

Identification the Highest Risk of Performance Based Contract in Bojonegoro-Padangan Road Projects

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Abstract— Development of road facilities and infrastructure in order to meet the need to improve the welfare of the community. Contract of project activity is carried out to bind both parties in this case, Owner and contractor as an interested party has the purpose to bind the rights and responsibilities in completing project activities. Performance based contracts are the innovative contracts presented by the Indonesian government to improve the quality of construction of road construction. The risk of applying this type of contract will be investigated so that it will be known to the highest risk, given the performance based contract has 4 stages such as design, build, operate, and maintenance. The project that implements the performance based contract under study is the Bojonegoro-Padangan road project, East Java. In the process of knowing the highest risk variable that occurs in the implementation, the researcher uses a simple probabilistic concept to determine the highest risk of each stage of a performance based contract. The correspondent of the contractor is PT Pembangunan Pembangunan (Persero) Tbk - PT Basuki Rahmanta Putra (Joint Operational) on the road construction project Bojonegoro – Padangan, East Java. The results obtained from this study from the implementation of performance-based contracts on the Bojonegoro-Padangan road construction project with the highest risk event gain is at the Design stage: Project budget. Build Stage: The vendor's offer price is higher than estimated. Operate Phase: Cashflow delay. Maintenance Stage: Short-term focus fails to minimize long-term costs..

Keywords— Construction, Contract, Maintenance, Road.

I. INTRODUCTION

The Indonesian government has implemented a performance based contract as a form of contract that is expected to provide innovation on the quality of construction. The adoption of this contract has not been fully implemented as performance-based contracts are still under probation, the risks of their application are not fully known. Performance based contracts have 4 stages, such as Design, Build, Operate, and Maintenance. All of these stages have different risks when applied. The implementation of the Bojonegoro-Padangan road construction that has implemented this contract becomes the object of the researcher to know the risks that occur at each stage. Projects that have entered this maintenance phase will also provide an overview of the dominant risks that occur during implementation. Unknown information about the risks that arise from the implementation of performance based contracts is an opportunity for research, and developed to determine the probability of events. Therefore, it can be used as a consideration for the government to be applied in various regions in Indonesia.

I.1 Problem Formulation

How is the highest risk of each stage of performance based contracts implemented in the Bojonegoro-Padangan road construction project be known?

I.2 Aim

Aims to perform the highest risk analysis of each stage of performance based contracts implemented in the Bojonegoro-Padangan road construction project.

I.3 Limitations of research

- a. Risks that occur in Performance Based Contract for road projects.
- b. Respondents in this research is the provider of goods / services that is the main contractor in the activities on the national road project using Performance Based Contract.
- c. Details of the risks and studied were obtained from preliminary literature and surveys.

II. LITERATURE STUDY

II.1 Forms of Construction Contracts

The form of construction contract according to (1) can be reviewed from various aspects, namely:

- a. Aspect Of Cost Calculation
 1. Fixed Lump Sum Price
 2. Unit Price
- b. Aspect of Service Calculation
 1. Cost Without Fee
 2. Cost Plus Fee
 3. Cost Plus Fixed Fee
- c. Aspects of Payment Method
 1. Monthly Payment
 2. Stage Payment
 3. Contractor's Full Prefinanced
- d. Task Division Aspects
 1. Conventional Contract
 2. Specialist Contract
 3. Design Construct / Build, Turnkey
 4. Engineering, Procurement and Construction
 5. Build, Operate and Transfer
 6. Force Account

II.2 Performance Based Contract

Performance Based Contract (PBC) is a type of contract with a clear objective and indicator that bases payments on the fulfillment of minimum performance indicators.

Critical elements of effective PBC are well defined and clearly defined job statements in order to achieve performance standards (2)

II.3 Risk

(3) explained in his book entitled Risk Management for contractors, which explained that Risk is a variation in things that may occur naturally in a situation. Meanwhile, according to (4) Risk is a threat to life, property or financial benefits due to the dangers that occur. In general, risk is associated with probability of occurrence beyond the expected events

II.4 Risk Relationship on Performance Based Contracts

According to (5) explains To know the relationship of risk at the Performance Based Contract stage identified risk will be known first variables and factors to be analyzed at each stage.

II.5 Road

Government Regulation No. 34 Year 2006 describes the Road is a land transportation infrastructure covering all parts of the road, including auxiliary buildings and equipment intended for traffic, located on the surface of the soil, above ground level, below ground and / or water, and On the water surface, except for railroads, lorries, and cable roads.

II.6 Simple Probabilistic Concepts

According to (6) an approach is developed using two criteria that are important to measure risk, namely:

1. Probability is the possibility of an undesirable event.
2. Impact is the level of influence or size of the impact on other activities, if unexpected events occur.

According to (7) the value of risk is the result of multiplication of the probability value of risk with the value of risk impact.

Table. 1
Score of Impact

Risk assessment can be formulated as follows:

$$R = P \times I \tag{1}$$

Where :

R = Risk level

P = potential risk

| Description | Probability | Impact on Project | | Score |
|-------------|-------------|--------------------|-------------------|-------|
| | | Timescale (% late) | Cost (% increase) | |
| VLO | <10% | <10% | <5% | 1 |
| LO | 10-30% | 10-20% | 5-10% | 2 |
| MED | 30-50% | 20-40% | 10-15% | 3 |
| HI | 50-70% | 40-50% | 15-30% | 4 |
| VHI | >70% | >50% | >30% | 5 |

I = the level of risk impact

With this formula the risk assessment is not based on absolute estimation, but Use the interval class as shown in table 1 as follows:

Table. 2
Probability Impact Grid

| | | | | | | |
|----|---|---|----|----|----|----|
| VH | 5 | 5 | 10 | 15 | 20 | 25 |
|----|---|---|----|----|----|----|

| | | | | | | |
|-----|---|----|---|-----|----|----|
| H | 4 | 4 | 8 | 12 | 16 | 20 |
| MED | 3 | 3 | 6 | 9 | 12 | 15 |
| L | 2 | 2 | 4 | 6 | 8 | 10 |
| VL | 1 | 1 | 2 | 3 | 4 | 5 |
| | | VL | L | MED | H | VH |

Source (7)

Table. 3
Risk Level

| Score | Risk |
|-------|----------|
| 1-5 | Very Low |
| 5-10 | Low |
| 10-15 | Medium |
| 15-20 | High |
| 20-25 | VeryHigh |

Source (8)

III. METHOD

The concept of this descriptive study to perform the highest risk analysis at each stage of Performance Based Contract on the project that has been implemented.

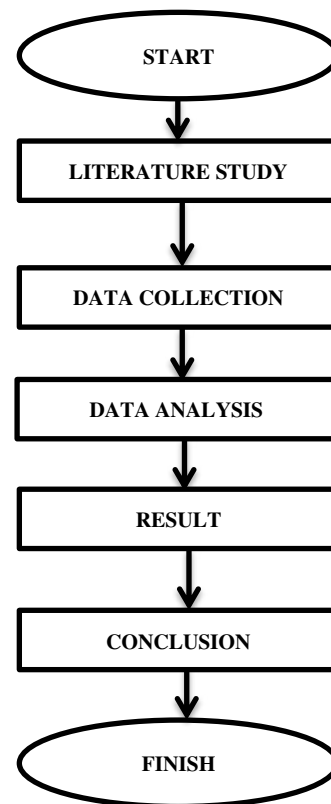


Figure.1 Flowchart of Research

III.1 Data collection

Data collection has been carried out from research references related to the subject and object of research, from the references such as journals, textbooks, theses, seminars and research reports.

Primary data collection has been done by researchers by:

1. Interview
2. Questionnaire

Data has been obtained after the construction phase during the maintenance service period with 1643

calendar days from the year 2015 until 2019 on the Bojonegoro-Padangan road project.

III.2 Respondent

Respondent in this research is contractor who apply contract or Performance Based Contract in East Java area is PT Pembangunan Pembangunan (Persero) Tbk - PT Basuki Rahmanta Putra (Joint Operational).

IV. RESULTS AND DISCUSSION

Assessment analysis for risk has been obtained from questionnaires that have been processed from risk variables arising from contractors who have implemented.

Table. 4 Risk Event Analysis

| No | VARIABLES OF RISK | P | | I | | RISK EVENT |
|----------------------------|---|-------|-------|-------|-------|------------|
| | | Total | Avg | Total | Avg | |
| PT. PP (CONTRACTOR) | | | | | | |
| A DESIGN | | | | | | |
| 1 | Accuracy scope of work | 20 | 2.857 | 23 | 3.286 | 9.388 |
| 2 | Qualification engineer | 21 | 3 | 18 | 2.571 | 7.714 |
| 3 | Engineering communication with procurement | 21 | 3 | 17 | 2.429 | 7.286 |
| 4 | Use of technology for working methods | 23 | 3.286 | 17 | 2.429 | 7.980 |
| 5 | Project budget | 23 | 3.286 | 22 | 3.143 | 10.327 |
| 6 | Project implementation schedule | 19 | 2.714 | 19 | 2.714 | 7.367 |
| 7 | Design changes | 15 | 2.143 | 17 | 2.429 | 5.204 |
| 8 | Incomplete specs | 15 | 2.143 | 17 | 2.429 | 5.204 |
| 9 | Shop Drawing incomplete | 16 | 2.286 | 17 | 2.429 | 5.551 |
| 10 | Lack of design accuracy | 19 | 2.714 | 18 | 2.571 | 6.980 |
| 11 | Less sophisticated design and engineering | 15 | 2.143 | 13 | 1.857 | 3.980 |
| B BUILD | | | | | | |
| 1 | The vendor's offer price is higher than estimated | 24 | 3.429 | 26 | 3.714 | 12.735 |
| 2 | Availability of materials and human resources | 8 | 1.143 | 15 | 2.143 | 2.449 |
| 3 | Delays in the supply of materials and tools | 15 | 2.143 | 11 | 1.571 | 3.367 |
| 4 | Identification of materials and equipment | 15 | 2.143 | 11 | 1.571 | 3.367 |
| 5 | Vendor Quality Control | 9 | 1.286 | 8 | 1.143 | 1.469 |

| | | | | | | |
|------------------|---|----|-------|----|-------|-------|
| 6 | Procurement of control documents | 15 | 2.143 | 7 | 1 | 2.143 |
| 7 | Manufacturing process | 15 | 2.143 | 12 | 1.714 | 3.673 |
| 8 | Vendor Performance | 11 | 1.571 | 7 | 1 | 1.571 |
| 9 | Material warranty | 12 | 1.714 | 13 | 1.857 | 3.184 |
| 10 | Late approval from the owner | 14 | 2 | 11 | 1.571 | 3.143 |
| 11 | Disputes from third parties | 11 | 1.571 | 11 | 1.571 | 2.469 |
| 12 | Less experience in inspection and shipping | 14 | 2 | 7 | 1 | 2.000 |
| C OPERATE | | | | | | |
| 1 | Site conditions different from | 18 | 2.571 | 14 | 2 | 5.143 |
| 2 | Restricting working hours | 14 | 2 | 11 | 1.571 | 3.143 |
| 3 | Quality control and insurance | 10 | 1.429 | 11 | 1.571 | 2.245 |
| 4 | The design can not be applied in the field | 15 | 2.143 | 11 | 1.571 | 3.367 |
| 5 | Additional time due to rework | 13 | 1.857 | 15 | 2.143 | 3.980 |
| 6 | Design changes | 14 | 2 | 19 | 2.714 | 5.429 |
| 7 | The supply of materials from third parties does not meet specifications | 12 | 1.714 | 14 | 2 | 3.429 |
| 8 | Forced mature | 12 | 1.714 | 15 | 2.143 | 3.673 |
| 9 | Friendship supervisor in making decisions | 14 | 2 | 15 | 2.143 | 4.286 |
| 10 | Cash flow delay | 19 | 2.714 | 19 | 2.714 | 7.367 |
| 11 | Disturbance from the surrounding environment | 21 | 3 | 16 | 2.286 | 6.857 |
| 12 | Disputes regarding the definition of specifications and documents | 16 | 2.286 | 17 | 2.429 | 5.551 |
| 13 | Duration in project implementation | 12 | 1.714 | 15 | 2.143 | 3.673 |
| 14 | Differences in availability of budgets with work progress | 19 | 2.714 | 18 | 2.571 | 6.980 |
| 15 | Quality of work does not meet the job | 15 | 2.143 | 15 | 2.143 | 4.592 |
| 16 | Unpredictable soil conditions | 16 | 2.286 | 16 | 2.286 | 5.224 |
| 17 | Inadequate specifications | 14 | 2 | 15 | 2.143 | 4.286 |
| 18 | Delayed payment termin progress | 19 | 2.714 | 17 | 2.429 | 6.592 |
| 19 | Licensing and regulation | 16 | 2.286 | 17 | 2.429 | 5.551 |
| 20 | The postponement is entangled in disputes | 14 | 2 | 14 | 2 | 4.000 |
| 21 | Differences in terms of | 14 | 2 | 14 | 2 | 4.000 |

| | | | | | | |
|----------------------|---|----|-------|----|-------|-------|
| | calculating the quantity of work | | | | | |
| 22 | Unexpected weather conditions | 19 | 2.714 | 15 | 2.143 | 5.816 |
| 23 | HSE Problems | 17 | 2.429 | 17 | 2.429 | 5.898 |
| 24 | Technical issues | 18 | 2.571 | 13 | 1.857 | 4.776 |
| 25 | The occurrence of differences between work sequences and performance indicators | 13 | 1.857 | 11 | 1.571 | 2.918 |
| D MAINTENANCE | | | | | | |
| 1 | The quality of construction is ugly | 12 | 1.714 | 21 | 3 | 5.143 |
| 2 | Unexpectedly severe conditions | 16 | 2.286 | 17 | 2.429 | 5.551 |
| 3 | Short-term focus that fails for the long term | 18 | 2.571 | 22 | 3.143 | 8.082 |
| 4 | Difficulties in power resources | 15 | 2.143 | 15 | 2.143 | 4.592 |
| 5 | Occurrence during the warranty period | 16 | 2.286 | 15 | 2.143 | 4.898 |
| 6 | Traffic damage occurred | 11 | 1.833 | 10 | 1.667 | 3.056 |
| 7 | Fines due to response Attractive less quickly | 11 | 1.571 | 10 | 1.429 | 2.245 |
| 8 | Age design does not fit the plan | 13 | 1.857 | 10 | 1.429 | 2.653 |

Table. 5 Ranking of Risk

| DESIGN | | |
|----------------|------------|---------|
| No | Scale | Ranking |
| 1 | 11 - 8.8 | 1 |
| 2 | 8.8 - 6.6 | 2 |
| 3 | 6.6 - 4.4 | 3 |
| 4 | 4.4 - 2.2 | 4 |
| 5 | 2.2 - 0 | 5 |
| BUILD | | |
| No | Scale | Ranking |
| 1 | 13 - 10.4 | 1 |
| 2 | 10.4 - 7.8 | 2 |
| 3 | 7.8 - 5.2 | 3 |
| 4 | 5.2 - 2.6 | 4 |
| 5 | 2.6 - 0 | 5 |
| OPERATE | | |
| No | Scale | Ranking |
| 1 | 8 - 6.4 | 1 |
| 2 | 6.4 - 4.8 | 2 |
| 3 | 4.8 - 3.2 | 3 |

| 4 | 3.2 - 1.6 | 4 |
|--------------------|-------------|---------|
| 5 | 1.6 - 0 | 5 |
| MAINTENANCE | | |
| No | Scale | Ranking |
| 1 | 9.00 - 7.20 | 1 |
| 2 | 7.20 - 5.40 | 2 |
| 3 | 5.40 - 3.60 | 3 |
| 4 | 3.60 - 1.80 | 4 |
| 5 | 1.80 - 0 | 5 |

Risk event results have been known variable that has the highest risk ranking with the value entered in the scale. So it is known the highest variable of each stage in Performance Based Contract.

Table. 6 The Highest Risk of each stage on Performance Based Contract

| A DESIGN | |
|----------------------|---|
| 1 | Project budget |
| 2 | Accuracy scope of work |
| B BUILD | |
| 1 | The vendor's offer price is higher than estimated |
| C OPERATE | |
| 1 | Cash flow delay |
| 2 | Differences in availability of budgets with work progress |
| 3 | Disturbance from the surrounding environment |
| 4 | Delayed payment termin progress |
| D MAINTENANCE | |
| 1 | Short-term focus that fails for the long term |

V. CONCLUSION

The results of the Highest Risk analysis of each stage of Performance Based Contract, such as:

1. Design :
 - a. Project budget (RE: 10,327)
 - b. Accuracy scope of work (RE: 9,388)
2. Build:
 - a. The vendor's offer price is higher than estimated (RE: 12.735)
3. Operate:
 - a. Cash flow delay (RE: 7.367)
 - b. Differences in availability of budgets with work progress (RE: 6.980)
 - c. Disturbance from the surrounding environment (RE: 6.857)
 - d. Delayed payment termin progress (RE: 6.592)
4. Maintenance:
 - a. Short-term focus that fails for the long term (RE: 8.082)

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