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Evaluation of Time Performance in Construction Project Implementation: A Case Study of Building X and Building Y

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Abstract

This study aims to evaluate the implementation of construction project time management in the Building Development Project at RSUD X. The research focuses on analyzing the conformity between planned schedules and actual project execution, identifying time deviations, determining critical path activities, and examining factors causing delays during project implementation. The study employed a descriptive quantitative approach with a case study method. Data were collected through observation, documentation, interviews, project schedules, S-curve data, and weekly progress reports. The analysis was conducted using S-Curve comparison and Critical Path techniques to evaluate project performance in terms of time control. The findings indicate that several project activities experienced delays caused by technical, managerial, and external factors, including material delivery constraints, coordination issues, and field conditions. Critical path analysis identified several key activities that significantly influenced the overall project duration. The study concludes that effective time management, continuous monitoring, and proper scheduling control are essential to minimize delays and improve construction project performance.

Introduction

The implementation of construction projects is an activity that needs to be carried out in accordance with the plan that has been set, covering aspects of time, budget, and quality or quality. Of these three aspects, time is one of the most important factors because it has a direct effect on the smooth implementation of the project.

Time management is a very important aspect in the implementation of construction projects. Good timing helps ensure that all work can be completed according to the plan that has been set. With proper time management, project activities can run in harmony with the schedule that has been prepared. A well-managed time also supports the smooth running of each stage of work in the field (Khohar et al., 2021).

Delays in the implementation of infrastructure projects are still one of the main challenges that the construction industry often faces, both in national and regional projects. Various studies show that many projects experience deviations between the realization schedule and the plan. In a review of the national literature (Surri & Alfianto, 2025) mentioned that construction project delays are often triggered by technical factors such as field conditions and design errors. Managerial factors such as ineffective planning and coordination are also

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the cause of delays. In addition, delays can arise from external factors such as bad weather and logistical constraints.

Timeliness is becoming increasingly important because the completion of projects on schedule has a direct impact on the effectiveness of implementation and related parties. According to (Astari et al., (Astari et al., 2021) Errors in planning, especially in less accurate scheduling, have the potential to cause delays. which can hinder the work of the project.

In addition to planning, time monitoring is also an important aspect in preventing time irregularities or delays. (Dicky et al., 2025) explained that proper and consistent supervision can help minimize irregularities. Continuous supervision helps keep activities on schedule. As well as helping and maintaining the effectiveness of coordination between related parties (Sulistia & Agustina, 2023).

Time control in construction projects is one of the most important factors because it has a direct effect on the smooth and successful implementation of the project. Good time control helps ensure that every activity runs on schedule, minimizes the risk of delays, and keeps the series of work coordinated effectively (Fahruri Munasir et al., 2025).

The X and Y Building Construction Project of X Hospital is a health service infrastructure project that has a fairly high level of complexity, considering that the construction location is in a hospital area that is still actively operating during the construction period (Syafira Aulia et al., 2025; Talang Rasa & Handayani, 2023). This condition certainly poses its own challenges in terms of mobilizing labor, materials, and heavy equipment in the field (Zai et al., 2024).

To find out the time control and good project performance, it is necessary to evaluate the suitability between the planning schedule and the realization of implementation in the field, so that it can be known whether the project implementation has followed the plan or has actually experienced time deviations. This evaluation is an important part in determining the extent to which the project implementation has succeeded in achieving the set targets.

Methods

Research Design and Study Context

This study employed a descriptive quantitative approach using a case study design to evaluate the time performance of the Building X and Building Y Construction Project at RSUD X. The analysis focused on the conformity between planned and actual progress, weekly schedule deviations, critical activities, and factors contributing to temporary project delays.

The unit of analysis consisted of weekly project progress and the activities included in the project schedule. The evaluation covered the entire 32-week implementation period, from the commencement of construction to the contractual completion date. The Critical Path analysis was conducted separately for Building X and Building Y because the two buildings had different work scopes, activity durations, and dependency relationships.

Data Sources and Data Collection

The study used both primary and secondary data. Primary data were obtained through direct field observation and interviews with the implementing contractor. Field observations were conducted to examine actual implementation conditions, activity sequencing, material and equipment mobilization, and constraints occurring at the construction site. Interviews were used to obtain explanations regarding the causes of schedule deviations and the measures implemented to recover delayed progress.

Secondary data were collected from project documents, including the baseline project schedule, planned and actual S-Curves, weekly progress reports, activity lists, work durations,

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activity weights, predecessor relationships, and dependency data. These documents were used to calculate weekly progress deviations and construct the activity networks for the critical path analysis.

The consistency of the information was assessed by comparing the weekly progress reports with the S-Curve data and supporting the documentary findings with information obtained through field observation and contractor interviews.

Data Analysis

Data analysis was performed in four stages. First, the planned cumulative progress was compared with the actual cumulative progress using the S-Curve. The comparison was conducted weekly from week 1 to week 32 to identify periods in which the project was ahead of, consistent with, or behind the planned schedule.

Second, the weekly schedule deviation was calculated using the following equation:

$$D_t = P_{a,t} - P_{r,t}$$

Where:

D_t = schedule deviation in week t
$P_{a,t}$ = actual cumulative progress in week t
$P_{r,t}$ = planned cumulative progress in week t

A positive deviation indicated that actual progress was ahead of the planned schedule, while a zero deviation indicated that actual progress was consistent with the plan. A negative deviation indicated that the project was behind schedule. For descriptive interpretation, weekly performance was classified as Achieved when the deviation was equal to or greater than zero and Late when the deviation was negative.

Third, the Critical Path was applied separately to Building X and Building Y. The analysis began by identifying the activities, durations, predecessor relationships, dependency types, and lag times. The activity relationships included Finish-to-Start (FS) and Start-to-Start (SS) dependencies.

The forward-pass calculation was used to determine the earliest possible start and finish times:

$$EF_i = ES_i + d_i$$

For a Finish-to-Start relationship:

$$ES_j = \max(EF_i + L_{ij})$$

For a Start-to-Start relationship:

$$ES_j = \max(ES_i + L_{ij})$$

Where ES represents Early Start, EF represents Early Finish, $d$represents activity duration, and Lrepresents the lag between related activities.

The backward-pass calculation was subsequently performed to determine the latest allowable start and finish times without delaying overall project completion:

$$LS_i = LF_i - d_i$$

For a Finish-to-Start relationship:

$$LF_i = \min(LS_j - L_{ij})$$

For a Start-to-Start relationship:

$$LS_i = \min(LS_j - L_{ij})$$

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Total Float was calculated using the following equation:

$TF_i = LS_i - ES_i = LF_i - EF_i$

Free Float was calculated as:

FF = Ef – d – Es

Activities with a Total Float value of zero were classified as critical activities because they had no scheduling flexibility. Any delay in these activities could directly affect the overall project completion date. The critical activities were subsequently compared with work items that experienced negative progress deviations to determine whether the observed delays were associated with the critical path.

Fourth, the factors contributing to schedule delays were identified through contractor interviews and field observations. The interview information was summarized, coded, and grouped according to its source, including technical, managerial, and external factors. The qualitative information was used to explain the schedule deviations identified through the S-Curve and Critical Path analyses. The interpretation particularly considered weather conditions, limitations associated with construction activities in an actively operating hospital, and coordination between material and equipment mobilization and the planned implementation sequence.

The analysis was descriptive and limited to the evaluated construction project. Therefore, no inferential statistical testing was conducted, and the findings were interpreted within the context of Building X and Building Y at RSUD X.

Results and Discussion

Comparison of Plan Progress and Realization

The S-curve is a graphical representation that illustrates the relationship between project implementation time and the cumulative progress of work from the beginning of the project until its completion. It is called an S-curve because the pattern of project progress generally develops slowly during the initial stage, increases more rapidly during the main implementation stage, and gradually slows down again as the project approaches completion. This graph is commonly used as a project control and monitoring instrument because it provides a clear visual comparison between the planned progress and the actual progress achieved within a particular period. Through this comparison, project managers can identify whether the implementation is progressing according to schedule, experiencing delays, or advancing faster than initially planned.

The S-curve can be constructed based on several project performance indicators, including cumulative costs, weighted work achievements, completed work volumes, labor utilization, material consumption, and other resource requirements. The horizontal axis, or x-axis, represents the project implementation period, which may be presented in days, weeks, or months, while the vertical axis, or y-axis, represents the percentage of cumulative work progress. By analyzing the distance between the planned and actual curves, the project team can evaluate performance deviations and determine the need for corrective actions. When the actual progress curve is below the planned curve, the project may be experiencing delays or productivity constraints. Conversely, when the actual curve is above the planned curve, the project is generally considered to be progressing faster than scheduled. Therefore, the S-curve is not only useful for documenting project progress but also serves as an important basis for decision-making, resource allocation, schedule adjustment, cost control, and the early identification of potential problems that may affect overall project completion (Papua et al., 2023; Permatasari et al., 2023).

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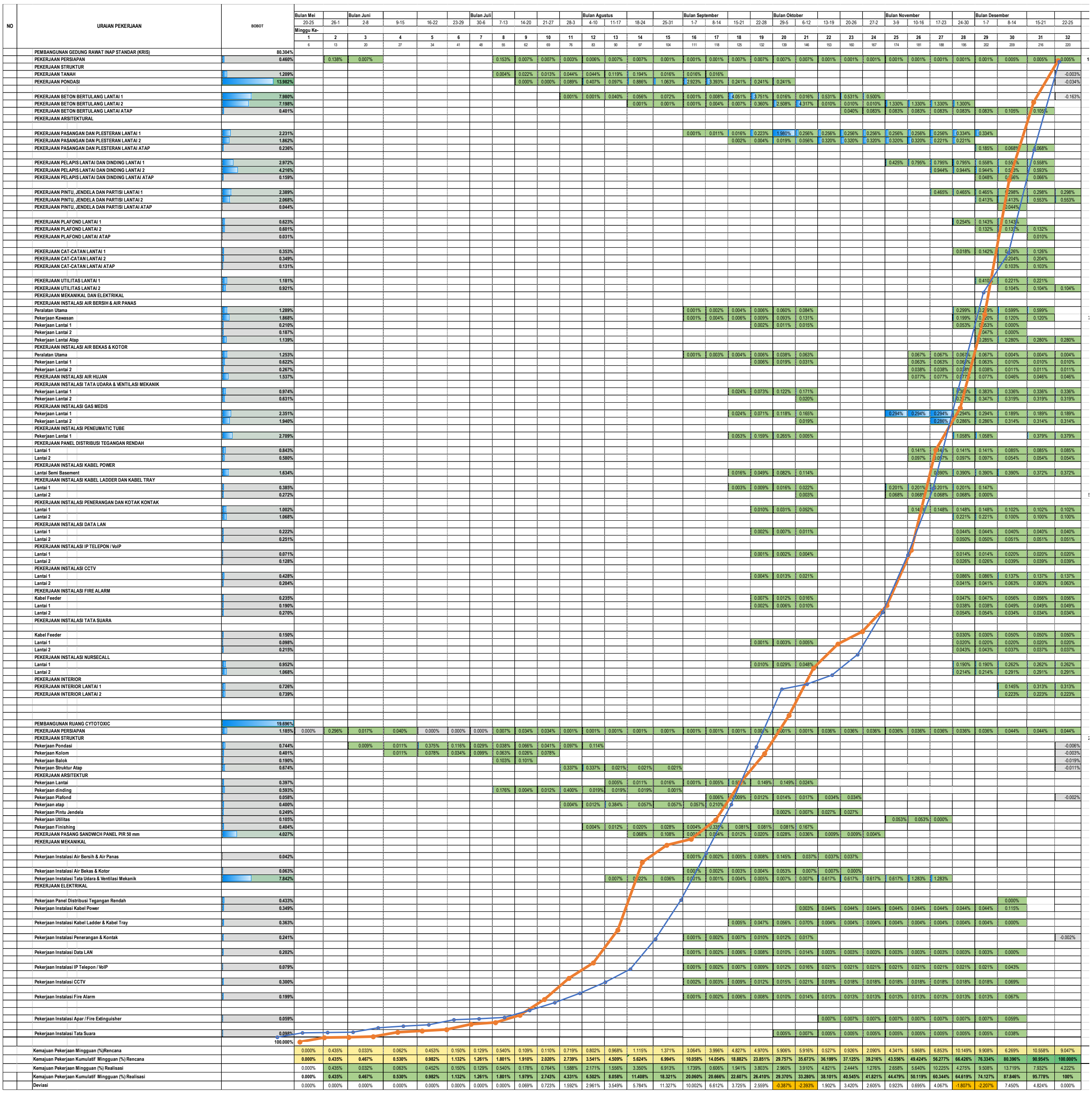

Figure 1. S Curve

Based on the project curve data, the comparison between the progress of the plan and the realization during the 32 weeks of implementation is presented in the following table.

Table 1. Comparison of Plan Progress and Cumulative Realization

Sunday	Plans	Realization	Deviation	Remarks
1.	0,000%	0,000%	0,000%	Achieved
2.	0,435%	0,435%	0,000%	Achieved
3.	0,467%	0,467%	0,000%	Achieved
4.	0,530%	0,530%	0,000%	Achieved
5.	0,982%	0,982%	0,000%	Achieved
6.	1,132%	1,132%	0,000%	Achieved
7.	1,261%	1,261%	0,000%	Achieved
8.	1,801%	1,801%	0,000%	Achieved
9.	1,910%	1,979%	0,069%	Achieved
10.	2,020%	2,743%	0,723%	Achieved
11.	2,739%	4,331%	1,592%	Achieved

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12.	3,541%	6,502%	2,961%	Achieved
13.	4,509%	8,058%	3,549%	Achieved
14.	5,624%	11,408%	5,784%	Achieved
15.	6,994%	18,321%	11,327%	Achieved
16.	10,058%	20,060%	10,002%	Achieved
17.	14,054%	20,666%	6,612%	Achieved
18.	18,881%	22,607%	3,726%	Achieved
19.	23,851%	26,410%	2.559%	Achieved
20.	29,757%	29,370%	-0,387%	Late
21.	35.673%	33.280 %	-2,393%	Late
22.	36,199%	38,101%	1,902%	Achieved
23.	37,125%	40,545%	3,420%	Achieved
24	39,216%	41.821%	2,605%	Achieved
25.	43,556%	44,479%	0,923%	Achieved
26.	49,424%	50,119%	0,695%	Achieved
27.	56,277%	60,344%	4,067%	Achieved
28.	66,426%	64,619%	-1,807%	Late
29.	76,334%	74,121%	-2,207%	Late
30.	80,396%	87,846%	7,450%	Achieved
31.	90,954%	95.778%	4,824%	Achieved
32.	100.00%	100.00%	0,000%	Achieved

Based on the table above, the progress of the plan increases gradually and consistently from week to week according to the initial planning of the project. Meanwhile, the progress of realization is not always in line with the plan; In some weeks the realization value exceeds the plan which indicates the work is going faster than schedule, but in other weeks the realization is below the plan which indicates a delay.

In weeks 1 to 8, the deviation value was at 0%, which means that the implementation of the project in the early stages went according to plan. Entering weeks 9 to 19, the deviation began to show positive numbers with the highest positive deviation recorded in week 15 of +11.327%, which means that the actual progress on the ground exceeded the planned target.

The first critical phase occurs in week 20 (−0.387%) and week 21 (−2.393%). After passing through the first critical phase, the project recovered again in weeks 22 to 27 with realizations that again exceeded plan. However, the delay re-emerged as the second critical phase in week 28 (−1,807%) and week 29 (−2,207%).

Furthermore, in the 30th to 32nd week is the final recovery phase where the contractor manages to catch up with all the lag that occurred in the second critical phase. A very significant spike in progress occurred in week 30 with a deviation of +7.450% and week 31 with a deviation of +4.824%.

Overall, the level of compatibility between the plan schedule and the realization of project implementation is relatively good. Of the total 32 weeks of implementation, 28 weeks (87.5%) showed progress that met or even exceeded the plan, while only 4 weeks (12.5%) experienced negative deviations. Despite fluctuations in several periods, the project was completed on time in the 32nd week according to the target set in the contract (Astari et al., 2021).

Time Deviation

There were 4 weeks that experienced negative deviations during the project. The first negative deviation occurred in week 20 (−0.387%), which included 1st floor pairing and plastering work, clean & hot water installation, 1st floor mechanical air & ventilation installation, 1st

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floor electrical distribution system installation, 1st floor electrical system (ELV) installation, 1st floor ladder & tray cables, and interior work on Building X.

Continuing in the 21st week (−2.393%), the affected work is expanding to include the work of the 1st and 2nd floors of the pairing and plastering, doors, windows & partitions of the 1st floor, ceiling of the 1st floor, 1st floor paintwork, the MEP work of Building X, as well as the installation of power cables in Building Y. After passing through the first critical phase, the project returned to the planned path in weeks 22 to 27.

However, delays reappeared in week 28 (−1,807%) and week 29 (−2,207%) as the second critical phase, involving the work of doors, windows & partitions of the 1st and 2nd floors, the interior of Building X, as well as the installation of power cables and fire extinguishing installations on Building Y.

In overcoming these irregularities, the contractor took corrective action in the form of increasing working hours (overtime), through the implementation of a two-shift work system, consisting of morning shifts from 08.00 to 19.00 and night shifts from 20.00 to 03.00. So the work lasted almost a full 24 hours. This acceleration effort proved effective, marked by a surge in progress realization in the 30th week of +7.450% and the 31st week of +4.824%, so that the project could be completed 100% on time by the 32nd week.

Critical *Path Method*

Critical paths are one of the methods used in project time management, where the main focus lies on critical paths, which are a series of activities that best determine the length and duration of the overall project duration (Khotimah et al., 2024; Mardiaman & Siregar, 2023).

The analysis was carried out on two buildings separately, considering that both have a scope of work and a relationship of dependency between different activities. The analysis begins with a breakdown of all project activities along with the duration and dependency relationships between activities, as presented in the following table.

Table 1. List of Activities, Duration & Dependencies of Building X

Yes	Project Activities	Activity Code	Duration (Sunday)	Previous Activities
1.	Prep Work	A	27	-
2.	Land Stewardship	B	10	-
3.	Foundation Work	C	12	B SS+1
4.	Concrete Works Reinforced 1st Floor	D1	12	C SS+2
5.	Concrete Works Reinforced 2nd Floor	D2	15	D1 SS+3
6.	Concrete Works Reinforced Roof Lt	D3	9	D2 SS+9
7.	Couple Jobs and Stucco 1st Floor	E1	14	D1 SS+5
8.	Couple Work and Stucco 2nd Floor	E2	11	D2 SS+9
9.	Couple Work and Roof Floor Stucco	E3	3	D3 SS+6
10.	Floor and Wall Cladding Work 1st Floor	F1	7	E1 SS+10
11.	Floor and Wall Cladding Work 2nd Floor	F2	5	E2 SS+9
12.	Floor and Wall Coating Work on Roof Floors	F3	3	E3 SS

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13.	1st Floor Doors, Windows and Partition Works	G1	6	E1 SS+11
14.	Doors, Windows and Partition Work 2nd Floor	G2	4	E2 SS+5
15.	Door, Window and Roof Partition Work	G3	1	E3 SS+1
16.	1st Floor Ceiling Work	H1	3	E1 FS+3, N1 SS+9, Q1 SS+3, R1 SS+8
17.	2nd Floor Ceiling Work	H2	3	E2 FS+1, N2 SS+8, Q2 SS+8, R2 SS+1
18.	Roof Ceiling Work	H3	1	E3 SS+2
19.	Paint Work 1st Floor	I1	4	F1 SS+3
20.	Paint Work 2nd Floor	I2	2	F2 SS+3
21.	Roof Floor Paint Job	I3	2	F3 SS+1
22.	1st Floor Utility Work	D1	3	I1 SS+2
23.	2nd Floor Utility Work	J2	3	I2 SS
24.	Clean Water & Hot Water Installation Work Area / Main Equipment	K1	10	C SS+7
25.	Clean Water & Hot Water Installation Work 1st Floor	K2	6	D1 SS+8
26.	Clean Water & Hot Water Installation Work 2nd Floor	K3	2	D2 SS+7
27.	Clean Water & Hot Water Installation Work Roof Floor	K4	4	D3 SS+6
28.	Main Equipment Waste & Dirty Water Installation Work	L1	13	C SS+7
29.	Waste & Dirty Water Installation Work 1st Floor	L2	10	D1 SS+8
30.	Waste & Dirty Water Installation Work 2nd Floor	L3	7	D2 SS+12
31.	Rainwater Installation Work	M	7	D3 SS+3
32.	Electrical Distribution System Installation Work 1st Floor	N1	9	E1 SS+2
33.	Electrical Distribution System Installation Work 2nd Floor	N2	6	E2 SS+3
34.	Low Voltage Distribution Panel Work 1st Floor	O1	7	E1 SS+10
35.	2nd Lt Low Voltage Distribution Panel Work	O2	7	E2 SS+8
36.	Power Cable Installation Work	P	10	C SS+9
37.	Kbel Ladder & Tray Job 1st Lt	Q1	9	D1 SS+7
38.	Kbel Ladder & Tray Job 2nd Floor	Q2	6	D2 SS+6
39.	Electrical and (ELV) System Installation Work 1st Floor	R1	8	E1 SS+5
40.	Electrical and (ELV) System Installation Work 2nd Floor	R2	5	E2 SS+10
41.	1st Floor Interior Work	S1	3	J1 SS+2
42.	2nd Floor Interior Work	S2	3	J2 SS+1

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Table 2. List of Activities, Duration & Dependencies Y

Yes	Project Activities	Activity Code	Duration (Sunday)	Previous Activities
1.	Prep Work	A	28	-
	Structure Work			
2.	Foundation Work	B	10	-
3.	Concrete Works Boney	C	9	B SS+1
4.	Roof Structure Work	D	7	C SS+8
	Architectural Work			
5.	Flooring Work	E1	9	C FS+1
6.	Wall Work	E2	8	C SS+4
7.	Ceiling Work	E3	7	E2 SS+1, G2 SS+4
8.	Door Work	E4	2	E2 SS+4
9.	Finishing Work	E5	10	E2 SS+4
10.	Work Integrity	E6	3	E5 FS+3
11.	Installation Work PIR Sandwich Panel 50 mm	F	11	C SS+10
	Mep Jobs			
12.	Clean Water & Dirty Water Installation Work	G1	8	C SS+5
13.	Mechanical Ventilation & Ventilation Installation Work	G2	15	E2 SS+5
14.	Low Voltage Distribution Panel Work	G3	1	G4 SS+11
15.	Power Cable Installation Work	G4	10	G5 SS+3
16.	Ladder Cable & Cable Tray Installation Work	G5	13	E3 SS+1
17.	Installation Work Description & Contact	G6	6	E2 FS+1
18.	Electrical and Electrical System Installation Work (ELV)	G7	15	E2 FS+1
19.	Fire Extinguisher Installation Work	G8	9	E5 FS+1
20.	Sound System Installation Work	G9	11	G5 SS+2

Table 3 presents the list of project activities, activity codes, durations, and predecessor relationships for Building X. This table serves as the basis for the Critical Path analysis because it identifies the sequence and dependency of each activity. The activities include preparation work, structural work, architectural work, mechanical and electrical installation, utility work, and interior work. The dependency relationships, such as SS and FS, show how one activity is connected to another and whether certain activities can run simultaneously or must wait for previous activities to be completed. Therefore, this table is important for determining the project network and identifying activities that may influence the overall project duration.

Table 4**.** List of Activities, Duration & Dependencies B

Yes	Project Activities	Activity Code	Duration (Sunday)	Previous Activities
1.	Prep Work	A	28	-

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	Structure Work			
2.	Foundation Work	B	10	-
3.	Concrete Works Boney	C	9	B SS+1
4.	Roof Structure Work	D	7	C SS+8
	Architectural Work			
5.	Flooring Work	E1	9	C FS+1
6.	Wall Work	E2	8	C SS+4
7.	Ceiling Work	E3	7	E2 SS+1, G2 SS+4
8.	Door Work	E4	2	E2 SS+4
9.	Finishing Work	E5	10	E2 SS+4
10.	Work Integrity	E6	3	E5 FS+3
11.	Installation Work PIR Sandwich Panel 50 mm	F	11	C SS+10
	Mep Jobs			
12.	Clean Water & Dirty Water Installation Work	G1	8	C SS+5
13.	Mechanical Ventilation & Ventilation Installation Work	G2	15	E2 SS+5
14.	Low Voltage Distribution Panel Work	G3	1	G4 SS+11
15.	Power Cable Installation Work	G4	10	G5 SS+3
16.	Ladder Cable & Cable Tray Installation Work	G5	13	E3 SS+1
17.	Installation Work Description & Contact	G6	6	E2 FS+1
18.	Electrical and Electrical System Installation Work (ELV)	G7	15	E2 FS+1
19.	Fire Extinguisher Installation Work	G8	9	E5 FS+1
20.	Sound System Installation Work	G9	11	G5 SS+2

After determining the dependency relationship between activities, then forward calculations, countdowns, and calculations of time allowance (float/slack) are carried out as a result of the critical path marked in red. Presented in the picture and table below.

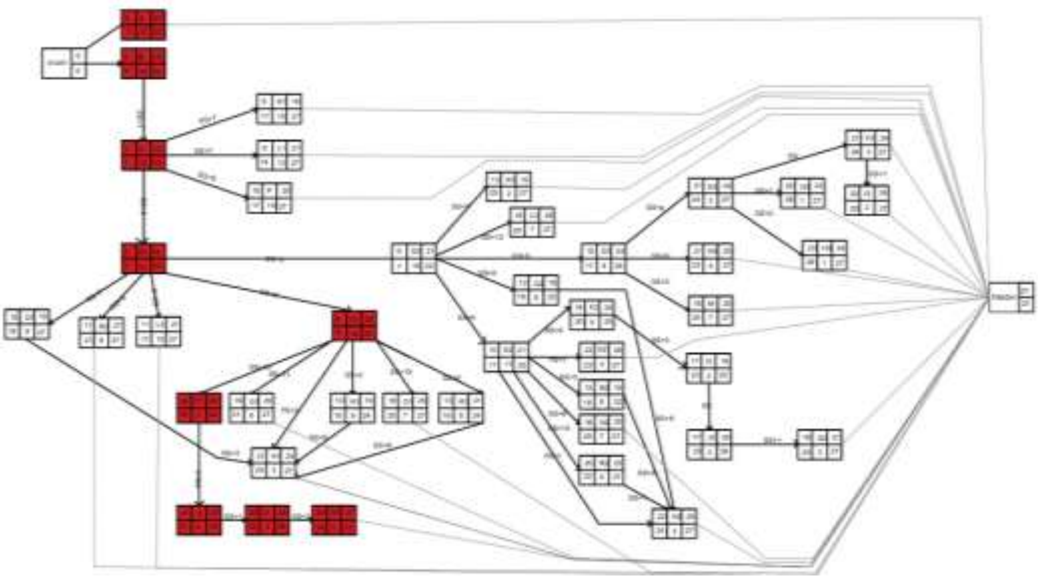

Figure 2. Building X Critical Path

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Table 5. Calculation of Float Value and Critical Path of Building X

Code	Previous Activities	Duration	Advanced Calculation		Countdown		Free Float (FF)	Total Float (TF)
			EN	EF	LS	LF		
A	-	27	0	27	0	27	0	0
B	-	10	0	10	0	10	0	0
C	B SS+1	12	1	13	1	13	0	0
D1	C SS+2	12	3	15	3	15	0	0
D2	D1 SS+3	15	6	21	7	22	0	1
D3	D2 SS+9	9	15	24	17	26	0	2
E1	D1 SS+5	14	8	22	8	22	0	0
E2	D2 SS+9	11	10	21	11	22	0	1
E3	D3 SS+6	3	21	24	24	27	0	3
F1	E1 SS+10	7	18	24	18	24	0	0
F2	E2 SS+9	5	19	24	25	25	0	1
F3	E3 SS	3	21	24	24	27	0	4
G1	E1 SS+11	6	19	25	21	27	0	2
G2	E2 SS+5	4	19	26	23	27	0	1
G3	E3 SS+1	1	22	23	26	27	0	4
H1	E1 FS+3, N1 SS+9, Q1 SS+3, R1 SS+8	3	21	24	24	27	0	4
H2	E2 FS+1, N2 SS+8, Q2 SS+8, R2 SS+1	3	22	25	24	27	0	3
H3	E3 SS+2	1	23	24	26	27	0	2
I1	F1 SS+3	4	21	25	21	25	0	0
I2	F2 SS+3	2	17	19	23	25	0	6
I3	F3 SS+1	2	22	24	25	27	0	3
D1	I1 SS+2	3	22	25	22	25	0	0
J2	I2 SS	3	17	20	23	26	0	6
K1	C SS+7	10	8	18	17	27	0	9
K2	D1 SS+8	6	11	21	17	27	0	6
K3	D2 SS+7	2	13	15	25	27	0	12
K4	D3 SS+6	4	21	25	23	27	0	2
L1	C SS+7	13	8	13	14	27	0	14
L2	D1 SS+8	10	11	21	17	27	0	6
L3	D2 SS+12	7	18	25	20	27	0	7
M	D3 SS+3	7	18	25	23	27	0	2
N1	E1 SS+2	9	10	19	15	24	0	9
N2	E2 SS+3	6	15	21	23	22	0	1
O1	E1 SS+10	7	18	25	20	27	0	2
O2	E2 SS+8	7	18	25	20	27	0	2
P	C SS+9	10	10	20	17	27	0	7
Q1	D1 SS+7	9	10	19	18	27	0	8
Q2	D2 SS+6	6	12	18	16	26	0	9
R1	E1 SS+5	8	13	21	16	24	0	3
R2	E2 SS+10	5	20	25	25	27	0	2
S1	J1 SS+2	3	24	27	24	27	0	0
S2	J2 SS+1	3	18	21	24	27	0	6

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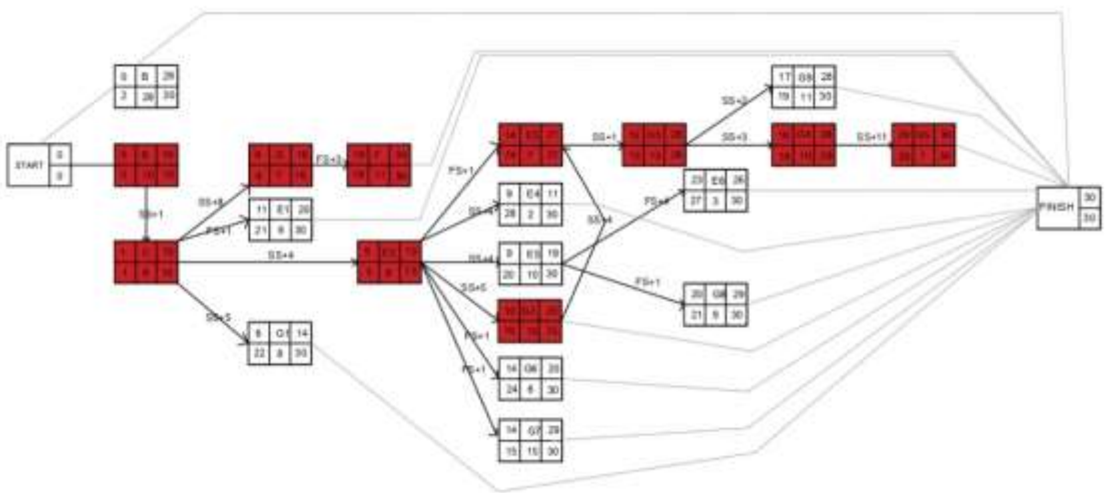

Figure 3. Building Y Critical Path

Table 6. Calculation of Float Value and Critical Path of Building Y

Code	Previous Activities	Duration	Advanced Calculation		Countdown		Free Float (FF)	Total Float (TF)
			EN	EF	LS	LF		
A	-	28	0	28	2	30	0	2
B	-	10	0	10	0	10	0	0
C	B SS+1	9	1	10	1	10	0	0
D	C SS+8	7	9	16	9	16	0	0
E1	C FS+1	9	11	20	21	30	0	10
E2	C SS+4	8	5	13	5	13	0	0
E3	E2 FS+1, G2 SS+4	7	14	21	14	21	0	0
E4	E2 SS+4	2	9	11	28	30	0	19
E5	E2 SS+4	10	9	20	19	30	0	11
E6	E5 FS+3	3	23	26	27	30	0	4
F	C SS+10	11	19	30	19	30	0	0
G1	C SS+5	8	6	14	22	30	0	16
G2	E2 SS+5	15	10	25	10	25	0	0
G3	E3 SS+3	13	15	26	15	26	0	0
G4	G3 SS+3	10	15	28	15	28	0	0
G5	G4 SS+11	1	18	28	18	28	0	0
G6	E2 FS+1	6	14	20	24	30	0	10
G7	E2 FS+1	15	14	29	15	30	0	1
G8	E5 FS+1	9	20	29	21	30	0	1
G9	G3 SS+2	11	17	28	19	30	0	2

Based on the results of the analysis, in building x, the critical path of activities with a Total Float value equal to zero, starting from Preparatory Work (A), Earthwork (B) and Foundation Work (C), Reinforced Concrete Work 1st Floor (D1), Couple and Plastering Work 1st Floor (E1) continuing Floor and Wall Coating Work 1st Floor (F1), Paint-Painting Work 1st Floor (I1), Utility Work 1st Floor (J1), until it ends at the 1st Floor Interior Work (S1).

Meanwhile, in building y, the critical line is formed from several works that have a *total float value* of zero, namely Foundation Work (B), Reinforced Concrete Work (C), Roof Structure Work (D), Wall Work (E2), Ceiling Work (E3), PIR Sandwich Panel Installation Work 50mm (F), Air Conditioning & Mechanical Ventilation Installation Work (G2), Low Voltage Distribution Panel Work (G3), Power Cable Installation Work (G4), and Ladder Cable & Cable Tray Installation Work (G5).

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The results of this critical path analysis are in line with the negative deviations that occur in the field. It is directly related to critical activities, such as the work of the 1st floor wall and plastering, the 1st floor and wall stucco work, the 1st floor painting work, and the 1st floor interior work in building X, as well as the installation of power cables in building Y, all of them are recorded to have a TF = 0 value.

Delay Factor

Based on the results of interviews with the implementing contractor, there are three main factors that cause delays during the project.

1. Weather conditions, such as heavy rain that occurred in several implementation periods, hampered work in the field.
2. The condition of the project location is in the hospital environment that is still actively operating during the construction process. This condition makes work space limited because it has to adjust to the hospital's operational activities, thus affecting the mobilization of tools, materials, and labor in the field.
3. The insynchronization between the mobilization system (SIMOB) and the implementation method. The arrangement of the arrival of tools and materials in the field is not always in harmony with the order of work that has been planned, so some work has to wait for the availability of tools and materials and disrupts the rhythm of implementation in the field. (Ayatullah et al., 2025; Diandra, 2025; Dicky et al., 2025).

Conclusion

The implementation of the Building X and Y Construction Project of RSUD X generally shows a good level of schedule suitability because the project was successfully completed on time in the 32nd week according to the contract target. Of the total 32 weeks of implementation, 28 weeks ran as planned or faster, while delays only occurred in certain 4 weeks. The time deviation that occurred was temporary and was successfully recovered through the acceleration of work with a shift work system of almost 24 hours. The results of the critical path analysis show that some jobs have a Total Float (TF) value = 0, so they do not have time allowance, are included in the critical path so that it greatly affects the overall duration of the project. The main factors causing delays include weather conditions, limited project space due to being in an active hospital environment, and insynchronization of material mobilization systems and work tools.

Suggestion

Project implementers are advised to increase regular progress monitoring so that potential delays can be detected early. Resource planning also needs to be evaluated on a regular basis, especially on high-volume work and critical activities. In addition, supervision of critical line work must be carried out more strictly because delays in these activities will directly affect the completion of the project. In projects in active facilities such as hospitals, synchronization between the mobilization system and the implementation method needs to be improved so that the project implementation runs more effectively and avoids operational obstacles.

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