STUDY OF PROGRESS DIFFERENCE ON BUILDING CONSTRUCTION WORKS

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ABSTRACT

The progress of construction work has different deviations at a certain point in time. Various factors cause inequality. A positive progress deviation indicates that construction work is completed faster where the progress of the plan is lower than the actual one, otherwise it is said to be late if it is negative. The uncertain nature of construction work causes there are 3 (three) scenarios of possible progress deviation values, so that these three values form one expected progress deviation value. A deviation of value greater than negative 10% for a duration from 0 to 70% is categorized as a critical contract. The purpose of this study was to determine the deviation of the progress of 29 construction works. Data collection was carried out on 29 construction works that had been carried out. The data is taken directly from the contractor. The results of data analysis showed that at 10% D, 11 construction works with poor performance were obtained. Information was also obtained that the construction work No. 12 have critical contracts (-11,773). Furthermore for the current construction work 30%D. 50% D and 70% D number of poorly performing construction works 12; 10; and 9. The value of the largest positive progress deviation is 15,362 at the 70% time point D. The expected value of the largest positive progress deviation is positive 1,763. By knowing the expected negative progress value, the contractor must exercise control as soon as possible before the contract expires. Acceleration can be done on activities that are on the critical path.

KEYWORDS	*Construction Work, Deviation Of Progress, Yield Value, Expected Value, Uncertainty*

INTRODUCTION

Work construction often experience delays that cause losses to contractors , consultants and owners good that time and money (Hassan et al., 2016) . Type profession construction miscellaneous . one _ delivered is profession building storied . High -rise buildings in general shared Becomes two , building graded low and building graded high .

From the side contractor , lost time cause source power no could quick drawn from location project . This cause happening swelling cost . Lateness be measured with no the fulfillment of the work progress that has been planned in schedule parent . Many factors cause _ why lateness occur (Mardiaman & Indriasari, 2021) ; (Hassan et al., 2016) ; (Shahsavand et al., 2018) . Lateness often caused by contractor no capable provide appropriate funds with the progress of the plan that has been compiled . Often an advance payment has been found given diverted to project another . This occur because contractor work more from one profession construction in time simultaneously . For prevent lateness contractor must To do analysis the cause (Shahsavand et al., 2018) . Besides that must identified factonrya (Asmi & Pratama, 2016) Stability finance must available for finance profession construction . According to (Mardiaman, 2020) that criteria stability finance Becomes most important criteria for choose contractor so that profession construction can success . one _ success profession construction seen from side suitability time plan .

Work progress construction could seen every period time . generally evaluated every week at the time meeting weekly . Meeting weekly generally attended element owners , consultants and contractors . On every meeting all problem about achievement of progress and weekly targets discussed by together according to ability . Target time customized with availability source power and condition field. However resources that should provided no fulfill good from side amount and quality.

In practice , progress can be experience deviation , fine positive and negative . The deviation of progress is difference between plan and actual progress . The size deviation is score results profession construction , Yield value Becomes criteria in evaluation value performance _ vary . This value must traced (Amruta B. Vyas & BV Birajdar, 2016) . Yield value is one _ technique control profession construction (Suharto, 2007) ; (Bhosekar & Vyas, 2012) . Time and costs incurred is reflection achievement progress (Huda et al., 2018) .

Because of the nature profession construction that is not certain then progress will be character probability , can fulfilled and not fulfilled . more and more information obtained so level probability the more high , worth zero until with one . There is progress pessimistic , most likely and optimistic , so that from all three will shape one score hope for progress (Mardiaman & Kusuma, 2021) .

The purpose of this study was to determine the deviation of the progress of 29 construction works.

Weight Work

Work item weight obtained dengsn compare between ` cost start of work item certain with total cost (Mardiaman, 2022)

$$Bobot\ kegiatan = \frac{x_i}{\sum_i^n x_i}(1)$$

x_i = Cost activity type i

$\sum_i^n x_i$ = Total project cost

Curve weight cumulative basically _ shape S curve . At first achievements percentage project rather small increase , then will the more increase fast because condition work and resources power many deployed to location . Achievement of progress in the end slow down because start occur withdrawal source power and work almost done worked on . At the end project the total progress achieved is 100 percent (Figure 1).
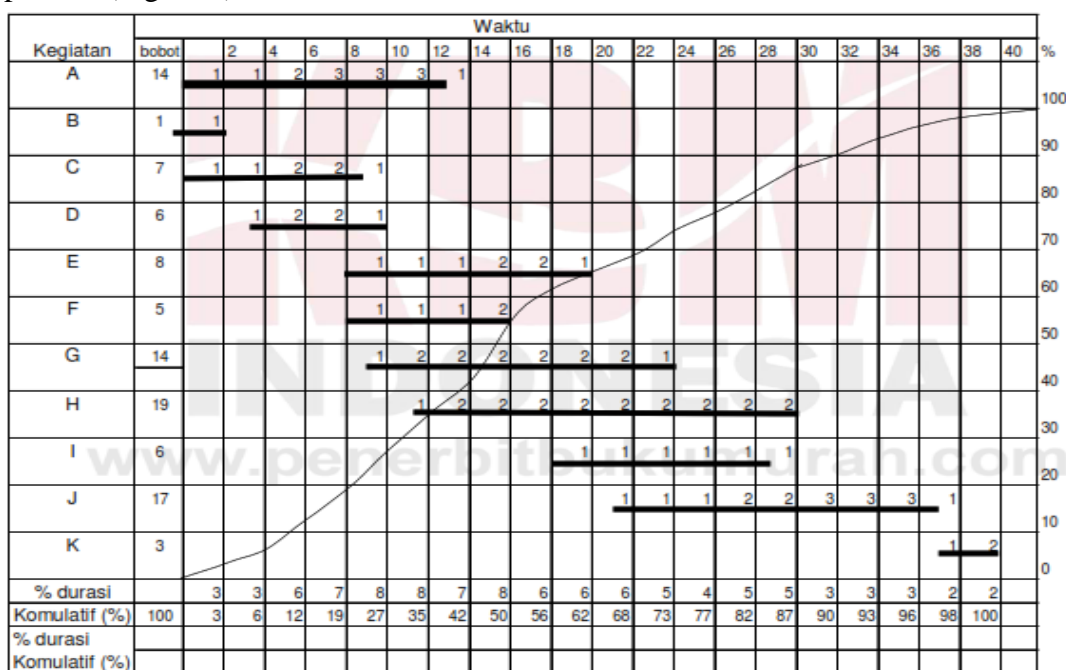
Kegiatan	bobot	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	%
A	14	1	1	2	3	3	3	1														100
B	1	1																				90
C	7	1	1	2	2	1																80
D	6		1	2	2	1																70
E	8				1	1	1	2	2	1												60
F	5				1	1	1	2														50
G	14				1	2	2	2	2	2	2	1										40
H	19					1	2	2	2	2	2	2	2	2	2							30
I	6									1	1	1	1	1	1							20
J	17										1	1	1	2	2	3	3	3	1			10
K	3																			1	2	0
% durasi		3	3	6	7	8	8	7	8	6	6	6	5	4	5	5	3	3	3	2	2	
Komulatif (%)	100	3	6	12	19	27	35	42	50	56	62	68	73	77	82	87	90	93	96	98	100	
% durasi																						
Komulatif (%)																						

Figure 1. The formed S curve of weekly progress

Deviation of Progress

The deviation of progress is difference Among progress plan and actual . Deviation value could positive and negative (Figure 2).
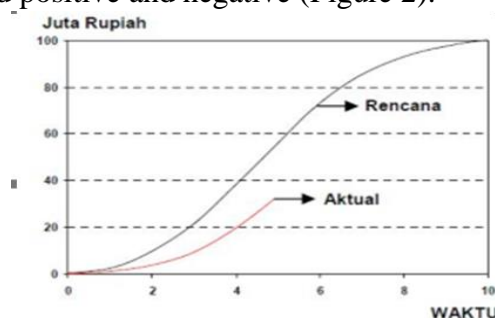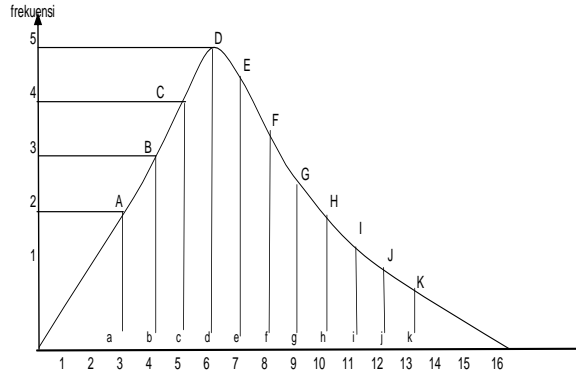

Figure 2. Deviation plan and actual .

Draft Probability in Work Construction

Project progress results no sure , where is the value will different between job construction . In general shaped asymmetrical and is called beta curve (Figure 3).

**Figure 3. curve distribution of work progress construction**

After determine estimation the numbers a, b and m then next formulated connection third number the Becomes one a number called " *pe* " or period expected time . _ *Pe* number is the average if activity the done by repeated in large amount . _ the progress that expected formulated :

$p_e = (a + 4m + b)/6$ (2)
a = pessimistic progress taken the smallest .
m   = progress most likely taken as average
b = optimistic progress take the biggest
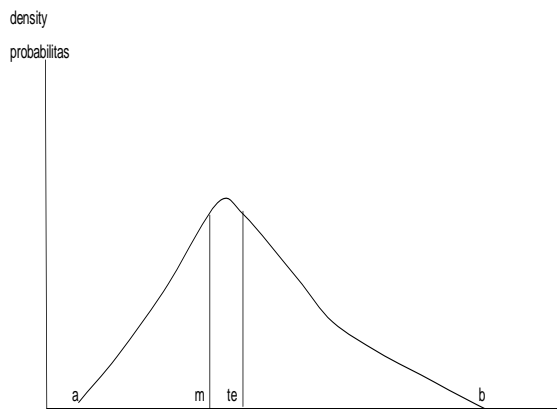
Figure 4. curve distribution asymmetric (beta) with a, m and b

Approach score hope consider that score hope for score results depend on estimate three number estimation .

Contract Critical

Part five chapter 36 of candy PUPR No. 14 of 2020 regarding standards and guidelines provision service construction mention that down payment given by a maximum of 30% of score contract for effort small , maximum 20% for qualification effort medium and large . While for contract year the biggest plural given 15% (Regulation of the Minister of Public Works and Public Housing of the Republic of Indonesia Number 07/PRT/M/2019 concerning Standards and Guidelines for Procurement of Construction Services Through Providers, 2020) . With advance payment _ expected profession construction no experience contract critical . In accordance with PU Ministerial Decree No. 07/PRT/M/2011 PK book 06A-Chapter VII B6 Number 39.2, contract declared critical when :

1. Period I (plan physique implementation 0% - 70% of contract), realization physique implementation late more big 10% of plan .
2. Period II (plan physique execution 70% - 100% of contract), realization physique implementation late more big 5% of plan . Study determine big deviation of work progress construction in the period of 10%, 30%, 50%, 70% of duration profession construction and big deviation of progress in the period of 10%, 30%, 50%, 70% of duration profession construction .

On some profession construction occur contract critical so that need conducted show case meeting (SCM). Implementation of SCM with inviting office maker commitment (PPK), contractor , consultant supervisor . At the PPK meeting , they asked explain reason lateness work and ways speed up profession in accordance with ability them and still received the reason .

Contractor make plan work with a certain progress target so that less progress _ from 10% for period 1 (plan physique implementation 0% - 70% of contract).

RESEARCH METHOD

Research data collected _ in the form of primary and secondary data . Secondary data in the form of timetable time plan and actual . There are as many as 29 jobs collected construction _ start 2016 to 2021. Duration _ profession construction start from 18 months up to 64 months . Schedule data collected from selected contractors and consultants _ with purposive sampling method . Due to duration profession construction different , then conducted equation time based on percentage times total duration time for every profession construction . The average deviation of progress uses formula 5.

$$\bar{x} = \frac{\sum_{i=0}^{n} x_i}{n}(5)$$

Yield value hope deviation of work progress construction calculated with step following :

- Big deviation of progress every week all profession construction ,
- deviation , average, maximum from all profession construction
- Count score hope the deviation of the progress of hope profession construction
- Big score results deviation progress hope using formula 2:

$$Pe = (a + 4m + b)(1/6)$$

- Count deviation of progress at time activity in progress for 10% of duration plan .
- Count deviation progress at the moment activity in progress for 30% of duration plan .
- Count deviation progress at the moment activity in progress for 50% of duration plan .
- Count deviation progress at the moment activity in progress for 50% of duration plan .

RESULTS AND DISCUSSION

From result processing of collected data obtained that the progress of each profession construction different different at the point time certain . Progress value there are positive and negative . Deviation worth positive signify that profession construction perform good , on the other hand if deviation worth negative state that profession construction perform bad . `

In table 1 it is explained that there are 4 periods rated time _ quantity deviation progress that is, at the point time profession construction 10%, 30%, 50% and 70% of plan physique implementation contract . At the time of 10%D obtained 11 projects perform bad be marked with the deviation of progress is worth negative , Next for profession 30% constructionD . 50%D and 70%D perform bad in a row 12; 10; and 9. On the contrary amount profession performance construction _ good with score positive progress deviation at 10%D , 30%D. 50%D and 70%D respectively as many as 8, 17, 19 and 20.

Table 1. Big Deviation of Progress at 29 Jobs Construction

pack. Construction	S10%D	S30%D	S50%D	S70%D
1	0.375	1.029	-3.418	0.458
2	0.375	1.029	-3.418	0.458
3	0.200	-1,800	-0.100	4,600
4	0.090	0.240	0.420	0.370
5	0.200	-1,800	-0.100	4,600
6	-0.209	-2.088	2,725	1.865
7	-0.110	0.540	-0.080	0.100
8	-2.419	6.104	2.133	2,283
9	-0.110	-0.460	-0.380	0.400
10	-2.419	6.104	2.133	2,283
11	0.090	-0.960	-1.010	-1,600
12	-0.278	-11,773	-9.010	4.506
13	-0.920	-0.640	0.040	-8.380
14	-0.940	0.180	0.300	-7,580
15	0.400	1,200	0.000	-0.300
16	0.150	-0.300	0.050	-7,500
17	-0.574	-0.533	-5.045	-4.151
18	0.090	-0.530	0.650	-0.200
19	-0.899	-1.087	2.447	0.581
20	1,670	2.93	1.4	-1,500

21	0.462	6.686	3.297	6.897
22	5.710	9,811	7.231	0.403
23	4.152	6,529	3.072	2.201
24	2.184	7.482	1,099	2,942
25	0.100	9.754	9.006	15,362
26	1.016	1.073	1.216	2,915
27	-0.765	1971	-8,870	-7,430
28	0.287	-8,807	7.628	2.851
29	0	0	0	0

Source data processing

For hopeful progress when 10 %D is obtained 0.73, Next for profession 30% constructionD . 50%D and 70%D perform bad consecutively 0.362; 0.285 and 1564. Work the best construction performance is profession construction 25th with _ score positive progress deviation biggest 15,362 at S70%D.

Table 2. Job Expectation Progress Construction

S% D	a	m	b	SPe
S10% D	-2.419	0.273	5.710	0.730
S30% D	-11,773	1.034	9,811	0.362
S50% D	-9.010	0.429	9.006	0.285
S70%D	-8.380	0.601	15,362	1.564

Source data processing

Table 1. explains that of 29 jobs construction there is 1 job great construction _ deviation progress more from negative 10% i.e. negative 11.773% so that enter category contract critical . Contract critical this need controlled . Big small deviation is known after monitoring and reporting .

Based on reporting , project 12th need _ conducted acceleration with stage deployment resource optimally . At the moment S30%D looks occur there is progress progress. Be marked with happening subtraction deviation to (-9.01) and at S50%D to (4.506).

At S70%D value deviation already Becomes positive 4,506. This thing state that profession construction this in the end perform good . Work this experienced 1 time contract critical because progress worth more small of (-10%).

Discussion

Big deviation of progress between one profession construction with others _ of course just fickle big , because of course various factor influence success profession construction . Influencing factors _ can from inside and outside . Factor outside difficult intervened temporary for internal factors can intervened . Acceleration easy conducted if the problem from in in other words acceleration can done . one _ the method with increase working hours (Frederika, 2010) . Various factor as reason delay in progress. This thing already proven from study before (Milah et al., 2019) ; (Gerawork Jembere et al., 2020) .

On project 12th happened _ contract critical because deviation of progress is worth (- 11.773) so that Required performed SCM. S how cause meeting (SCM) was held because big more progress deviation of (-10%). For reduce big deviation

worth negative   need conducted efforts maximum . Priority solution profession certain that can done by together must noticed . It is also necessary to pay attention dependent work one each other on the track critical. Speed up work on track critical is a good strategy.

Of course just in speed up work on track critical need conducted with add power work , add tool . no in accordance achievements profession construction often occur because not enough consistency contractor carrying out job. There are various the cause that is happening planning that doesn't in accordance with condition field . Of course just this cause happening addition time for correct repeat planning . Contractor no put source power in accordance with needs join donate happening delay . Understanding to method work also suspected as contributor lateness implementation construction .

Method work actually already proposed by the contractor at the time submit offer project at the moment auction. However, many only limited theory because no truly visit field. At the moment meeting preparation the field (pre construction meeting) has also been discussed. Election contractor by right on time auction determine in success project.

CONCLUSION

Based on discussion previously so concluded namely : Work construction character no certain with existence difference deviation of progress in the case studied . Various factor the uncertainty that affects good external and internal to existence uncertainty There are 3 (three) scenarios possibility occur the deviation of progress is pessimistic, most likely and optimistic that make up one score hope.

REFERENCES

Amruta B. Vyas, & B. V. Birajdar . (2016). Tracking of Construction Projects by Earned Value Management. International Journal of Engineering Research And, V5(03), 829–831. https://doi.org/10.17577/ijertv5is031318

Asmi, A., & Pratama , JCS (2016). Identification Factors Lateness In Project Construction In Jakarta. Journal.Umj.Ac.Id / Index.Php / Semnastek , November, 1–12.

Bhosekar , SK, & Vyas, G. (2012). Cost Controlling Using Earned Value Analysis in Construction Industries. International Journal of Engineering and Innovative Technology, 1(4), 324–332. https://www.researchgate.net/profile/Gayatri_Vyas2/publication/26528533 9_Cost_Controlling_Using_Earned_Value_Analysis_in_Construction_Ind ustries/links/553b16c50cf2c415bb08ffcf/Cost-Controlling-Using-Earned-Industries-Astruction-Value.pdf

Frederika, A. (2010). Analysis Conversation Implementation With Adding Optimum Working Hours To The Project Construction (Study Case : Super Villa Development Project , Peti Tenget-Badung) Ariany Frederika. 14(2), 113–126.

Geawork Jembere , M., Bewket Mitikie , B., & Kelemework Yigzaw , E. (2020). Performance Evaluation of Housing Construction Project, Using Earned Value Analysis; the Case of 20/80 Condominium Addis Ababa Bole Arabsa

Site. American Journal of Engineering and Technology Management, 5(4), 69. https://doi.org/10.11648/j.ajetm.20200504.12

Hassan, H., Mangare , JB, & Pratasis , PAK (2016). Factors reason delay on project construction and alternatives solution (study) case : in Manado Town Square III). Journal Civil Statics Vol.4, 4(11), 657–664.

Huda, K., Mulyadi , L., & Santosa , A. (2018). Analysis of time and cost performance with earned value method in lecture building project development of nutrition department at East Kalimantan health polytechnic. International Journal of Scientific and Technology Research, 7(2), 203–207.

Mardiman . (2020). Determining Weight Criteria/ Sub-Criteria In Selecting Public Construction Work Contractor. Palarch's Journal Of Archeology Of Egypt/Egyptology, 17(9), 9485–9495. https://archives.palarch.nl/index.php/jae/article/view/5910/5786

Mardiman . (2022). Planning and Scheduling Construction (1st ed.). Indonesian KBM.

Mardiaman , & Indriasari . (2021). Factors The Main Determinants of Late Work Construction Factory (Study Case : Cikarang Area Factory). CENTECH 2020 E-Journal, 2(1), 1–11. http://ejournal.uki.ac.id/index.php/cen

Mardiaman , & Kusuma, E. (2021). Study of Progress Expected Results Based on Percentage of Construction Work Plan Duration. Journal of Civil Engineering , Lamongan Islamic University , 6(2), 167. https://doi.org/10.30736/cvl.v6i2.628

Milah , S., Nurmayadi , D., & Hendardi , AR (2019). Analysis Project Time Control Construction Using Earned Value Concept (EVC) and Critical Path Method (CPM). Journal Civil Engineering Science , 1(1), 1–14.

Minister of Work Regulation Public and Public Housing of the Republic of Indonesia Number 07/PRT/M/2019 Regarding Standards And Guidelines Construction Services Procurement Through Provider , State Gazette of the Republic of Indonesia Year 2019 Number 319. Jakarta (2020).

Shahsavand , P., Marefat , A., & Parchamijalal , M. (2018). Causes of delays in construction industry and comparative delay analysis techniques with SCL protocol. Engineering, Construction and Architectural Management, 25(4), 497–533. https://doi.org/10.1108/ECAM-10-2016-0220

Suharto, D. (2007). Earned Value Method For Control (Study Case City Hall Building Project Surak). Journal of Civil Engineering UNS Surakarta.