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Analysis Of Work Implementation Delay On Irrigation Construction Projects

Hairiyah[1], Henry Wardhana[2]
[1, 2)] *Master Program in Civil Engineering, Department of Construction Management, Faculty of Engineering, Lambung Mangkurat University, Banjarmasin, Indonesia*
Corresponding Author: Hairiyah

ABSTRACT: *Activities in the irrigation sector include the development and management of irrigation networks. Each year, the work implementation on irrigation sector construction project often experiences delays, not in accordance with the work plan that previously has been made because there are always many obstacles, both the predictable and the unpredictable one (service providers). These constraints become the reason behind obstruction on the implementation of construction work so that the work delayed or not implemented according to the plan. Therefore, it is necessary to analyze factors that cause delay in construction work, impacts of the delay, and approaches to minimize work delay.*
This is a non-experimental study with five irrigation projects in Balangan Regency. In this study, 11 factors were divided into 34 variables that cause work delay. The analysis used in this study is descriptive analysis as well as index and variant analyses that were previously carried out by testing the validity and reliability.
The results showed that the dominant factors causing work delay were managerial factors (lack of coordination and communication between the representative owner, supervisor consultant, and contractor), material factors (delay in material/material delivery), location characteristics (access to project location that was very far and difficult to reach by means of transportation) and labor factors (wrong or incorrect method of construction / execution). The resulted impact is the delay in overcoming problems in the field, such as land acquisition problems and handling for errors on contractor work methods, lack of construction materials, and problems on resource mobilization. Steps taken to minimize delay in the work implementation are conducting periodic meetings; making coordination between the work owner and the community regarding the land status to be built into project's land; proposing mobilization of resources or land that get impacts after the operation of the building to be done at a minimum one year before planning, especially before the work is started; preparing supervisory consultants in the field to supervise the contractor's work method; planning and scheduling the procurement of construction materials to be used and determining the transportation route, shipping and storage of appropriate construction materials; and determining the appropriate route and means of transportation to access the project location in order to match the time and cost planning.
KEYWORDS:*delay in the work implementation, factors of delay, irrigation*

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I. INTRODUCTION

Activities in the irrigation sector include the development and management of irrigation networks.Therefore, Department of Public Works and Spatial Planning of Balangan Regency always carries annual development and management of irrigation networks both from the Regional Budget (APBD) and the State Budget (APBN) through the Special Allocation Fund (DAK). In addition to APBD budget, the DAK is needed by the Regional Government as an additional fund to implement the project for supporting government programs to increase food self-sufficiency regarding the limited APBD budget.

Every year, the work implementation on this construction project of irrigation sector often experiences delay. For projects sourced from the APBD budget, it can still be handled because the completion time is up to December; while for those sourced from DAK, since 2016 the irrigation sector has difficulty for completing the work because it is challenged by the physical progress requirements that must be met by each field according to the requirements of physical DAK distribution. Unlike the previous year,requirements on the DAK distribution for each Regional Work Unit (SKPD) together can be fulfilled by all fields in the

Since the DAK distribution per sector is implemented, the construction project of irrigation sector in the Water Resources (SDA) division of the Public Works and Spatial Planning Office of Balangan Regency has experienced delays in itswork implementation. Since 2016,irrigation projects worked by the SDA division through rehabilitation of irrigation networks were financed by DAK budget only. In 2016, two of the four construction projects (50%) experienced delays, and in 2017 five of the six construction projects (± 83%) experienced delays.

Five irrigation projects which experience delay in theirwork implementation in 2017 fiscal year were: rehabilitation of irrigation networks in DI. Marias of Juai Subdistrict, DI. Mantimin of Batumandi Subdistrict, DI. Batu Merah of Lampihong Subdistrict, DI. Jungkal of Lampihong Subdistrict, and DI. Belahing of Juai Subdistrict. The rehabilitation projects worked include secondary channels in the form of existing soil excavations which are upgraded to permanent secondary channels with the lining construction, stone pairs, normalization of channels, and the construction of sluice gates. This project becomes the authority of the Regional / City Government because it has an area of ≤ 1.000 Ha.

The resulted impact from this delay was the SDA Division is unable to partially achieve the physical progress required for DAK distribution so that the project is onlypartially completed. Due to the contract used is the unit price contract, then one ofthe five late projects was in the addendum minus and the contract was terminated, one project continued itswork by paying a fine of 1/1000 of the contract value per day, and three other projects were tolerated to be completed after the end of the period contract. If this condition iscontinued, the funds cannot be optimally absorbed and the community cannot optimally use the project results.

Every construction work expects the work to be completed according to the work plan that has been made previously. In fact, the implementation of construction project always meetschallenges, both the predictable and the unpredictablechallenges (service providers). These constraints become the cause of the delay on the implementation of construction work so that the work cannot be implemented according to plan.

The project delay has greatimpacton the contractor because it can cause loss of time and costs regarding the decreased benefits expected by the contractor or even no benefit at all. Whereas impact resulted on the owner or project owner, delay in the completion of the project will cause a loss on the operating time of the project results, so the use of the project development results becomes backward or late. Impact on local government, the budget absorption is not realized according to plan.

This construction work of irrigation field does look quite simple but the characteristics of the area are very complicated compared to other fields such as: most of the location is difficult to reach by means of transportation so that the process of material mobilization to the work site is also very difficult,land used for the work location and for mobilization to the work location involves community-owned paddy fields and the impact of building operations also involves community land outside the project site. In addition, theproject of irrigation sector has an impact on the building function which is obstructed due to the delay in the work implementation.

From the background of the problem, this study will examine factors that cause delays in construction work, either delay in starting work or delay in completing work. In addition, it will also examine impacts of the delay. Finally, an approach will also be sought to minimize work delays.

This study intends to analyze the dominant factors that cause delays in the implementation of construction work, as well as impacts that arise and the appropriatemethod taken to minimize delays in the implementation of construction work.

This study is expected to give benefits that can be used as reference for companies engaged in irrigation construction work in Balangan regency in avoiding delays in the completion of future work, as well as reference for supervisors of the construction work to participate in anticipating delays in completing their construction work on irrigation;as an input for construction service users in selecting service providers by knowing factors that cause delays and weaknesses of certain construction service providers;as a comparison or reference for the next similar research.

II. THEORETICAL REVIEW

According to the Government Regulation of the Republic of Indonesia No. 20 of 2006 concerning Irrigation:

Irrigation is an effort to supply, regulate, and discharge irrigation water to support agriculture whose types include surface irrigation, swamp irrigation, underground water irrigation, pump irrigation, and pond irrigation; Irrigation networks are channels, buildings, and complementary structures which are one unit needed for the supply, distribution, provision, use and disposal of irrigation water; Irrigation area is a unit of land that gets water from an irrigation network.

According to Hassan, et al (2016), delay in construction projects means a prolonged durationof the project implementation from the time has been planned and listed in the contract document. Delay on work completion is a deficiency of the productivity level of and of course all it will result in inefficiency in financing, both in the form of direct financing spent on Government projects and in the form of inventory swings and

losses on private projects. The active participationof the management is one of the main keys for the success of project management. An assessment of the project schedule is needed to determine steps taken for fundamental changes so that delays in project completion can be avoided or minimized.

According to Astina, et al (2012), the delay factors described by Proboyo (1999), Andi, et al (2003) and Assaf (1995) are classified into eleven (11) factors, namely:

1. Labor factors, consisted of 7 sub-factors:
a. Labor expertise
b. Labor discipline
c. Labor motivation
d. The number of workers who are inadequate / in accordance with existing work activities
e. Labor nationalism
f. Replacement of new labor
g. Communication between the workforce and the headman / foreman
2. Material factors, consisted of 7 sub-factors:
a. Delays in material delivery
b. Lack of construction materials
c. Poor material quality
d. Material damage in storage
e. Material changes in shape, function, and specifications
f. Scarcity due to specificity
g. Inaccurate order
3. Equipment factors, consisted of 5 sub-factors:
a. Delay in delivery / supply of equipment
b. Equipment damage
c. Availability of adequate equipment / as needed
d. Equipment productivity
e. The lack of ability of the foreman or operator in operating the equipment
4. Site characteristic, consisted of 7 sub-factors:
a. Surface and underground conditions
b. Perspective or response of the surrounding environment
c. Physical characteristics of buildings around the project site
d. Material storage area
e. Access to the project site
f. Workspace needs
g. Project location
5. Financial factors, consisted of 4 sub-factors:
a. There is no bonus / intensive money for the contractor if the completion time is faster than the schedule
b. Material prices
c. Funding difficulties on the contractor side
d. Payment difficulties by the owner
6. Situation factors,consisted of 3 sub-factors:
a. Rainfall intensity
b. Social and cultural factors
c. Unpredictable conditions such as fires, floods, extreme weather, storms / hurricanes, earthquakes and landslides
7. Factors of Change, consisted of 3 sub-factors:
a. Changes of design made by the owner
b. Design errors made by the planner
c. Error in land investigation
8. Scope and Contract Documents Factors, consisted of 6 sub-factors:
a. Wrong / incomplete (image / specification) planning
b. Change of scope at the time of work implementation
c. Owner's delay in making a decision
d. There are many (often) additional jobs given
e. There is a request for changes to the work that has been completed
f. Disagreement of work sketch between planners and contractors
9. Planning and scheduling factors, consisted of 5 sub-factors:
   a. Incomplete identification of the work type
   b. Unstructured / non-integrated work order

c. Unspecified duration of work
d. Inconsistent work plan of the owner
e. Incorrect construction / execution methods

10. Factors of Inspection System, Job Control, and Evaluation, consisted of 7 sub-factors:
a. Difference of sub-contractor schedules in project completion
b. Unscheduled submission of material samples by contractors
c. The prolonged process for approving samples of material by the owner
d. Delay in the inspection and material testing process
e. Contractor failure to carry out work
f. Many work results must be repaired / repeated due to defects / incorrect
g. The longer process and procedures for evaluating the work progress through an agreed schedule

11.Managerial factors, consisted of 3 sub-factors:
a. Field manager experience
b. Communication between the representative owner and the contractor
c. Communication between planner and contractor

According to Kamaruzzaman (2012), project delays will cause losses to the contractor, consultant, and owner, namely:

a) The Contractor

Delay in the project completion willresult in an increase in overhead, because it prolongs the duration of work implementation. Overheads include costs for the company as a whole, regardless of whether the contract is being handled or not.

b) The Consultant

The consultant will experience time loss and will be late in working on other projects if there is delay on the project implementation.

c) The Owner.

Project delay on the owner part means loss of income from the building that should have been operated or rented out. If the owner is the government, delay on the construction of public facilities such as a hospital of course will be detrimental to public health services or harm the service program that has been prepared. This loss cannot be assessed orrepaid with money. Whereas if the owner is a non-government who construct a building, shop, or hotel, of course the building operation schedule will retreat from the planned time, so there is free time without getting money.

According to Dipohusodo (1996), there are several ways to control delays: mobilize additional resources; remove obstacles, or other efforts to ensure that the work improves and bring it back to the plan line. If it is not possible to remain on the first plan, it may be necessary to revise the schedule, which is then used as a basis for assessing the progress of the next work.

According to Proboyo (1999), to compile a ranking of causes, the data regarding the number (frequency) of respondents was processed by giving weight to each scale of -100, -50, 0, +50, +100 for the confirmation scale using a Likert scale which included:

1. Very Non-Influential (STB),
2. Not Influential (TB),
3. Neutral or Don't Know (N / TT),
4. Influential (B) and
5. Very influential (SB).

Thus, the index value can be calculated using the formula as follows:

$$\text{Index (Xm)} = \frac{\sum_{i=1}^{5} \mathbf{n}_i \text{ .weight}}{n}$$

The resulting index value is used as a basis for sorting or compiling a ranking of factors that affect the delay in the work implementation. Factors with a higher index value will have a higher rating as well.

In addition to finding the index value, a variant value is used to determine the two variables that have the same index value, namely:

$$V = \frac{1}{n-1} \sum_{i=1}^{5} \mathbf{ni} \quad [\text{weight}_i - I(Xm)]^2 \qquad ($$

Where:

X = aspect code (A, B, C, ...),

m = sequence number of the cause type in aspect X (1, 2, 3, ...),
n_i = frequency on scale i (i = 1,2, ……, 5)
n = total number of respondents,
V = variant,
I = index value,
$weight_i$ = weight on scale i
The same index value with smaller variants will rank higher in affecting work delays.

III. METHOD

Two things related to delays in the work implementation in this study are causal factors and delay impacts. Causal factors are classified into 11 factors which then divided into 34 variables / sub factors. While impacts of work delay is grouped into three groups, namely the impacts on the job owner, the contractor or the job implementer, and the supervisory consultant. Scoring of respondents' perceptions on items / factors that cause delays is used to find the dominant factors that cause job delays. On the other hand, impacts resulted from the delay work will be known which then can be used to reduce the delay's causal factors in the work implementation described in research suggestions.

Data obtained from the data collection, both primary and secondary data, then processed or analyzed. Before doing index and variant analysis and descriptive analysis, tests were conducted before, such as data validity and reliability testing, because the data produced were respondents' perception. Instruments were used for testing data.

Validity test was taken with purpose to see whether the data obtained really represents the measurement results or observations that need to measure. While reliability test was conducted to show to which extent is the reliability of a measuring instrument. After the required data from validity and reliability tests were obtained, the data then ready to be analyzed.

Because the answer is still in qualitative form, it needs to be quantified by giving weight to each variable, namely:

a. For very non-influential answer is given a weightof -100
b. For not influential answer is given a weight of -50
c. For neutral or don't knowanswer is given a weight of 0
d. For influential answer is given a weightof +50
e. For very influential answer is given a weight of +100

After the data is valid and reliable, then data processing and analysis are conducted by using instruments, index and variance analysis to determine the dominant factors causing delays in the work implementation with the help of interpretation guidelines that cause delays in the job execution, where variables from factors with index values from 81 to 100 are the dominant factors causing delays in the work implementation. Whereas descriptive analysis was taken to determine the delay impacts and approaches taken to minimize delays in the work implementation.

IV. RESULTS AND DISCUSSION

Primary data collected from the answers of respondent's questionnaire were tested for validity and reliability with instruments. The results are suggested in the table below:

Table 1. Results of Research Variable Validity Test

Factors		**Variables**		**Correlation Coefficient**
A	Labor factors:	A1	The lack of labor expertise	0,451
		A2	The lack of labor motivation	0,468
		A3	Labor shortages by contractors	0,403
		A4	Inappropriate or incorrect construction method / work implementation	0,575
B	Material factors:	B1	Delays in material delivery	0,614
		B2	The lack of construction materials	0,419
C	Equipment factors:	C1	Delays in equipment delivery / supply	0,623
		C2	Equipment damage	0,417
		C3	The availability of adequate equipment / as needed	0,421
D	Site characteristic factors:	D1	Access to project locations that are very far and difficult to reach by means of transportation	0,469
		D2	The owner's failure to coordinate land handover or land use	0,614

E	Financial factors:	E1	Higher material prices due to material mobilization to very far location	0,372
		E2	Funding difficulties by the contractor	0,608
		E3	Funding difficulties by the owner	0,588
F	Situation / Environment factors:	F1	High intensity of rainfall	0,800
G	Factors of Change:	G1	Changes of design made by the owner	0,889
		G2	Wrong planning and specification	0,923
		G3	Ambiguous planning and specification	0,850
		G4	Changes in planning and specifications	0,894
H	Scope and Contract Documents Factors:	H1	Wrong / incomplete planning (drawings / specifications)	0,730
		H2	Changes of scope in the job implementation	0,810
		H3	Owner's delay in making a decision	0,858
		H4	There are many (often) additional jobs given	0,850
		H5	Disagreement of work sketch between planners and contractors	0,412
I	Planning and scheduling factors:	I1	Incomplete identification of the work type	0,733
		I2	Unstructured / non-integrated work order	0,785
		I3	Inconsistent work schedule by the contractor	0,450
		I4	Incorrect / wrong construction / execution methods	0,791
J	Factors of Inspection System, Job Control, and Evaluation:	J1	Too many projects must be repaired / repeated due to defects / incorrect results	0,520
		J2	Prolonged process and procedures for evaluating the progress of the preceding work	0,662
K	Managerial factors:	K1	Unqualified personnel or owner	0,397
		K2	Poor technical and managerial qualifications of personnel in the contractor's work organization	0,577
		K3	Lack of coordination and communication between the parts in the contractor's work organization	0,844
		K4	Lack of coordination and communication between the representative owner, supervisory consultant and contractor	0,397

From the validity test results,it is suggested that all variables have a correlation coefficient (r count) greater than r table (0.330). Therefore it can be said that all variables used in this study are valid.After the validity test is done and the variable is considered as valid, then the reliability test is carried out. From the results of the reliability test with instruments, the alpha cronbach value obtained related factors causing delay is 0.957. Because the value is more than 0.6, it can be said that the measurement scale is reliable.

After the data is considered as valid and reliable, then to get the interpretation results regarding the dominant factors causing delays in the work implementation from the results of index analysis and by using the guidelines in the research method, there are interpretation resultssuggested in Table 2 below:

T**able1**. Interpretation Results on Factors Causing Delay in Job Implementation

Factors		**Variables**		**Index Value**	**Variant Value**	**Level of Delay Causal factors**
A	Labor factors:	A1	The lack of labor expertise	50,00	945,95	CB
		A2	The lack of labor motivation	46,05	862,38	CB
		A3	Labor shortages by contractors	76,32	1586,06	B
		A4	Inappropriate or incorrect construction method / work implementation	84,21	554,77	SB
B	Material factors:	B1	Delays in material delivery	92,11	341,39	SB
		B2	The lack of construction materials	75,00	1858,11	B
C	Equipment factors:	C1	Delays in equipment delivery / supply	48,68	1957,68	CB
		C2	Equipment damage	-46,05	6267,78	STB
		C3	The availability of adequate equipment / as needed	52,63	1344,24	CB
D	Site characteristic factors:	D1	Access to project locations that are very far and difficult to reach by means of transportation	88,16	1680,30	SB
		D2	The owner’s failure to coordinate land handover or land use	76,32	3072,55	B
E	Financial	E1	Higher material prices due to material	34,21	2581,79	TB

	factors:		mobilization to very far location			
		E2	Funding difficulties by the contractor	39,47	426,74	TB
		E3	Funding difficulties by the owner	-43,42	293,39	STB
F	Situation / Environment factors:	F1	High intensity of rainfall	14,47	4987,55	STB
G	Factors of Change:	G1	Changes of design made by the owner	5,26	3755,33	STB
		G2	Wrong planning and specification	18,42	3435,28	STB
		G3	Ambiguous planning and specification	11,84	2626,24	STB
		G4	Changes in planning and specifications	19,74	3586,42	STB
H	Scope and Contract Documents Factors:	H1	Wrong / incomplete planning (drawings / specifications)	-15,79	2852,06	STB
		H2	Changes of scope in the job implementation	-21,05	4409,67	STB
		H3	Owner's delay in making a decision	26,32	2667,14	TB
		H4	There are many (often) additional jobs given	10,53	2453,77	STB
		H5	Disagreement of work sketch between planners and contractors	-42,11	3179,23	STB
I	Planning and scheduling factors:	I1	Incomplete identification of the work type	72,37	1445,59	B
		I2	Unstructured / non-integrated work order	51,32	3714,44	CB
		I3	Inconsistent work schedule by the contractor	26,32	1856,33	TB
		I4	Incorrect / wrong construction / execution methods	50,00	3648,65	CB
J	Factors of Inspection System, Job Control, and Evaluation:	J1	Too many projects must be repaired / repeated due to defects / incorrect results	-61,84	1815,43	STB
		J2	Prolonged process and procedures for evaluating the progress of the preceding work	5,26	2539,12	STB
K	Managerial factors:	K1	Unqualified personnel or owner	47,37	263,16	CB
		K2	Poor technical and managerial qualifications of personnel in the contractor's work organization	1,32	2092,82	STB
		K3	Lack of coordination and communication between the parts in the contractor's work organization	73,68	640,11	B
		K4	Lack of coordination and communication between the representative owner, supervisory consultant and contractor	93,42	563,66	SB

From Table 2 above, it can be seen that the dominant factors causing delays in the implementation of irrigation work are variables of factors that have an index value of 81 to 100 with Very Influential Delay (SB) as level of delay causal factor as shown in Table 3 below:

Table 3. Dominant factors causing delay in the work implementation from index analysis and interpretation results

Factors		**Variables**		**Index Value**	**Variant Value**	**Level**
K	Managerial factors:	K4	Lack of coordination and communication between the representative owner, supervisory consultant and contractor	93,42	563,66	1
B	Material factors:	B1	Delays in material delivery	92,11	341,39	2
D	Site characteristic factors:	D1	Access to project locations that are very far and difficult to reach by means of transportation	88,16	1680,30	3
A	Labor factors:	A4	Inappropriate or incorrect construction method / work implementation	84,21	554,77	4

From Table 2 and 3, it can be seen that the dominant causes of work delays that influencing irrigation construction projects of 2017 in Water Resources Division of the Public Works and Spatial Planning Office of the Balangan Regency are:

1. Managerialfactor i.e.the lack of coordination and communication between the representative owner, supervisory consultant, and contractor (K4).

2. Material factori.e. the delay in material delivery (B1).
3. Site characteristic, i.e. access to project locations that are very far and difficult to reach by means of transportation (D1).
4. Labor factor i.e. incorrect / wrong method of construction / execution (A4).

V. CONCLUSION

Based on the study results on factors causing delays in the implementation of construction work in irrigation sector for 2017 fiscal year in Water Resources Division of the Public Works and Spatial Planning Office of Balangan Regency, there are several conclusions can be drawn:

1. The dominant factors which causing delays in the implementation of the construction work are shown in Table IV.18 and IV.19:

a. Managerial Factor K i.e.the lack of coordination and communication between the representative owner, supervisory consultant, and contractor (K4).
b. Material factor / B i.e. the delay in material delivery (B1).
c. Site characteristic / D, i.e. access to project locations that are very far and difficult to reach by means of transportation (D1).
d. Labor factor / A i.e. incorrect / wrong method of construction / execution (A4).

The above four factors are the dominant factors which cause delays in the construction of irrigation work in 2017 in the Water Resources Division of the Public Works and Spatial Planning Office of Balangan Regency.

2. Impacts resulted from delays in the work implementation include:

a. Late response towards problems arises in the location, including land acquisition and incorrect work methods of the contractor.
a. The work implementation is hampered due to the lack of material supplied by the contractor regarding delays in the materials delivery.
b. The mobilization of resources is hampered, include material, equipment, and labor in the work implementation.
c. The building owner and the community cannot use the building according to the planned schedule for its operation.
d. The government development targets in the predetermined fiscal year are missing, so that budget absorption cannot be achieved and the next work program is disrupted.
e. Changes in the technical specifications of the project will reduce the quality of the building.
f. The credibility of the government and contractors are affected.

3. The appropriate methods to minimize delays in the implementation of construction work can be proposed are:

a. Representative owner, supervisory consultant, and contractor together conduct periodic meetings so that the problems arisecan be quickly monitored and resolved as well as establish good communication between each party.
b. In crisis situations of time, the critical path must be communicated and agreed upon by the Project Team.
c. Perform regular updates on the critical path (CPM). The more often it will get better. Simulations of project plans alsocan be conducted to get the most efficient and effective strategy.
d. The supervisory consultant must be ready in the location to monitor the contractor's work method in carrying out the taskin order to avoid mistakes.
e. Actively evaluate the existing implementation methods so that the most efficient and effective implementation method can be obtained.
f. Planning and scheduling for procurement of construction materials to be used, as well as purchasing, transporting and shipping, determining routes for transportation and shipping, managing material supplies and storing appropriate construction materials.
g. The contractor must determine the best route and means of transportation for accessing the project location to suit the time and cost planning.

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