Development Of Risk-Based Audit Method Standard For Stadium Project Using Design And Build Contract To Minimize Dispute From Construction Management Point Of View

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Abstract.

The Design and Build method have been widely used in government projects in recent years. The construction of a sports stadium is one type of project that uses an integrated contract. Design and build, which is considered to have high complexity and is urgent, so the use of the Design and Build method is expected to provide a solution in the implementation of the project. However, in implementing the integrated design and construction contract, there are still many disputes from stakeholders involved such as Inspection of Work Results. This study aims to identify the factors that cause dispute in the Design and Build project and develop a Standard for Inspection of Work Results from the perspective of Construction Management. The results of the study indicate the factors causing the dominant risk-based dispute as well as corrective action in the form of standard inspection of work results on construction projects.

Keywords: *Project Management, Design and Build, Standards for Inspection of Works, and Construction Management and Dispute.*

I. INTRODUCTION

Based on the increasing trend of using design and build contracts in infrastructure projects, it is necessary to evaluate the implementation of these contracts. The design and build contract are expected to minimize disputes. In fact, it causes 8% more disputes than conventional contracts, as well as the characteristics of infrastructure projects which in fact cause 9% more disputes than private projects. Although disputes are unavoidable in a construction project, disputes should be minimized by carrying out contract management in accordance with the nature of the project and the nature of the contracts used, namely infrastructure projects with design and build contracts. One of the causes of disputes in design and build construction projects is the quality of the work of contractors or service providers that do not meet the criteria and specifications. The number of findings from the KPK (Corruption Eradication Commission) and BPK (Financial Audit Agency) in terms of the quality of work results on sports stadium project buildings is due to the lack of standardization of work results inspection methods in the audit process. The purpose of this research is to compile audit processes and activities for stadium building for DB contracts; to categorize the risks to obtain the dominant risk that occurs in each audit activity can be identified; Develop an audit process for stadiums building based on dominant risk factors and mitigating the risks in order to reduce disputes in DB type of contract.

II. METHODS

The methodology carried out for this research included study literature, analytical, validity, reliability, and descriptive-analytical tests, through four steps of data collection (1) study literature (2) Focus Group Discussion with expert from Construction Management (3) pilot survey, (4) questionnaire, (4) expert validation, and (5) final expert validation. Furthermore, the data analysis was conducted using SPSS.

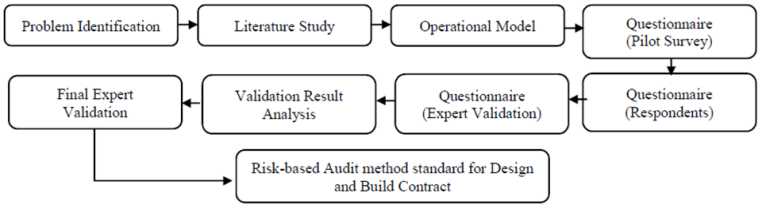

Fig 1. Flow Diagram

III. RESULT AND DISCUSSION

A. Audit Process

Literature study related to the audit process and activities for the stadium project was conducted and a forum group interview has been done, using a questionnaire as an instrument used to obtain expert validation afterwards, the analysis is carried out so that the audit process and activities for DB is obtained. The result is that there are 67 audit activities from 28 process which are included into 4 phases as shown in the Table:

Table 1. Audit Process

No	Audit Process
I	**Inspection Proced**
1.	Identification of Needs
2.	Preparation and Determination of Budgeting Plan
3.	General Policy Determination – Work package
4.	General Policy Determination – Procurement Method
5.	General Policy Determination – Procurement Organization
6.	Preparation of Term of Reference
7.	Announcement of General Procurement Plan
II	**Audit Contract Selection Procedure**
8	Audit Contract Selection Procedure
9	Review of general procurement plan
10	Preparation and determination of procurement implementation plan
11	Selection of procurement system
III	**Contract Execution Inspection Procedure**
12	Contract Documents
13	Implementation Preparation
14	Implementation of Field Work
15	Quality Control
16	Control of quantity/volume of work
17	Monitoring execution schedule of work
18	Time extension
19	Addendum
20	Suspension and termination of contract
21	Late charge
22	Adjustment for Changes in Cost
23	Guarantee
IV	**Work Handover Inspection Procedure and Maintenance Period**
24	Inspection of Construction Work Results
25	First Handover
26	Timely completion of work packages
27	Maintenance period
28	Second Handover

B. Risk Categories and Dominant Factors

The risk categories and dominant risk factors that occur in each activity is gathered from literature study there are 88 risk factors on the DB audit process and activities referring to references journal then the questionnaire was sent to 30 respondents after having validation process on the variables and pilot survey were done. The way to determine this priority order is by giving weight to each of the frequency and impact criteria. Then the average result on the frequency weighting value is multiplied by the average result on the impact weighting value to determine the level of risk. Following is the summary of the high-risk results:

Table 2. Risk Category

Variabel	Risk Detail	Category
X1. Owner Management Ability		
X1.1	Setting a very tight project schedule by the owner / unrealistic project schedule	High
X1.2	Availability of special owner personnel to handle Design and Build work	Moderate
X1.3	Owner planning experience in making Design and Build Terms of Reference (TOR).	High
X1.4	Understanding of the owner in determining the duration of the implementation of Design and Build work	High
X1.5	The owner's ability to evaluate the results of the develop design submitted by the executor	High

Variabel	Risk Detail	Category
X1.6	Planning work sequence plans that are not well structured	Moderate
X1.7	The desire of the owner to provide input on the design of the work	High
X1.8	The quality of the owner's communication with the design team at the time of developing the design	High
X1.9	Availability of accompanying experts, Construction Management (MK) consultants, to assist the owner during the implementation of Design and Build work	High
X1.10	The owner's desire to make changes during implementation	Very High
X1.11	The owner's understanding in calculating the budget for design and build work costs, or also budget inflation due to unrealistic prices	High
X1.12	Budget limitations owned by the owner / budget are not provided	Very High
X1.13	Limited authority of the personnel owner in decision making	Moderate
X1.14	Experts with appropriate educational background	High
X1.15	Regulations that apply to the success of the project	High
X1.16	Good managerial organization for project success	High
X1.17	The ability of experts in carrying out their duties, or also experts do not have a certificate of expertise	Moderate
X2. Procurement Process		
X2.1	The owner sided with/leads to a certain group/executor/company	High
X2.2	Availability of experienced Design and Build company	Moderate
X2.3	Insufficient technical assessment criteria in assessing the qualifications of bidders	High
X2.4	Delays in the process of making contract documents	High
X2.5	Time available to bidders to prepare tender bids	Moderate
X2.6	Time available for the owner and tender committee to evaluate documents from Design and Build bidders	High
X2.7	The price negotiation process does not take into account the fairness of the bid price	High
X2.8	Delays in the tender process	High
X2.9	The announcement of the tender is not clear/complete, for example it does not mention the qualification requirements, location and estimated cost of the work	High
X2.10	Uploaded tender documents are incomplete and/or fragmented and/or changed without providing adequate information	High
X2.11	Selection of the procurement method is not in accordance with the provisions	Moderate
X2.12	The choice of evaluation method does not comply with the provisions	Moderate
X2.13	In giving the explanation the committee did not answer the questions asked by the participants.	Moderate
X2.14	No follow-up / field explanations were carried out for the information that should have been given to the participants.	Moderate
X2.15	There is no winner announcement	Moderate
X3. Planning Skills		
X3.1	Announcement of winners is not transparent to all bidders and the public	High
X3.2	Design team experience in making designs on Design and Build work	High
X3.3	The design team's understanding of the design requirements requested by the owner is in accordance with the KAK	High
X1.4	The design team's understanding of the applicable regulatory standards	High
X3.5	Understanding of the design team in estimating the duration of time for each activity in design and build work	High
X3.6	Understanding of the design team in estimating the cost of carrying out design and build work	High
X3.7	Communication between personnel involved in carrying out design and build work, both among the design team's own personnel and with the physical execution team	High
X3.8	The design team's understanding of the design changes requested by the owner during the development design	High
X3.9	Enter the contractor to the design team (building knowledge) during the development design	High
X3.10	Delays in reaching a design agreement at the time of developing design, caused by differences in the perception of the owner and the design team	Moderate
X4. Execution Ability		
X4.1	Job suitability with educational background	High
X4.2	Contractor experience in carrying out design and build work	High
X4.3	Contractor competence in carrying out design and build work	High
X4.4	Contractor's cash flow ability to carry out design and build work	High

Variabel	Risk Detail	Category
X4.5	The contractor's understanding of the develop design that has been mutually agreed upon between the design team and the owner	High
X4.6	Availability of equipment and machinery for contractors to carry out design and build work	High
X4.7	Contractor's ability in project management (HR, finance, K3, etc.)	High
X4.8	Coordination and communication between divisions within the contractor's work organization	High
X4.9	The suitability of the number of human resources with existing jobs	High
X4.10	Contractor's ability to manage capacity and quality control of design and build work	Moderate
X4.11	Job suitability with educational background	High
X4.12	Delays in receiving material at the time of execution of work	High
X4.13	The occurrence of damage or theft of equipment, materials and other project facilities during the execution of the work	Moderate
X4.14	There was a work accident during the execution of work	Moderate
X4.15	There is no supervision during the fabrication of the material	Moderate
X4.16	Difficulty in access to the project location during the execution of the work	High
X4.17	The implementation method is not in accordance with field conditions	High
X4.18	There were problems during the foundation pile drilling work	High
X4.19	Poor quality of subcontractors	Moderate
X4.20	Material damage during delivery	Moderate
X4.21	Traffic congestion	High
X4.22	The quality of the work relationship between the contractor and the owner	High
X4.23	Negligence and delay on the part of subcontractors	Moderate
X4.24	Erroneous design that led to job changes	Moderate
X4.25	The determination of the price of foreign exchange rates for components of imported goods is floating.	High
X4.26	Execution of work that is not in accordance with the terms of the contract such as the volume of work that is not in accordance with the contract, the quality of the work does not comply with the technical specifications in the contract / low quality of work, and the completion of work is late.	High
X4.27	Reporting is not implemented or implemented but not in accordance with the circumstances / incomplete / not in accordance with the rules	Moderate
X5. Project Manager Ability		
X5.1	After-sales guarantee cannot be realized	High
X5.2	Project manager experience in carrying out design and build work	High
X5.3	Project manager experience in selecting personnel involved for design and build projects	High
X5.4	Project manager experience in carrying out the division of tasks and responsibilities	High
X5.5	Project manager experience in scheduling all work activities	High
X5.6	The ability of the project manager to communicate and coordinate with the owner during design and build work	High
X5.7	The ability of the project manager encourages his entire team to commit to quality, cost and time of design and build work	High
X5.8	The ability of the project manager to schedule monitoring and control meetings during design and build work	High
X5.9	The project manager's ability to communicate and coordinate with his team including subcontractors during design and build work	High
X5.10	Project manager competence in carrying out design and build work	High
X6. Project Scope		
X6.1	Project manager skills in leadership and motivating his team	High
X6.2	Compliance with design specifications standards	High

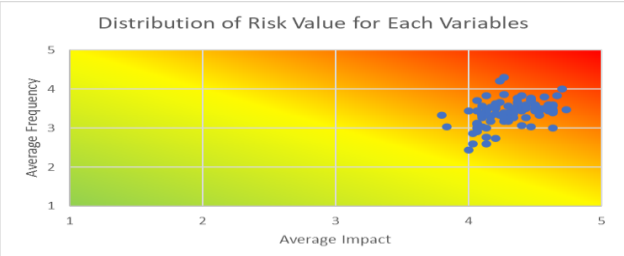

Fig 2. Distribution of Risk Value

The last analysis to be carried out is regression analysis. Regression analysis is a method used in statistics to show the effect or relationship between the independent (independent) variables on the dependent (dependent) variable. In this study, the dependent variable is variable Y (Dispute), which is a variable whose value depends on the value of the independent variable, namely variable X (Risk). The results of the regression analysis will be in the form of an R value which is a symbol of the coefficient of determination. R value2 or RSquare will show how much influence is formed by the interaction of these variables on the dependent variable. In this study, the effect of the X value will be grouped or categorized based on predetermined risk categories. As for the dependent variable isDispute which consists of Y1 (Behavior or actions that are carried out consciously and planned or due to ignorance that deviate from the work contract resulting in losses) and Y2 (There are ambiguities or differences in contracts, implementation that is not in accordance with the contract and related to payment). Regression analysis was performed using an application programsoftware SPSS via logistic binomial regression. Logistic binomial regression was used because in this study there were 2 dependent variables (Y1 and Y2). The following are the regression results for each risk category (X),

Table 3. R-Square Result

No.	Risk category	Coefficient of Determination (R2)
1.	Owner Management Capability	0.551
2.	Proses Procurement	0.406
3.	Planning Ability	0.382
4.	Execution Capability	0.706
5.	Project Manager capabilities	0.107
6.	Project Scope	0.491

The value of the coefficient of determination can be interpreted in terms of the percentage of influence on the dependent variable with the largest value of 100%. If the coefficient of determination is below 100%, then the remaining percentage is influenced by other factors, in this case other risk categories. Based on the value of the coefficient of determination resulting from the regression analysis with SPSS, X4 (Execution Capability Process) and followed by X1 (Owner Management Capability) and so on. Of the six risk categories, the Procurement Process and Project Scope have moderate influence (0.40<R2<0.60) based on R value2 and Planning Ability (0.20<R2<0.40) classified as having a small effect and the rest had a very small effect (0.00<R2<0,20).

IV. CONCLUSION

This study aimed to develop a risk-based audit method standard for Design and build contract which will be used in the construction of stadium projects. It can be concluded as the result from literature study, questionnaire and expert validation, there are 28 audit process and 67 audit activities for DB contract from Construction Management's point of view; There are 6 risk categories and 61 dominant risk indicators that affect the dispute on audit process in the design and build contract for stadium projects; This is based on the risk value which is the multiplication of the frequency and impact of each risk. Based on the regression value, the risk category that has the greatest influence value is based on the coefficient of determination (R2) is X4 (Ability to Execute) with a value of R2 of 0.706 and continued with X1 (Owner Management Ability) with a value of R2 of 0.551; Future direction of this research will be to obtain expert validation on the risk path mapping for dominant risks and the mitigation on each audit activities which could be used for audit standard method in the Design and Build contract as it could help the auditor using it as a standard to avoid dispute during audit process in stadium project.

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