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Risk Model Contract Based Performance Road Work in Indonesia

B. Mochtar[1], H. Parung[2], J. Patanduk[2], N. Ali[2]

[1] Student Doctoral Program in Civil Engineering, University of Hasanuddin, Makassar 2015, Indonesia
[2] Lecturer, Department of Civil Engineering, University of Hasanuddin, Makassar 2015, Indonesia
E-mail: benny_mochtar@yahoo.com, bennymochtar18@gmail.com

ABSTRACT

Performance-based contract is a solution for road maintenance in the form of integrated contracts of process design, execution and maintenance of construction lump sum payment system. The purpose of this study is to formulate a model of the relationship of risk to the performance of performance based contract. The research methodology done using the method in which the survey questionnaire as data collection instruments were distributed to the parties involved in projects performance-based contract in Indonesia. Then the data is processed by factor analysis, regression analysis and path analysis to obtain structural equation relationship PBC risk and project performance. The results showed that there are 31 of the most important risks that affect project performance cost, time and quality. Of the 31 identified risks, there are 12 risk factors that directly affect and significant impact on all aspects of project performance-based contract. From the formulation of the resulting model obtained a function of the parameters 3 empirical models path diagram that explains the correlation risks to project performance-based contract, the empirical model 1 risk relationship to the performance fee, the empirical model 2 risk relationship to performance time and empirical models of 3 risk relationship to performance quality.

Keywords: Performance Based Contracts, Road Project, Risk, Performance, Model

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1. INTRODUCTION

Study of the PBC in Indonesia has started since the early 2000s involving many experts from abroad. However, for the construction work, the PBC began to be implemented in national road since 2011 ie in 2 (two) road: Ciasem - Pamanukan and Demak - Trengguli, and continued in 2012 in 3 sections: Semarang - Bawen, Bojonegoro - Padangan, Padangan - Ngawi, and Sei Hanyu - Tb Lahung (Middle Kalimantan) [1]. Previous PBC concept has also been applied since 2011 by implementing Extended Warranty Period (EWP) on some national roads. PBC with the lowest levels are normal contract but with a two-year maintenance period. The next stage has been applied in Indramayu and Demak with maintenance period of 3-5 years, only 18 km in length this year the four major cities, namely Medan later, Jakarta, Semarang, Makassar with path length that can reach 100-250 km within a period of 10 year. The Government adopted the PBC and PBMC as a solution for handling the road, both from the government in order to provide a continuous path in good condition, as well as of the service providers who see this business profitable and attractive to them because the conditions of the contract which has a longer period the length of the road is quite high. Performance based contract which is an integration of three processes, namely the design, implementation and maintenance of this construction is equivalent to the contract Design and Build (DB) and system maintenance service contract with a lump sum [2].

The purpose of the application of the PBC is to build a state that encourages construction service providers to be aware of the importance of quality and risk management. During this risk due to poor job of service providers has always been a risk of service users (government), but in this performance based contract will be the service provider's own risk [2].

The scope of this research did was study of the literature to identify the types of risks that may occur in the PBC and analyze project to compare the effects of risks to project performance PBC. The World Bank and Pusjatan become the main reference in identifying risk groups in this research.

This research is limited to the PBC project based on data from the Directorate General of Highways, so that The research population is limited to providers and service users who have been involved in the planning and implementation of projects PBC [3].

2. METHODOLOGY

A. Time and Location Research

The research took place for 15 (fifteen) months, starting in September 2013 up to December 2014, including literature, to modeling. The study was conducted at the PBC project in Central Java, West Java, Jakarta, and Middle Kalimantan.

B. Materials and tools

Materials and tools used in this study is a questionnaire with a questionnaire instrument or a list of questions, and the interview prepared to obtain data and information from respondents. Supporting instrument used in this study is a voice recorder [4].

C. Populasi dan Sampel

This study population is a provider of services or construction companies and users of services or government agencies (DGH, Ministry of Public Works) involved in 6 pilot PBC projects in Indonesia during the period of the project from 2011 through 2014. Population data service providers (contractors) can be seen in Table 1. Due to the size of the population is not large, the technique of taking samples in this study is the technique of random sampling (simple random sampling) which is part of probability sampling method that gives equal opportunity for every element of (members of) the population to be elected as members of the sample [5].

D. Data Collection

Data collected by several stages by simple sampling techniques as described below, namely: Phase I - Distribution and Data Collection. Physical questionnaire was made in the form of a printed questionnaire sent directly to all respondents or members of the population. Other options, submitted to the respondents through an online questionnaire on the google site form. Questionnaires were distributed to 50 respondents with a proportional amount corresponding sampling technique is simple. Phase II - Collection and Evaluation of Data. The questionnaire has been filled evaluated in the form of direct or via telephone interview. Once evaluated, the data is then processed to obtain the level of reliability (reliability) statistical data required. Questionnaires were collected 43, 3 of them are not filled valid and complete so as not to be used. Analyzes were performed using SPSS 22.0 and Monte Carlo PCA. Data analysis includes the factor analysis and path analysis is the level of risk group relationships and group performance [6].

The main usefulness of factor analysis by Pallant, (2005) is for a reduction in the number of variables. A reduction is done by looking at the interdependence of several variables that can be used as one that found variables called factors. Factor analysis involves a number of steps: assessment of the data, the extraction factor and rotation factors. Before doing this analysis first check reliability analysis, validity, linearity, multikolinearitas and classical assumption of data that will be tested to obtain satisfactory results [7].

Given the number of risk variables obtained from literature review, with 74 variables in five groups of risk, then the amount necessary for the subsequent analysis of factor analysis to obtain the dominant cause of the occurrence of the risk on the project performance based contract.

Factor analysis is done in two parts. In Part 1 procedure performed is a data assessment and extraction factor. From this stage the test results obtained in the form of tables Total Variance Explained or eigenvalues obtained in SPSS to be compared with the value corresponding to the random results of a parallel analysis (Monte Carlo PCA). If the value of the SPSS output is greater than the value of the parallel analysis criteria, then factor retained for further analysis. Conversely, if a lower eigenvalues, then these factors in waste. In part 2 additional procedures required to rotate with Varimax method and interpret factor scores with regression method.

Path analysis is a technique the development of multiple linear regression. This technique is used to test the amount of the contribution shown by the path coefficient for each path diagram of causal relationships between variables X1, X2 and X3 to the Y and its impact on Z (Retherford 1993). Path analysis also aims to provide a model estimates the level of interest (magnitude) and significance (significance) hypothetical causal relationship in a set of variables. The model is illustrated in the form of a circle and an arrow image where a single arrow indicates the cause. Regression imposed on each of the variables in a model as the dependent variable (donor response) while others as the cause. Weighting regression predicted in a model that compared with the observed correlation matrix for all variables and also counting tests conducted statistical alignment [8].

3. RESULT AND DISCUSSION

A. Factor Analysis

From the results of the factor analysis produced that in each group (planning, management, delivery, physical, and contractual) produced two (2) factors that qualify as illustrated in Table 1 attached.

B. Path analysis

By means of the same analysis for the group Planning, Management, Delivery, Physical, and structural equation Contractual then each group is as follows:

$Y = 0{,}323X_5 + 0{,}312X_6 + 0{,}323X_9 + 0{,}240X_{19} + 0{,}823e_1$ .....(equation1)

$Y = 0{,}305X_2 + 0{,}412X_{41} + 0{,}250X_{52} + 0{,}767\ e_2$ .....(equation 2)

$Y = 0{,}282X_{24} + 0{,}330X_{46} + 0{,}548X_{49} + 0{,}672e3$ .....(equation 3)

$Y = 0{,}434X_{32} + 0{,}221X_{33} + 0{,}408X_{40} + 0{,}752\ e_4$ .....(equation 4)

$Y = 0{,}234X_{55} + 0{,}326X_{61} + 0{,}341X_{67} - 0{,}515X_{68} + 0{,}335X_{69} + 0{,}294X_{72} + 0{,}212X_{74} + 0{,}812\ e_5$ .....(equation 5)

$Y = 0{,}315X_5 + 0{,}330X_6 + 0{,}225X_9 + 0{,}317X_{19} + 0{,}819\ e_1$ .....(equation 6)

$Y = 0{,}297X_{17} + 0{,}266X_{18} + 0{,}418X_{41} + 0{,}277X_{52} + 0{,}763\ e_2$.....(equation 7)

$Y = 0{,}313X_{24} - 0{,}209X_{28} + 0{,}297X_{29} + 0{,}294X_{46} + 0{,}470X_{49} + 0{,}728\ e_3$.....(equation 8)

$Y = 0{,}339X_{16} + 0{,}566X_{40} + 0{,}630\ e_4$ .....(equation 9)

$Y = 0{,}242X_{55} + 0{,}252X_{61} + 0{,}198X_{63} + 0{,}315X_{67} - 0{,}432X_{68} + 0{,}371X_{69} + 0{,}208X_{72} + 0{,}793e_5$.....(equation 10)

$Y = 0{,}379X_4 + 0{,}326X_6 + 0{,}269X_{19} + 0{,}788e_1$ .....(equation 11)

$Y = 0{,}294X_{17} + 0{,}349X_{18} + 0{,}419X_{41} + 0{,}192X_{52} + 0{,}762\ e_2$.....(equation 12)

$Y= 0,336X_{23}+0,300X_{24}-0,314X_{28}+0,401X_{29}$
$+0,343X_{49}+0,774e_3$.....(equation 13)

$Y= 0,484X_{30} + 0,474X_{40} + 0,718\ e_4$
.....(equation 14)

$Y= 0,224X_{55} - 0,315X_{62} + 0,561X_{63} - 0,259X_{65}$
$+ 0,275X_{67} – 0,456X_{68} + 0,516X_{69}$
$+ 0,318X_{72} + 0,561\ e_5$.....(equation 15)

In general, the study found 31 species of 74 risks were identified which direct and significant impact on the performance of the project PBC, namely:

1. Changes in Policy
2. Maintain a private access road and pedestrian
3. Area buildup and discharge
4. The land use agreement
5. Acquisition of land
6. The impact of traffic overloading
7. Renewal of the surface of which was completed by another contractor
8. Performance of design work, construction and maintenance contractors completed
9. The accuracy and completeness of the information asset inventory of government
10. Maintenance monitoring utility that the other contractors who are reported to service users
11. All full approval as required jobs
12. Visual inspection and reporting of routine bridge
13. Visual inspection and routine reporting of post-flood bridge
14. Cleaning bridge
15. Maintenance of the bridge surface protective layer
16. Maintenance of bridges and other wood components other than sight / handrail.
17. Maintenance resting facilities for heavy vehicles
18. Recovery work funded as agreed emergency work
19. Response to the safety and convenience of the location of the job
20. Management encroachment disturbing lines and other maintenance work
21. Use of resources for traffic control at a time of public events
22. Unclear scope of work for not following annwijzing
23. Disputes concerning the responsibility of drawing designs, implements selected and maintenance supervisors who require permission
24. Potential inconsistencies implicit service users can make changes.
25. Unclear predetermined program flow.
26. The difference in perception about the delay of work.
27. The difference in the understanding of the sub-contract.
28. The inconsistency of construction failure.
29. Recommendations team project management / contract.
30. Unclear informal information about the level of service.
31. The difference in the perception of the phrase "provisions have not been implemented" in the contract documents.

Based on the risk group there are 5 risk planning, 5 risk management , 6 risk delivery, 5 phisyical risk Asset and 10 types of risk contractual significant effect and partially to each performance. Of the 31 risks identified, there were 12 risk factors identified direct and significant impact on all aspects of project performance with a performance-based contract. (cost, quality and time), namely:

1. Area buildup and discharge.
2. Acquisition of land.

3. Maintenance monitoring utility that other contractors are reported to service users.
4. All full approval as required jobs.
5. Visual inspection and routine reporting of post-flood bridge.
6. Maintenance resting facilities for heavy vehicles.
7. Use of resources for traffic control at a time of public events.
8. Unclear scope of work for not following annwijzing.
9. The difference in the understanding of the sub-contract.
10. The inconsistency of construction failure.
11. Recommendations team project management / contract.
12. Obscurity informal information about the level of service

4. CONSLUSION

1. This study has identified 31 risk factors made up of 5 risk planning, 5 risk management , 6 risk delivery, 5 risk physical asset and 10 contractual risks.
2. Of the 31 risks identified, there were 12 risk factors identified direct and significant impact on all aspects of project performance with a performance-based contract.
3. From the resulting path analysis Empirical Model in the form of 15 structural equations that prove the hypothesis of the relationship between risk and performance cost, time and quality.

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