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# The Delay Analysis of State Building Construction Projects in South Kalimantan Province

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**Abstract: The success of a project is influenced by performance of each component executive jobs include project owner. Based on nature and objectives, each involve component has different interests, which if not managed optimally would be a potential for the occurrence of disputes in various forms and complexities that can potentially towards increased construction costs and delay completion of the work. Projects are experiencing delays that often recurs in the aspect that influenced and influencing factors. The purpose of this study is to identify the factors that cause delays construction project building government of South Kalimantan Provincial. This research was conducted to find out what factor construction works late and what factors have the most influence works late on construction project building government which financed by SBSN budged in South Kalimantan Provincial. The research method used in this research is a survey research method with a questionnaire media. Data taken previous research and from reconnaissance survey direct speech with expert persons. While the analysis method uses the Relative Importance Index (RII) method. This analysis that study about factor have the most dominant from 50 (fifty) indicators causes works late. From this analysis we know that there are 34 (thirty-four) factors cause construction building of government lates, there are 8 (eight) factors that most influence on construction building of government lates, and there are 8 (eight) mitigation strategies has validation with experts/professional. The strategy most emphasized by experts is the need to use BIM (building information modeling) technology, to conduct regular socialization, and to provide technical guidance or similar events that discuss mitigation strategies in contract control and project management.**

***Keywords:*** *Procurement of Goods and Services; Construction; Relative Importance Index; Construction Works Late.*

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## I. INTRODUCTION

Delays in construction projects can be caused by errors in estimating the time required to complete the project in the planning stage, or by various other possibilities, such as improper management, material issues, labor, equipment, finance, and an unsupportive environment, resulting in project delays. Project delays will result in time and cost losses for contractors. For owners, delays in project completion will cause losses in the time of building operation, which will be delayed. In timely construction project implementation, it can be ensured that both parties benefit. Therefore, good companies will always strive to implement according to the set time or try to minimize delays by choosing the necessary corrective actions and making decisions based on an analysis of various delay factors (Putri & Yuliana, 2025).

This research will analyze the construction work projects of state buildings financed from the State Sharia Securities (SBSN) within the scope of the Regional Office of the Ministry of Religious Affairs of South Kalimantan Province, totaling 10 work packages, which focus on work packages that only experience a minus deviation of more than 10%. In 2024, there are three work packages for school building construction projects that have a minus deviation of more than 10%, where package A is -10.42% in the 10th week out of 150 calendar days, package B is -25.82% in the 10th week. In general, delays that occur in building project work are often raised but still recur, due to the lack of human resources who are really capable of managing in contract control. Previous research only discussed one focus of work projects, general buildings, and were directly financed by the project owner, but this research was raised because there are differences in work packages that not only focus on one research location, but also in terms of financing, which is financed by State Sharia Securities funds lowered by the Ministry of Finance with the SBSN (State Sharia Securities) financing mechanism, this work package is not common because the building will become a state asset (not directly handed over to the beneficiary like other grant work packages) because it is a capital participation from the central

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government, so it must be maintained by the local government where the project is located and will be the responsibility of the local government. Not all state buildings are financed by SBSN funds, which have special criteria and requirements that must be met first before getting the flow of these funds. On the other hand, the constructed buildings and land become state assets because they are built with SBSN funds.

If delays occur, let alone to the point of contract termination, the impact is not only on the blacklisted service providers for 2 (two) years, but also on the user (owner) and the beneficiary who will not get the physical project for the next 2 (two) years. The appointed PPK is an employee of the regional office of the relevant ministry who receives the SBSN funds, while the PPK in that agency is not a human resource with experience in the field of engineering/construction even though they already have a level 1 procurement of goods and services certificate. Due to the large number of agencies and human resources involved in the construction of these school buildings, the more risks that will occur. Therefore, this research is written to provide an understanding of how human resources related to contract control, contract management and provide mitigation strategies to mitigate the risks that will occur.

## II. RESEARCH METHOD

➢ *Preliminary Study*

In this research, there are two stages of grouping. The first stage is to group the factors causing work delays based on the results of previous research and the results of a preliminary survey from direct interviews with experts or experts to obtain instrument variables that are above 50% of 3 respondents, where 2 respondents stated agree then it is considered above 50% and is considered to have an influence on the delay of construction work, if only 1 agrees then it is considered below 50% and is not stated to have an influence on the delay of construction work. The second stage is the grouping of factors to determine the most dominant variables by distributing the second survey questionnaire using the Likert scale measurement method which is distributed to the parties involved from the owner and service provider side in the SBSN construction work within the scope of the Regional Office of the Ministry of Religious Affairs of South Kalimantan Province.

➢ *Data Analysis*

After the data from the questionnaire has been collected, it is then tabulated and tested. After that, an analysis is carried out using the Relative Importance Index (RII) formula. Where the highest RII value is given the first rank, which means that this factor is the most dominant factor in that category. Only the highest ranking (rank 1) in each category will undergo the next process. So there are 8 (eight) variables that are stated as the most dominant factors, then the dominant factors of each variable in each category obtained will be cross-checked with the results of observations and interviews. In addition, direct field observations with direct questions to the project actors concerned through interviews to cross-check the dominant factors in order to ensure that this is the dominant factor causing the delay in construction work. The most dominant variables with the highest values in each category are used as variables for which mitigation strategies are made.

Table 1 RII Value

| Nilai RII | Categories |
|---|---|
| 0,000 – 0,199 | Extremally Not Important |
| 0,200 – 0,399 | Not Important |
| 0,400 – 0,599 | Enough |
| 0,600 – 0,799 | Important |
| 0,800 – 1,000 | Very Important |

➢ *Mitigation Strategy*

After obtaining the dominant factors causing delays from data analysis, the next step is to formulate a mitigation strategy proposal. The strategy is made by considering the results of the questionnaire, observations and interviews. Then the proposed mitigation strategy will be validated by experts or experts to be used as consideration in refining the proposed strategy made so that it can better mitigate the risks in contract control. The method used is direct interviews with experts accompanied by discussions to obtain solutions or strategies for the findings of this research.

➢ *Validity and Reliability Test*

The validity test is a test conducted to measure the ability of the instrument to answer research questions or objectives. The higher the validity of the instrument data, the higher the relationship between the research objectives. Where, the higher the validity of the instrument data, the higher the relationship between the research objectives. The test results are checked using the Spearman's Rank correlation formula to calculate the correlation between the item score and the total instrument score. according to equation (1).

$$r_s = \frac{6\,\Sigma\, d^2}{N\,(N^2 - 1)} \quad (1)$$

Where $r_s$ is the Spearman correlation, d is the difference between X and Y, N is the number of pairs (data). Validity testing in research using the SPSS program has a significance level of 5% (Santoso, 2014). According to (Sugiyono, 2017), the following are the requirements that must be met in the validity test calculation:

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- If r count > r table, then the statement from the questionnaire is declared valid.
- If r count < r table, then the statement from the questionnaire is declared invalid so it must be repaired or changed.

The reliability test is used with the Alpha Cronbach test, according to equation (2).

$$r_{11} = \left(\frac{k}{n-1}\right)\left(1 - \frac{\Sigma S_b{}^2}{S_t{}^2}\right) \quad (2)$$

Where $r_{11}$ is the instrument reliability, k is the number of questionnaire items, $\sum Sb$ 2 is the sum of the item variances, and St 2 is the total variance (Asrul, et al., 2015, p.146). The Alpha Cronbach test is measured on a scale of 0 to 1. If the scale is grouped into five classes with the same range, then the measure of the reliability coefficient alpha cronbach can be interpreted.

Table 2 Coefficient Interval

| Number | Coefficient Interval | Reliability Level |
|---|---|---|
| 1 | 0,000 – 0,199 | Very Low |
| 2 | 0,200 – 0,399 | Low |
| 3 | 0,400 – 0,599 | Enough |
| 4 | 0,600 – 0,799 | Stong |
| 5 | 0,800 – 1,000 | Very Strong |

The instrument is said to be reliable if r_(hitung) is greater than or equal to r_(tabel). If r_(hitung) is smaller than r_(tabel) the instrument is said to be unreliable or the r_(hitung) value is consulted with the r interpretation table with the provision that it is said to be reliable if r_(hitung) ≥ 0.6. Reliability testing is carried out with the help of the SPSS program.

## III. RESULT AND DISCUSSION

➢ *Research Respondents*

Data collection was carried out qualitatively by conducting interviews and observations with respondents including the service user (owner) and service provider for SBSN work within the scope of the Regional Office of the Ministry of Religious Affairs of South Kalimantan Province, namely KPA, PPK, Technical Team, Technical Management Team consultant supervisor, and executor/contractor.

Table 3 Research Respondents

| No | Unsur | Jumlah | Prosentase |
|---|---|---|---|
| 1. | KPA | 2 | 6,67% |
| 2. | PPK | 3 | 10% |
| 3. | Implementer/Contractor | 10 | 33,33% |
| 4. | Supervisor | 10 | 33,33% |
| 5. | Technical Team | 2 | 6,67% |
| 6. | Tim Pengelola Teknis | 3 | 10% |
| | Total Responden | 30 | 100% |

➢ *Research Variables*

There are 50 (fifty) variables taken based on literature studies, field experience and previous research. Then a preliminary survey (discussion) was conducted with 3 people who were considered experts to determine the variables that influence the delay in construction work. From the results of the discussion with the experts/experts in the preliminary survey, there are two variables that are not included in the subsequent research because the number of respondents who agree is below 50%. The two variables are:

- Delayed payment by the project owner
- Subcontract issues

The next step is to distribute the main questionnaire to 30 (thirty) respondents with 48 (forty-eight) variables that are considered influential based on the results of the preliminary survey (interviews) with experts.

➢ *Validity and Reliability Test*

- *Validity Test*

Of the forty-eight variables, there are 11 (eleven) variables that are not valid. The 11 (eleven) variables above will be eliminated or not included in the next process. The results of the validity test of 48 variables can be seen in the table below:

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Table 4 Validity Test Result

| NO | CATEGORY | VARIABLE CODE | VARIABLE | *Sig. (1-tailed)* | DESCRIPTION |
|---|---|---|---|---|---|
| 1 | MANAJERIAL | S1 | Poor contractor workmanship | 0,018 | VALID |
| | | S2 | Ineffective quality control | < 0,001 | VALID |
| | | S3 | Incorrect execution methods | 0,002 | VALID |
| | | S4 | Changes to work orders (verbally) by the project owner | < 0,001 | VALID |
| | | S5 | Poor supervision of workers | 0,121 | NOT VALID |
| | | S6 | Internal company issues | 0,981 | NOT VALID |
| | | S7 | Poor communication between contractor and owner | 0,157 | NOT VALID |
| | | S8 | Inadequate contractor work experience | 0,093 | NOT VALID |
| | | S9 | Poor scheduling control | < 0,001 | VALID |
| | | S10 | Excessive waiting time for inspection and testing approvals | < 0,001 | VALID |
| | | S11 | Poorly organised contractor | 0,001 | VALID |
| | | S12 | Communication between workers and foremen | 0,001 | VALID |
| | | S13 | Poor contract management | 0,011 | VALID |
| | | S14 | Design changes during implementation | 0,001 | VALID |
| | | S15 | Inappropriate organisational structure | 0,008 | VALID |
| 2 | MATERIAL | T1 | Material quality not in accordance with specifications | 0,003 | VALID |
| | | T2 | Inaccurate material requirements calculations | < 0,001 | VALID |
| | | T3 | Errors in material orders | < 0,001 | VALID |
| | | T4 | Far from the main material centre | < 0,001 | VALID |
| 3 | EQUIPMENT | U1 | Equipment availability | < 0,001 | VALID |
| | | U2 | Equipment quality not suitable for the job | < 0,001 | VALID |
| | | U3 | Insufficient equipment (equipment sharing) | < 0,001 | VALID |
| 4 | LABORS | V1 | Insufficient number of workers | 0,09 | NOT VALID |
| | | V2 | Poor worker productivity | 0,109 | NOT VALID |
| | | V3 | Low worker skill level | < 0,001 | VALID |
| | | V4 | Low worker discipline and motivation | < 0,001 | VALID |
| | | V5 | High turnover of new workers | < 0,001 | VALID |
| 5 | SITE CHARACTERISTIC | W1 | Site management issues (site layout) | < 0,001 | VALID |
| | | W2 | No material storage space | < 0,001 | VALID |
| | | W3 | Difficult access to the project site | 0,003 | VALID |
| | | W4 | Requirement for extensive/numerous workspaces at the project site (Director's Kit) | < 0,001 | VALID |
| | | W5 | Inadequate site design preparation/establishment (coordinate points) | < 0,001 | VALID |
| | | W6 | Unexpected soil conditions | < 0,001 | VALID |
| | | W7 | Surrounding environmental issues (safety) | < 0,001 | VALID |
| | | W8 | Remote project location | 0,365 | NOT VALID |
| | | W9 | Technical justification changes due to existing structures | < 0,001 | VALID |
| 6 | FINANCIAL | X1 | Low contract prices due to intense competition | < 0,001 | VALID |
| | | X2 | Significant changes in material and labour costs | < 0,001 | VALID |
| | | X3 | Contractor financial problems | 0,927 | NOT VALID |
| 7 | ADMINISTRATION | Y1 | Inconsistent specifications and drawings | < 0,001 | VALID |
| | | Y2 | Termination of employment | 0,065 | NOT VALID |
| | | Y3 | Poorly written contracts/contract writing errors | 0,002 | VALID |
| | | Y4 | Slow preparation and approval of planning drawings | 0,002 | VALID |
| | | Y5 | Unrealistic implementation timeframes | 0,005 | VALID |
| 8 | OTHER FACTORS | Z1 | Rapidly changing government regulations related to project financing | < 0,001 | VALID |
| | | Z2 | High rainfall intensity | 0,071 | NOT VALID |
| | | Z3 | Declining/unstable economic conditions | < 0,001 | VALID |
| | | Z4 | Workplace accidents | 0,273 | NOT VALID |

Then a second validity test was carried out to ensure that the variables used were really valid. The results of the second validity test showed that 37 variables got a result of < 0.05, so they can be declared valid. The calculation results can be seen in the table below:

Table 5 Validity Test Second Result

| NO | CATEGORY | VARIABLE CODE | VARIABLE | *Sig. (1-tailed)* | DESCRIPTION |
|---|---|---|---|---|---|
| 1 | MANAJERIAL | S1 | Poor contractor work quality | 0,018 | VALID |
| | | S2 | Ineffective quality control | < 0,001 | VALID |
| | | S3 | Incorrect implementation methods | 0,002 | VALID |
| | | S4 | Changes to work orders (verbal) by the project owner | < 0,001 | VALID |
| | | S9 | Poor scheduling control | < 0,001 | VALID |
| | | S10 | Excessive waiting time for inspection and test approvals | < 0,001 | VALID |
| | | S11 | Poor contractor organisation | 0,001 | VALID |
| | | S12 | Communication between workers and foremen | 0,001 | VALID |
| | | S13 | Poor contract management | 0,011 | VALID |
| | | S14 | Design changes during implementation | 0,001 | VALID |
| | | S15 | Inappropriate organisational structure | 0,008 | VALID |
| 2 | MATERIAL | T1 | Material quality does not meet specifications | 0,003 | VALID |
| | | T2 | Inaccurate material requirements calculations | < 0,001 | VALID |
| | | T3 | Errors in material orders | < 0,001 | VALID |
| | | T4 | Far from the main material centre | < 0,001 | VALID |
| 3 | EQUIPMENT | U1 | Equipment availability | < 0,001 | VALID |
| | | U2 | Equipment quality does not match the work | < 0,001 | VALID |
| | | U3 | Insufficient equipment (equipment sharing) | < 0,001 | VALID |
| 4 | LABORS | V3 | Low worker skill level | < 0,001 | VALID |
| | | V4 | Low worker discipline and motivation | < 0,001 | VALID |
| | | V5 | New worker turnover | < 0,001 | VALID |
| 5 | *SITE CHARACTERISTIC* | W1 | Site management issues (site layout) | < 0,001 | VALID |
| | | W2 | No storage space for materials | < 0,001 | VALID |
| | | W3 | Difficult access to the project site | 0,003 | VALID |
| | | W4 | Requirement for extensive/numerous workspaces at the project site (Director's Kit) | < 0,001 | VALID |
| | | W5 | Inadequate preparation/establishment of site layout (coordinate points) | < 0,001 | VALID |
| | | W6 | Unexpected soil conditions | < 0,001 | VALID |
| | | W7 | Issues with the surrounding environment (security) | < 0,001 | VALID |
| | | W9 | Technical justification changes due to surrounding structures | < 0,001 | VALID |
| 6 | FINANCIAL | X1 | Low contract prices due to high competition | < 0,001 | VALID |
| | | X2 | Significant changes in material and labour costs | < 0,001 | VALID |
| 7 | ADMINISTRATION | Y1 | Inconsistencies in specifications and drawings | < 0,001 | VALID |
| | | Y3 | Poor written contracts/contract writing errors | 0,002 | VALID |
| | | Y4 | Preparation and approval of planning drawings | 0,002 | VALID |
| | | Y5 | Unrealistic implementation timeframes | 0,005 | VALID |
| 8 | OTHER FACTORS | Z1 | Government regulations related to rapidly changing project financing | < 0,001 | VALID |
| | | Z3 | Declining/unstable economic conditions | < 0,001 | VALID |

- *Reliability Test*

Reliability testing is done per category of variables, with categories 1. Managerial (management), materials,equipment, labor, site characteristics, financial, administration, other factors. Reliability testing uses the Alpha Cronbach method where the questionnaire is declared reliable if the coefficient is > 0.6. The following are the results of the reliability test, which can be seen in the statistical calculations below:

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Table 6 Results of Reliability Test of 37 Variables

| NO | CATEGORY | VARIABLE CODE | VARIABLE | *Sig. (1-tailed)* | DESCRIPTION | *Alpha Cronbach* | DESCRIPTION |
|---|---|---|---|---|---|---|---|
| 1 | MANAJERIAL | S1 | Poor contractor work quality | 0,018 | VALID | 0,770 | RELIABEL |
| | | S2 | Ineffective quality control | < 0,001 | VALID | | |
| | | S3 | Incorrect implementation methods | 0,002 | VALID | | |
| | | S4 | Changes to work orders (verbal) by the project owner | < 0,001 | VALID | | |
| | | S9 | Poor scheduling control | < 0,001 | VALID | | |
| | | S10 | Excessive waiting time for inspection and test approvals | < 0,001 | VALID | | |
| | | S11 | Poor contractor organisation | 0,001 | VALID | | |
| | | S12 | Communication between workers and foremen | 0,001 | VALID | | |
| | | S13 | Poor contract management | 0,011 | VALID | | |
| | | S14 | Design changes during implementation | 0,001 | VALID | | |
| | | S15 | Inappropriate organisational structure | 0,008 | VALID | | |
| 2 | MATERIAL | T1 | Material quality does not meet specifications | 0,003 | VALID | 0,648 | RELIABEL |
| | | T2 | Inaccurate material requirements calculations | < 0,001 | VALID | | |
| | | T3 | Errors in material orders | < 0,001 | VALID | | |
| | | T4 | Far from the main material centre | < 0,001 | VALID | | |
| 3 | EQUIPMENT | U1 | Equipment availability | < 0,001 | VALID | 0,680 | RELIABEL |
| | | U2 | Equipment quality does not match the work | < 0,001 | VALID | | |
| | | U3 | Insufficient equipment (equipment sharing) | < 0,001 | VALID | | |
| 4 | LABORS | V3 | Low worker skill level | < 0,001 | VALID | 0,588 | NOT RELIABEL |
| | | V4 | Low worker discipline and motivation | < 0,001 | VALID | | |
| | | V5 | New worker turnover | < 0,001 | VALID | | |
| 5 | *SITE CHARACTERISTIC* | W1 | Site management issues (site layout) | < 0,001 | VALID | 0,858 | RELIABEL |
| | | W2 | No storage space for materials | < 0,001 | VALID | | |
| | | W3 | Difficult access to the project site | 0,003 | VALID | | |
| | | W4 | Requirement for extensive/numerous workspaces at the project site (Director's Kit) | < 0,001 | VALID | | |
| | | W5 | Inadequate preparation/establishment of site layout (coordinate points) | < 0,001 | VALID | | |
| | | W6 | Unexpected soil conditions | < 0,001 | VALID | | |
| | | W7 | Issues with the surrounding environment (security) | < 0,001 | VALID | | |
| | | W9 | Technical justification changes due to surrounding structures | < 0,001 | VALID | | |
| 6 | FINANCIAL | X1 | Low contract prices due to high competition | < 0,001 | VALID | 0,759 | RELIABEL |
| | | X2 | Significant changes in material and labour costs | < 0,001 | VALID | | |
| 7 | ADMINISTRATION | Y1 | Inconsistencies in specifications and drawings | < 0,001 | VALID | 0,389 | NOT RELIABEL |
| | | Y3 | Poor written contracts/contract writing errors | 0,002 | VALID | | |
| | | Y4 | Preparation and approval of planning drawings | 0,002 | VALID | | |
| | | Y5 | Unrealistic implementation timeframes | 0,005 | VALID | | |
| 8 | OTHER FACTORS | Z1 | Government regulations related to rapidly changing project financing | < 0,001 | VALID | 0,758 | RELIABEL |
| | | Z3 | Declining/unstable economic conditions | < 0,001 | VALID | | |

Table 7 Results of Reliability Test of 35 Variables (Cronbach's Alpha If Item Deleted, Variables V5 and Y5)

| NO | CATEGORY | VARIABLE CODE | VARIABLE | *Sig. (1-tailed)* | DESCRIPTION | *Alpha Cronbach* | DESCRIPTION |
|---|---|---|---|---|---|---|---|
| 1 | MANAJERIAL | S1 | Poor contractor work quality | 0,018 | VALID | 0,770 | RELIABEL |
| | | S2 | Ineffective quality control | < 0,001 | VALID | | |
| | | S3 | Incorrect implementation methods | 0,002 | VALID | | |
| | | S4 | Changes to work orders (verbal) by the project owner | < 0,001 | VALID | | |
| | | S9 | Poor scheduling control | < 0,001 | VALID | | |
| | | S10 | Excessive waiting time for inspection and test approvals | < 0,001 | VALID | | |
| | | S11 | Poor contractor organisation | 0,001 | VALID | | |
| | | S12 | Communication between workers and foremen | 0,001 | VALID | | |
| | | S13 | Poor contract management | 0,011 | VALID | | |
| | | S14 | Design changes during implementation | 0,001 | VALID | | |
| | | S15 | Inappropriate organisational structure | 0,008 | VALID | | |
| 2 | MATERIAL | T1 | Material quality does not meet specifications | 0,003 | VALID | 0,648 | RELIABEL |
| | | T2 | Inaccurate material requirements calculations | < 0,001 | VALID | | |
| | | T3 | Errors in material orders | < 0,001 | VALID | | |
| | | T4 | Far from the main material centre | < 0,001 | VALID | | |
| 3 | *EQUIPMENT* | U1 | Equipment availability | < 0,001 | VALID | 0,680 | RELIABEL |
| | | U2 | Equipment quality does not match the work | < 0,001 | VALID | | |
| | | U3 | Insufficient equipment (equipment sharing) | < 0,001 | VALID | | |
| 4 | LABORS | V3 | Low worker skill levels | < 0,001 | VALID | 0,785 | RELIABEL |
| | | V4 | Low worker discipline and motivation | < 0,001 | VALID | | |
| 5 | *SITE CHARACTERISTIC* | W1 | Site management issues (site layout) | < 0,001 | VALID | 0,858 | RELIABEL |
| | | W2 | No storage space for materials | < 0,001 | VALID | | |
| | | W3 | Difficult access to the project site | 0,003 | VALID | | |
| | | W4 | Requirement for extensive/numerous workspaces at the project site (Director's Kit) | < 0,001 | VALID | | |
| | | W5 | points) | < 0,001 | VALID | | |
| | | W6 | Unexpected soil conditions | < 0,001 | VALID | | |
| | | W7 | Issues with the surrounding environment (security) | < 0,001 | VALID | | |
| | | W9 | Technical justification changes due to surrounding buildings | < 0,001 | VALID | | |
| 6 | FINANCIAL | X1 | Low contract prices due to high competition | < 0,001 | VALID | 0,759 | RELIABEL |
| | | X2 | Significant changes in material and labour costs | < 0,001 | VALID | | |
| 7 | ADMINISTRATION | Y1 | Inconsistent specifications and drawings | < 0,001 | VALID | 0,425 | NOT RELIABEL |
| | | Y3 | Poor written contracts/contract writing errors | 0,002 | VALID | | |
| | | Y4 | Slow preparation and approval of planning drawings | 0,002 | VALID | | |
| 8 | OTHER FACTORS | Z1 | Government regulations related to financing rapidly changing jobs | < 0,001 | VALID | 0,758 | RELIABEL |
| | | Z3 | Declining/unstable economic conditions | < 0,001 | VALID | | |

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Table 8 Results of Reliability Test of 34 Variables (Cronbach's Alpha If Item Deleted, Variable Y1)

| NO | CATEGORY | VARIABLE CODE | VARIABLE | *Sig. (1-tailed)* | DESCRIPTION | *Alpha Cronbach* | DESCRIPTION |
|---|---|---|---|---|---|---|---|
| 1 | MANAJERIAL | S1 | Poor contractor work quality | 0,018 | VALID | 0,770 | RELIABEL |
| | | S2 | Ineffective quality control | < 0,001 | VALID | | |
| | | S3 | Incorrect implementation methods | 0,002 | VALID | | |
| | | S4 | Changes to work orders (verbal) by the project owner | < 0,001 | VALID | | |
| | | S9 | Poor scheduling control | < 0,001 | VALID | | |
| | | S10 | Excessive waiting time for inspection and test approvals | < 0,001 | VALID | | |
| | | S11 | Poor contractor organisation | 0,001 | VALID | | |
| | | S12 | Communication between workers and foremen | 0,001 | VALID | | |
| | | S13 | Poor contract management | 0,011 | VALID | | |
| | | S14 | Design changes during implementation | 0,001 | VALID | | |
| | | S15 | Inappropriate organisational structure | 0,008 | VALID | | |
| 2 | MATERIAL | T1 | Material quality does not meet specifications | 0,003 | VALID | 0,648 | RELIABEL |
| | | T2 | Inaccurate material requirements calculations | < 0,001 | VALID | | |
| | | T3 | Errors in material orders | < 0,001 | VALID | | |
| | | T4 | Far from the main material centre | < 0,001 | VALID | | |
| 3 | *EQUIPMENT* | U1 | Equipment availability | < 0,001 | VALID | 0,680 | RELIABEL |
| | | U2 | Equipment quality does not match the work | < 0,001 | VALID | | |
| | | U3 | Insufficient equipment (equipment sharing) | < 0,001 | VALID | | |
| 4 | LABORS | V3 | Low worker skill levels | < 0,001 | VALID | 0,785 | RELIABEL |
| | | V4 | Low worker discipline and motivation | < 0,001 | VALID | | |
| 5 | *SITE CHARACTERISTIC* | W1 | Site management issues (site layout) | < 0,001 | VALID | 0,858 | RELIABEL |
| | | W2 | No storage space for materials | < 0,001 | VALID | | |
| | | W3 | Difficult access to the project site | 0,003 | VALID | | |
| | | W4 | Requirement for extensive/numerous workspaces at the project site (Director's Kit) | < 0,001 | VALID | | |
| | | W5 | Inadequate preparation/establishment of site layout (coordinate points) | < 0,001 | VALID | | |
| | | W6 | Unexpected soil conditions | < 0,001 | VALID | | |
| | | W7 | Issues with the surrounding environment (security) | < 0,001 | VALID | | |
| | | W9 | Technical justification changes due to surrounding buildings | < 0,001 | VALID | | |
| 6 | FINANCIAL | X1 | Low contract prices due to high competition | < 0,001 | VALID | 0,759 | RELIABEL |
| | | X2 | Significant changes in material and labour costs | < 0,001 | VALID | | |
| 7 | ADMINISTRATION | Y3 | Poor written contracts/contract writing errors | 0,002 | VALID | 0,650 | RELIABEL |
| | | Y4 | Slow preparation and approval of planning drawings | 0,002 | VALID | | |
| 8 | OTHER FACTORS | Z1 | Government regulations related to financing rapidly changing jobs | < 0,001 | VALID | 0,758 | RELIABEL |
| | | Z3 | Declining/unstable economic conditions | < 0,001 | VALID | | |

From the results of the validity and reliability tests above, 14 (fourteen) variables were eliminated, so leaving 34 variables for further analysis.

➢ *RII Analysis*

After obtaining 34 (thirty-four) variables to determine the ranking of a group of factors or variables that are later considered the most influential or most important for respondents, it is determined through the magnitude of the RII value obtained. The variable with the highest value from each category will be taken and further analyzed. Here is an example of one of the RII calculations with the variable code S2:

$$RII = \frac{\sum W}{A\ N} \quad (3)$$

Where RII is the Relative Importance Index, W is the Weight of the answers in the form of a Likert scale from all respondents, A is the Maximum Answer Weight, and N is the Number of respondents.

$$RII = \frac{n_1 + 2n_2 + 3n_3 + 4n_4 + 5n_5}{5(n_1 + n_2 + n_3 + n_4 + n_5)} \quad (4)$$

$$RII = \frac{0 + 2\cdot 0 + 3\cdot 4 + 4\cdot 13 + 5\cdot 13}{5(0 + 0 + 4 + 13 + 13)} = 0{,}860 \quad (5)$$

Where the higher the ranking of a factor, the higher the influence it has. The ranking can be seen in the table below:

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Table 9 RII Analysis Result

| NO | CATEGORI | VARIABLE CODE | VARIABLE | STB | TB | CB | B | SB | Total | W | RII | RANK |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | MANAJERIAL | S1 | Poor contractor work quality | 0 | 0 | 4 | 4 | 22 | 30 | 138 | 0,920 | 2 |
| | | S2 | Ineffective quality control | 0 | 0 | 4 | 13 | 13 | 30 | 129 | 0,860 | 4 |
| | | S3 | Incorrect implementation methods | 0 | 0 | 3 | 5 | 22 | 30 | 139 | 0,927 | 1 |
| | | S4 | Changes to work orders (verbal) by the project owner | 2 | 5 | 13 | 7 | 3 | 30 | 94 | 0,627 | 11 |
| | | S9 | Poor scheduling control | 0 | 0 | 5 | 15 | 10 | 30 | 125 | 0,833 | 5 |
| | | S10 | Excessive waiting time for inspection and test approvals | 0 | 1 | 17 | 6 | 6 | 30 | 107 | 0,713 | 10 |
| | | S11 | Poor contractor organisation | 0 | 0 | 7 | 11 | 12 | 30 | 125 | 0,833 | 5 |
| | | S12 | Communication between workers and foremen | 0 | 1 | 10 | 13 | 6 | 30 | 114 | 0,760 | 7 |
| | | S13 | Poor contract management | 0 | 0 | 14 | 10 | 6 | 30 | 112 | 0,747 | 8 |
| | | S14 | Design changes during implementation | 0 | 0 | 15 | 10 | 5 | 30 | 110 | 0,733 | 9 |
| | | S15 | Inappropriate organisational structure | 0 | 1 | 8 | 14 | 6 | 29 | 112 | 0,772 | 6 |
| 2 | MATERIAL | T1 | Material quality does not meet specifications | 0 | 0 | 4 | 5 | 21 | 30 | 137 | 0,913 | 3 |
| | | T2 | Inaccurate material requirements calculations | 0 | 0 | 3 | 6 | 21 | 30 | 138 | 0,920 | 2 |
| | | T3 | Errors in material orders | 0 | 0 | 4 | 4 | 22 | 30 | 138 | 0,920 | 1 |
| | | T4 | Far from the main material centre | 0 | 1 | 6 | 15 | 8 | 30 | 120 | 0,800 | 2 |
| 3 | *EQUIPMENT* | U1 | Equipment availability | 0 | 0 | 2 | 8 | 20 | 30 | 138 | 0,920 | 2 |
| | | U2 | Equipment quality does not match the work | 0 | 0 | 2 | 11 | 17 | 30 | 135 | 0,900 | 3 |
| | | U3 | Insufficient equipment (equipment sharing) | 0 | 0 | 2 | 7 | 21 | 30 | 139 | 0,927 | 1 |
| 4 | LABORS | V3 | Low worker skill levels | 0 | 0 | 1 | 9 | 20 | 30 | 139 | 0,927 | 1 |
| | | V4 | Low worker discipline and motivation | 0 | 0 | 5 | 18 | 7 | 30 | 122 | 0,813 | 2 |
| 5 | *SITE CHARACTERISTIC* | W1 | Site management issues (site layout) | 0 | 7 | 12 | 8 | 3 | 30 | 97 | 0,647 | 5 |
| | | W2 | No storage space for materials | 0 | 2 | 13 | 11 | 4 | 30 | 107 | 0,713 | 2 |
| | | W3 | Difficult access to the project site | 0 | 1 | 2 | 14 | 13 | 30 | 129 | 0,860 | 1 |
| | | W4 | Requirement for extensive/numerous workspaces at the project site (Director's Kit) | 1 | 16 | 5 | 6 | 2 | 30 | 82 | 0,547 | 6 |
| | | W5 | Inadequate preparation/establishment of site layout (coordinate points) | 1 | 5 | 13 | 7 | 4 | 30 | 98 | 0,653 | 4 |
| | | W6 | Unexpected soil conditions | 0 | 1 | 16 | 8 | 5 | 30 | 107 | 0,713 | 2 |
| | | W7 | Issues with the surrounding environment (security) | 0 | 0 | 19 | 7 | 4 | 30 | 105 | 0,700 | 3 |
| | | W9 | Technical justification changes due to surrounding buildings | 0 | 2 | 15 | 7 | 6 | 30 | 107 | 0,713 | 2 |
| 6 | FINANCIAL | X1 | Low contract prices due to high competition | 1 | 3 | 10 | 9 | 7 | 30 | 108 | 0,720 | 1 |
| | | X2 | Significant changes in material and labour costs | 0 | 1 | 19 | 7 | 3 | 30 | 102 | 0,680 | 2 |
| 7 | ADMINISTRATION | Y3 | Poor written contracts/contract writing errors | 0 | 6 | 19 | 3 | 2 | 30 | 91 | 0,607 | 2 |
| | | Y4 | Slow preparation and approval of planning drawings | 0 | 2 | 18 | 6 | 4 | 30 | 102 | 0,680 | 1 |
| 8 | OTHER FACTORS | Z1 | Government regulations related to financing rapidly changing jobs | 0 | 3 | 16 | 8 | 3 | 30 | 101 | 0,673 | 1 |
| | | Z3 | Declining/unstable economic conditions | 1 | 8 | 13 | 5 | 3 | 30 | 91 | 0,607 | 2 |

Variables that have the largest RII value and occupy the first rank from each category and are stated as the most dominant factor causing construction delays are:

- The management category is the wrong implementation method.
- The material category is the error in ordering materials.
- The equipment category is the lack of equipment (alternating use of equipment).
- The labor category is the low skill of the workforce.
- The site characteristic category is the difficulty of accessing the project site.
- The financial category is the low contract price due to high competition.
- The administrative category is the slow preparation and approval of the design drawings.
- The other factors category is the rapidly changing government regulations regarding work financing.

➢ *Mitigation Strategy*

The results of direct observations and interviews in the field with field executors (contractors) and team leaders (supervisors) who experienced these incidents, the following mitigation strategies were made:

Table 10 Mitigation Strategy Result

| NO | MOST DOMINANT MITIGATION STRATEGY CAUSES OF DELAY | MITIGATION STRATEGY |
|---|---|---|
| 1 | Wrong implementation | 1. Implement a monitoring system and method sanctions |
| | | 2. Perform checklists at each stage of the work according to the time schedule |
| | | 3. Implement adaptive cost estimates |
| 2 | Errors in placing material orders | 1. Accurate planning and scheduling of material needs |
| | | 2. Material Buffer Stock (Provide reserve stock for materials that are difficult to obtain or have long delivery times) |
| 3 | Lack of equipment (sharing of equipment) | 1. Mature planning of equipment needs |
| | | 2. Provision of reserve equipment or additional rentals |
| | | 3. Periodic evaluation and monitoring |
| | | 4. Grouping of work based on equipment availability |
| 4 | Low workforce skill training | 1. Pre-project training and on-the-job training |
| | | 2. Certification and competency standardisation |
| | | 3. Recruitment of skilled workers |
| | | 4. Performance-based incentives |
| 5 | Difficulty accessing project site | 1. Initial site survey and mapping |
| | | 2. Structured logistics planning |
| | | 3. Efficient Material Storage |
| | | 4. Utilisation of building information modeling (BIM) technology to visualise space and heavy equipment movement |
| 6 | Low contract price due to high bidding competition | 1. Risk and profitability analysis before bidding |
| | | 2. Internal cost efficiency |
| | | 3. Contract risk management |
| | | 4. Reputation and portfolio improvement |
| 7 | Slow preparation and approval of design drawings | 1. Use of BIM technology |
| | | 2. More realistic design planning |
| | | 3. Design risk management from the start of the project |
| 8 | Rapidly changing government regulations regarding work financing | 1. Proactive monitoring of regulations |
| | | 2. Flexibility in financial planning |
| | | 3. Adaptive contract clauses |
| | | 4. Compliance documentation and audits |

➢ *Mitigation Validation*

Further analysis after obtaining the mitigation strategies above, namely re-validating the mitigation strategies by three representatives other than those considered experts as well as the perpetrators of the work being studied, both from the service user (owner) side and the service provider, namely 1 (one) representative from the contractor, 1 (one) representative from the supervisor and 1 (one) from the owner as the PPK. The opinions of the service providers are as follows:

- Implement a monitoring system according to the time schedule.
- Accurate planning of material needs.
- Plan equipment needs carefully.
- Conduct competency certification, technical guidance and regular socialization as needed.
- Carry out structured logistics planning.
- Conduct risk and profitability analysis before bidding.
- Implementation and use of BIM technology.
- Flexibility in financial planning.

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Table 11 Mitigation Validation Result

| NO | MOST DOMINANT MITIGATION STRATEGY CAUSES OF DELAY | MITIGATION STRATEGY | MITIGATION VALIDATION |
|---|---|---|---|
| 1 | Wrong implementation | 1. Implement a monitoring system and method sanctions<br>2. Perform checklists at each stage of the work according to the time schedule<br>3. Implement adaptive cost estimates | Experts agree and emphasise the strategy of implementing a scheduled monitoring system in accordance with the time schedule |
| 2 | Errors in placing material orders | 1. Accurate planning and scheduling of material needs<br>2. Material Buffer Stock (Provide reserve stock for materials that are difficult to obtain or have long delivery times) | Experts agree and emphasise the strategy of accurate planning and scheduling of material requirements |
| 3 | Lack of equipment (sharing of equipment) | 1. Mature planning of equipment needs<br>2. Provision of reserve equipment or additional rentals<br>3. Periodic evaluation and monitoring<br>4. Grouping of work based on equipment availability | Experts agree and emphasise the strategy of mature planning of equipment requirements |
| 4 | Low workforce skill training | 1. Pre-project training and on-the-job training<br>2. Certification and competency standardisation<br>3. Recruitment of skilled workers<br>4. Performance-based incentives | Experts agree and emphasise the strategy of competency certification, technical guidance and periodic socialisation as needed |
| 5 | Difficulty accessing project site | 1. Initial site survey and mapping<br>2. Structured logistics planning<br>3. Efficient Material Storage<br>4. Utilisation of building information modeling (BIM) technology to visualise space and heavy equipment movement | Experts agree and emphasise the strategy of structured logistics planning |
| 6 | Low contract price due to high bidding competition | 1. Risk and profitability analysis before bidding<br>2. Internal cost efficiency<br>3. Contract risk management<br>4. Reputation and portfolio improvement | Experts agree and emphasise the need for risk and profitability analysis before bidding |
| 7 | Slow preparation and approval of design drawings | 1. Use of BIM technology<br>2. More realistic design planning<br>3. Design risk management from the start of the project | Experts agree and emphasise the implementation and utilisation of BIM technology |
| 8 | Rapidly changing government regulations regarding work financing | 1. Proactive monitoring of regulations<br>2. Flexibility in financial planning<br>3. Adaptive contract clauses<br>4. Compliance documentation and audits | Experts agree and emphasise the importance of flexibility in financial planning |

## IV. CONCLUSION

Based on the results of the research and data processing that has been done, several conclusions can be obtained as follows:

- ➢ Identified the factors causing delays in the construction of state buildings SBSN within the scope of the Regional Office of the Ministry of Religious Affairs of South Kalimantan Province that have an effect of 34 main variables that pass the validity and reliability tests.
- ➢ The causes of delays in construction work from 8 (eight) categories that have the largest RII value and occupy the first rank from each category and are stated as the most dominant factor causing construction delays are as follows:

- Wrong implementation method.
- Error in ordering materials.
- Lack of equipment (alternating use of equipment).
- Low workforce skill.
- Difficulty accessing the project site.
- Low contract price due to high competition.
- Slow preparation and approval of design drawings.
- Rapidly changing government regulations regarding work financing.

- ➢ The risk mitigation strategies made by the researcher and have been validated by experts are as follows:

- Implement a monitoring system according to the time schedule.
- Accurate planning of material needs.
- Careful planning of equipment needs.
- Conduct competency certification, technical guidance and regular socialization as needed.
- Carry out structured logistics planning.
- Implementation and use of BIM technology.
- Use of BIM technology.
- Flexibility in financial planning.

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