Risk Identification in Procurement of Precast Façade on High Rise Buildings in Jakarta

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Abstract. This research aims to identify risks in the procurement façade precast phase in buildings in Jakarta. In this research, there are three phases of procurement based on PMBOK that is planning, implementation, and management. The problem in this research is to be able to know and identify the cause of the risk of procurement façade precast on high rise buildings in Jakarta and to know the façade precast wall characteristic in buildings. The research object is a building in Jakarta area. The test conducted in this study is validity with Expert Judgement, factor test, regression test and model test with the help of SPSS 23 program. Obtained 38 risk variables based on data collection through the study of the library. Furthermore, the correlation test and intercorrelation are only obtained 12 variables that worth to used. Based on the results of analysis conclusions, of the 3 factors and 38 risk variables that affect project completion performance. The most dominant or significant risk has been obtained: X9 = design planning, X31 = the existence of rework, X16 = location of difficult sites, X14 = transportation and delivery problems.

Keywords: Risks Identification, Procurement, Precast Façade

1. Introduction

With the rapid development of technology in the construction world that produces new innovations used by construction services (contractors) to be used in construction development to be more practical so that it can influence of quality, cost and time. One of the advancements that have been widely used are concrete precast products. According to Ervianto, (2006) There are several obstacles that must be considered in precast concrete work namely, a) technology, b) materials, c) human Resources, D) planning, E) logistics, F) production, g) carriage and distribution, and h) installation and Repair. With these constraints, precast concrete work can be the right choice or can be a very big problem when applying the precast concrete in a high-rise building in Jakarta. This is because, such as planning factors, time, coordination between interests, transportation and distribution carried out in precast concrete is in need of careful planning so that it can produce concrete precast procurement Positive impact on construction projects. The subject matter in this study is to identify risks and know the precast character of the building's façade precast in Jakarta. This is the basis of the problem of this research to identify the most significant risks in procurement façade precast in buildings in Jakarta.

2. Research Methodology

2.1. Research Process

The research uses primary data and secondary data. Primary Data obtained from contractors are directly involved in the procurement of façade precast. Meanwhile, for secondary data obtained from various references related to this research such as research journals, books as well as from previous research data. Research Instrument
2.2. Factor and Variables

Factors and Variable risk management procurement is obtained from the information of some experts directly related to the procurement of façade precast and literary sources such as scientific journals, previous research, textbooks that refer to PMBOK (6th Edition) etc.

3. Results and Discussions

3.1 Risks Identification

In the analysis phase is validation with experts to get a more significant variable to this study, as for 38 variables there are only 31 variables that deserve to be a risk variable based on the experts. The following are the validation results of the risk variables:

| No | Variabel Risiko                                      |
|----|------------------------------------------------------|
| A  | Planning process                                    |
| A1 | Contract Value                                      |
| A2 | Material types are not clearly defined in the contract |
| A3 | Contract clause incomplete                         |
| A4 | Weak coordination with suppliers                    |
| A5 | Specification requirements of Owner                 |
| A6 | Specification changes that affect manufacturing      |
| A7 | Scope of work is not clearly defined                 |
| A8 | Approximate accuracy of material quantities          |
| A9 | Design planning                                     |
| A10| Quality of materials used for the construction       |
| A12| Cost estimation Error                               |
| A13| Less good process of procurement document supervision|
| B  | Implementation process                              |
| B14| Transportation and shipping problems                 |
| B15| Tender process and contract type                     |
| B16| Difficult site location                             |
| B17| Delays in material delivery caused by bad weather    |
| B18| Material damage when delivery by supplier to Contractor|
| B19| Inconformity between the amount of material sent by the supplier to the contractor with the number of requests from the contractor |
| B20| Quality mismatch/material quality sent by supplier to the contractor to the quality standards according to the specifications on the contract |
| B21| Lack of information about company vendors            |
| B22| The onset of congestion around project locations     |
| B23| Failure in material delivery caused by traffic accidents|
| B24| Supplier fault                                      |
| C  | Control process                                     |
| C25| Availability of equipment                           |
| C26| Lack of coordination between parties involved in the |
| C27| Adding jobs by Owner                                |
| C28| Very strict procurement schedule of materials and equipment |
| C29| Schedule changes in job execution                   |
| C30| Material availability                               |
| C31| Rework                                              |

3.2 Risks Analysis
From the results of expert validation then analysis on the results of the questionnaire by conducting regression factor test and model test, the following is the result of the test conducted with the help of SPSS 23:

### 3.2.1 Correlations test
The following is a variable correlation test Result:

| Table 2 Correlations test results |
|-----------------------------------|
| Factor | Variable | Description | R Count |
| Planning | X4 | Weak coordination with suppliers | 0.417 |
| | X6 | Specification changes that affect manufacturing | 0.418 |
| | X9 | Design planning | 0.532 |
| | X14 | Transportation and Ammisdelivery | 0.448 |
| | X16 | Difficult site location | 0.520 |
| | X17 | Delays in material delivery caused by bad weather | 0.470 |
| Implementation | X18 | Material damage when delivery by supplier to Contractor | 0.487 |
| | X19 | Inconformity between the amount of material sent by the supplier to the contractor with the number of requests from the contractor | 0.401 |
| | X22 | The onset of congestion around project locations | 0.625 |
| | X26 | Transportation and shipping problems | 0.540 |
| Management | X30 | The frequency of coordination meetings between the parties involved in the | 0.632 |
| | X31 | Rework | 0.632 |

### 3.2.2 Factor Analysis
The value obtained in KMO Measure of Sampling Adequency should be > 0.5 so that the factor analysis can be processed for further. The significance value in Bartlett's test should show the number of < 0.05 so that factor analysis can be done. Here is the table of KMO-MSA analysis result factor:

| Table 3 KMO and Bartlett Factor Analysis Results |
|--------------------------------------------------|
| KMO and Bartlett's Test |
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | .688 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 105.352 |
| df | 55 |
| Sig. | .000 |

Based on the results of the analysis in the table above, the value of KMO obtained is 0.688, at the value of KMO obtained the value of > 0.5 which means for factors analysis can be conducted.

### 3.2.2.1 Total Variance Explained
The following are test results of Total Variance Explained:
### 3.2.3 Regression Analysis

In the regression model selection, the method used is the Stepwise method. The About regression procedure is one of the best predictor variable selection procedures. The following is the result of regression analysis using about methods:

#### Table 4 Regression Model Selection Results

| Model | R   | R Square | Adjusted R Square | Std. Error of the Estimate |
|-------|-----|----------|-------------------|----------------------------|
| 1     | .795*| .632     | .620              | .30934                     |
| 2     | .843*| .711     | .693              | .27809                     |
| 3     | .881*| .777     | .755              | .24838                     |
| 4     | .899*| .808     | .782              | .23427                     |

Based on table 4 results above, get 4 regression models that are the result of the Stepwise method analysis. The model which has the largest R Square value is Model 4 which is 0.808 with variables X9, X31, X16 and X14.

#### 3.2.3.1 Autokorelasi Test

The following is the value of Durbin Watson obtained with the help of SPSS 23 program:

#### Table 5 Autocorrelation test Results

| Model | R   | R Square | Adjusted R Square | Std. Error of the Estimate | Durbin-Watson |
|-------|-----|----------|-------------------|----------------------------|---------------|
| 1     | .795*| .632     | .620              | .30934                     | 2.221         |
| 2     | .843*| .711     | .693              | .27809                     |               |
| 3     | .881*| .777     | .755              | .24838                     |               |
| 4     | .899*| .808     | .782              | .23427                     |               |

According to table 5, the results of Durbin Watson were obtained by 2.221. This value states that the value is still within the limit of the stated range of 1.2833 – 2.7167 and 1.65282 – 2.3471. Therefore, it can be said that the model is free from autocorrelation.

#### 3.2.4 T-test

The calculated T values can be seen in table 6:
### Table 6 T test Results Coefficients

| Model | Unstandardized Coefficients | Standardized Coefficients |
|-------|-----------------------------|---------------------------|
|       | B | Std. Error | Beta | t | Sig. |
| 1     | (Constant) | 1.053 | .471 | 2.236 | .032 |
|       | X9 | .789 | .105 | .795 | 7.521 | .000 |
| 2     | (Constant) | .122 | .526 | .231 | .819 |
|       | X9 | .659 | .104 | .664 | 6.337 | .000 |
|       | X31 | .325 | .109 | .311 | 2.972 | .006 |
| 3     | (Constant) | -.761 | .554 | -1.374 | .179 |
|       | X9 | .614 | .094 | .618 | 6.519 | .000 |
|       | X31 | .306 | .098 | .294 | 3.133 | .004 |
|       | X16 | .259 | .086 | .262 | 3.018 | .005 |
| 4     | (Constant) | -.993 | .533 | -1.864 | .072 |
|       | X9 | .568 | .091 | .572 | 6.234 | .000 |
|       | X31 | .277 | .093 | .266 | 2.981 | .006 |
|       | X16 | .207 | .084 | .209 | 2.451 | .020 |
|       | X14 | .177 | .080 | .198 | 2.202 | .036 |

### 3.2.5 Regression equation

Based on table 6 above, acquired regression equation as follows:

\[ Y = -0.993 + 0.568X9 + 0.277X31 + 0.207X16 + 0.177X14 \]

With:
- \( Y \): Project Alignment time performance
- \( X9 \): Design Planning
- \( X31 \): Rework
- \( X16 \): Difficult site location
- \( X14 \): Transport and delivery problems

### 3.3 Façade Precast CharacterISTICS in Building

Based on the results of the library studies, previous journals and analysis with experts, obtained by precast façade wall characters, namely:

a) Planning precast façade walls should be done very closely in line with dimensions, distance and connection/joint details, this is due to the level of precision or accuracy when installation can be achieved.

b) Flexibility in the process of scaffolding (can be in production according to needs).

c) The continuity of production is not disrupted by weather.

d) Good quality of concrete can be produced easily because the production is done in the factory with a better level of quality control.

e) Planning on transportation/transport should be done properly and properly due to the high level of difficulty in the process of transporting from the factory to the project site that could cause damage during travel.

f) Accelerate the process of implementing work on the building façade.

g) Require additional technical equipment for the installation process and transporting precast panels.
h) High difficulty level in the installation process.

Based on the research results, façade precast have a character that can positively or negatively impact a project. The precast façade walls have a favorable outcome as well as the implementation of it.

4. Conclusion
The conclusions of this research are:
1. Of the 3 factors and 38 variable risks that affect project completion performance. The most dominant risk analysis results are:
   a) X9 = Design Planning
   b) X31 = Rework
   c) X16 = Difficult site location
   d) X14 = Transport and delivery problems
2. As for the precast character building façade walls are as follows:
   a) planning precast façade walls should be done very closely in line with dimensions, distance and connection/joint details, this is due to the level of precision or accuracy when installation can be achieved.
   a) Flexibility in the process of scaffolding (can be in production according to needs).
   b) The continuity of production is not disrupted by weather.
   c) Good quality of concrete can be produced easily because the production is done in the factory with a better level of quality control.
   d) Planning on transportation/transport should be done properly and properly due to the high level of difficulty in the process of transporting from the factory to the project site that could cause damage during travel.
   e) Accelerate the process of implementing work on the building façade.
   f) require additional technical equipment for the installation process and transporting precast panels.
   g) High difficulty level in the installation process.

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