carried out by the implementing contractor using *Barchart* and the S curve, it is known that the overall duration of the project is for 330 calendar days. From the two results, a difference in the comparison of the duration of the project work for 60 days was obtained. From this analysis, we can see that scheduling using PDM results in a faster and more efficient project completion duration.

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