

# Schedule Risks Identification of Design Build Projects Procurement in the Development of Core Governmental Area of the New National Capital in Indonesia

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**Abstract** — The rapid execution time and the immediate necessity of the infrastructure are the reasons why many projects in the Core Governmental Area utilize the design and build method for construction in the new capital city, Nusantara. However, delays frequently occur during implementation. This thesis explores the risk factors affecting the project execution time of design and build projects. Variables were compiled from secondary data and literature studies, validated by experts, and questionnaires were distributed to respondents. These were then evaluated using qualitative risk analysis. From the 100 risk factors surveyed, 16 were identified as the most critical: (X5) (X6) inaccurate cost estimation during the planning phase, (X8) changes in urban planning, (X9) (X47) inadequate site investigation/unexpected ground/surface conditions, (X26) financial feasibility of the contractor, (X54) (X56) delayed delivery of construction equipment and materials, (X55) (X75) difficult/limited site access including weather-related factors, (X57) (X59) scarcity of labor and construction materials, (X61) (X63) design or scope changes during implementation at the owner's request, (X62) complexity and large project size, and (X70) unacquired land.

**Keywords** — Design and Build, Risk Factors, Time Performance, Qualitative Risk Analysis.

## I. INTRODUCTION

The Core Governmental Area (KIPP), encompassing approximately 6,671 hectares, is located in Sepaku District, Penajam Paser Utara Regency, East Kalimantan Province. This KIPP area is situated on the southern side of the National Capital Area (KIKN). The complexities faced in the development of the new capital include a short execution time, with the target for the completion of the first phase of infrastructure construction by 2024. All tasks are carried out in parallel, with limited logistics access routes and the involvement of numerous stakeholders. Additionally, challenges include the need for integration based on topographic and geological conditions, land use planning, and infrastructure planning aligned with drainage systems to prevent flooding. Coordination of underground infrastructure and ensuring space for future expansion are also critical. These complexities highlight the intricacies of planning and executing large-scale urban development projects, particularly when aiming for sustainable development that encompasses economic, social, and environmental impacts (Kalalinggi et al., 2023).

There are various procurement methods in construction work. Among these methods, the Design-Bid-Build (DBB) method, also known as conventional procurement, involves three main parties: the Project Owner, the Design Consultant, and the Construction Contractor. In this method, the Project Owner monitors

and controls the project performance of both the designer and the contractor to ensure compliance with the contract (Mahdi & Alreshaid, 2005). Another method that can be used is the Design-Build (DB) method, where the Project Owner contracts with a single entity responsible for both design and construction. This method is preferred when the owner desires a single source of responsibility and accountability. Notably, because one entity is responsible for both design and construction, the confrontational relationships that can arise in DBB can be avoided (Mafakheri et al., 2007).

The Ministry of Public Works and Housing (PUPR) has been entrusted with the responsibility of developing the infrastructure for the New National Capital (IKN). Historically, in other infrastructure projects, the Ministry of PUPR has generally employed the conventional method using the Design-Bid-Build system, where the planning and construction phases are conducted separately. This separation process requires more time to complete the project because it necessitates two separate tenders for the planning and construction stages. According to Peraturan Presiden Nomor 12 Tahun 2021, the implementation of Government Goods/Services Procurement allows for the execution of construction work using the Design and Build method. Design and Build projects are expected to provide a faster solution, delivering results that meet the technical specifications required by the Employer.

Specifically, for design and build projects in KIPP, there are currently 25 ongoing projects, of which 4 are behind schedule. The impact of delays in construction projects at the Central Government Core Area includes:

1. The failure to achieve the intended use of infrastructure buildings within the expected timeframe (target use of KIPP by June 2024).
2. Delays can also result in increased costs, as additional time and resources are required to complete the project.
3. Additionally, delays can affect the overall quality of the project, as rushed work or changes made to meet deadlines can compromise the final product's quality.

The aim of this research is to identify the stages and activities involved in the procurement process for Design and Build projects at KIPP, as well as to determine the high-impact risks contributing to delays at each stage.

## II. THEORITICAL STUDY

### ***Project Management***

A project is a series of unique activities with specific constraints, necessitating professional and integrated management from the planning stage to the control stage to achieve its objectives and obtain optimal results (Project Management Institute, 2017). Although projects can vary in terms of complexity, size, schedule, and cost, each project follows a distinct pattern that differentiates it from routine operational activities.

### ***Design and Build***

Design and Build (DB) is a delivery method where the owner assigns both the design and construction of a project to a single entity or design-build team under one contract. This method has emerged and continues to evolve in the international construction market due to the various advantages it offers. For example, single-point responsibility, shorter project delivery duration, enhanced financial certainty, high levels of coordination, and the transfer of design responsibility risk from the designer/owner to the DB contractor are among the key relative advantages of DB (Liu et al., 2017).

Based on the determining aspects mentioned above, the advantages and disadvantages of implementing the Design and Build (DB) method can be summarized as follows (Levy, 2006). The advantages include price certainty, the ability of the project owner to avoid conflicts and disputes, the contractor's responsibility for

detailed design, faster project delivery, and the reduced need for technical staff by the project owner. However, the disadvantages include limited certainty of quality control, subjective selection of the winning contractor, and restricted access for small contractors.

In general, the activities carried out by the Ministry of Public Works and Housing (PUPR) in conducting goods and services procurement using the Design and Build (DB) system are in accordance with LKPP Regulations Number 11 and 12 of 2021. The implementation of integrated construction procurement for Design and Build must meet the following requirements: the availability of a Construction Management Consultant or Technical Team from the procurement preparation stage to the final handover of the work results; the availability of documents, at a minimum, including basic design documents, which encompass technical geological map data of the project location, reference data from soil/geotechnical investigations of the nearest project location, clear and detailed definition of the scope of work, design criteria, related work standards, quality standards, and other technical requirements set by the PPK, project risk identification and allocation, land requirement identification, and supporting drawings; and the availability of proposed budget implementation documents from the budget user. Additionally, there must be sufficient time allocation for tender participants to prepare bid documents as determined by the PPK and outlined in the selection documents.

### ***Project Risk Management***

Risk refers to hazardous activities or factors that, if they occur, will increase the likelihood that the project's objectives related to time, cost, and quality will not be achieved. Many risks can be anticipated and controlled. Furthermore, risk management should be an integral part of project management throughout the project lifecycle (Kerzner, 2013). An event or condition that is uncertain, which, if it occurs, can have a positive or negative effect on project objectives. Events with potential negative impacts are referred to as threats, while those with potential positive impacts are referred to as opportunities. Opportunities are essentially treated as positive risks (Bissonette, 2016).

Project risk management is the process of identifying, analyzing, and managing risks throughout the project lifecycle within project management. This involves assessing potential risks that may arise during the project, determining their impact and likelihood, and

developing strategies to mitigate or eliminate them. The objective of project risk management is to ensure that potential risks are proactively identified and addressed to minimize their impact on the project's success (Levene & Lewis, 2015).

### ***DB Procurement Stages and Activities***

In general, the activities carried out by the Ministry of Public Works and Housing (PUPR) in conducting goods and services procurement using the Design and Build (DB) system, in accordance with LKPP Regulation Number 12 of 2021, are as follows:

1. Procurement Planning involves activities such as drafting technical specifications/Terms of Reference (TOR), estimating costs/Budget Plan (RAB), packaging Goods/Services Procurement, and preparing supporting costs. The result of procurement planning is a work packaging plan displayed in the Procurement General Plan Information System (SIRUP). The output of the procurement planning stage is the procurement planning documents prepared by the Commitment Making Officer (PPK) and approved by the Budget User Authority (KPA).
2. Procurement Preparation includes activities such as setting the Work Budget Ceiling, drafting the contract (for Design and Build projects, the Ministry of Public Works and Housing uses a Lump Sum contract type), defining Technical Specifications/Owner's Requirements, determining the amount of advance payment, advance payment guarantee, performance guarantee, and maintenance guarantee. The result of the procurement preparation will form the basis for the preparation of tender documents.
3. Preparation for Tender is carried out after the Tender Committee receives a request for provider selection from the PPK, accompanied by procurement preparation documents for Goods/Services through the Provider. The Tender Committee's preparation for selection includes reviewing the procurement preparation documents, determining the provider selection method, qualification method, provider requirements, bid evaluation method, bid document submission method, preparing and setting the selection schedule, drafting the Tender Document, and determining the value of the Bid Security and Appeal Guarantee. The output of this stage is the Tender Document, which is drafted and approved by the Tender Committee.

4. Tender for the Design and Build infrastructure development projects at KIPP, the Ministry of Public Works and Housing uses the standard Prequalification - 2 files - quality and cost combination evaluation method, with a lump sum contract type.
5. Contract Implementation involves the PPK reviewing the provider selection report, conducting pre-contract signing meetings with the provider, handing over the work site and personnel, issuing the Work Commencement Order (SPMK), providing advance payments, conducting pre-implementation contract meetings, mobilization, joint inspections, contract control, performance payments, contract modifications, granting extensions, contract termination, and imposing penalties and damages.
6. Handover occurs after the work is completed according to the terms stipulated in the contract. The Provider submits a written request to the PPK for the handover of the work results.

### **III. METHOD**

Based on the problem formulation questions: "What are the stages and activities of the procurement process in Design and Build projects at KIPP?" and "What are the high-impact risks causing delays at each stage?", it is necessary to conduct an initial identification of these risk factors. The results of the identification will be analyzed qualitatively to determine the factors with high impact.

During the identification stage, data obtained from the literature review will be used as the initial identification of research variables. These variables, in the form of stages and activities, will then be verified, clarified, and validated by experts. The experts will provide comments and feedback on Research Question (RQ) 1. The criteria for expert respondents must include a minimum of 10 years of experience in goods/services procurement, specifically in design and build, a good reputation, knowledge and education in construction contracts, and at least a master's degree. The number of experts is set at three.

The results of the first stage questionnaire will be collected and reorganized into a second stage questionnaire (Research Question II / RQ 2), including a ratio scale that describes the magnitude of the influence (impact) and frequency of occurrence of these risk factors on the execution time of Design and Build projects at KIPP, Ministry of Public Works and

Housing. This questionnaire will be distributed to respondents who are currently or have previously worked on infrastructure development in KIPP using the design and build method, with a minimum of 3 years of experience. The questionnaire will be distributed to 30 respondents.

**Measurement Scale**

An open-ended questionnaire instrument is used, with the measurement of determining factors evaluated on a numerical scale from 1 to 5, where 1 means no influence at all, and 5 means very influential.

*Table 1. Explanation for Risk Frequency Assessment*

Scale	Likelihood to happen
1	Almost never causes delays in the construction project timeline
2	Low likelihood of causing delays in the construction project timeline
3	May cause delays in the construction project timeline
4	Highly likely to cause delays in the construction project timeline
5	Almost certain to cause delays in the construction project timeline

*Table 2. Explanation for Risk Impact Assessment*

Scale	Information
1	No influence / no impact on the implementation time, resulting in the project being on time or faster than planned
2	Slightly influences the occurrence of delays in implementation time, causing delays of -0.001% to -3% from the planned time
3	Moderately influences the occurrence of delays in implementation time, causing delays of -3% to -7% from the planned time
4	Significantly influences the occurrence of delays in implementation time, causing delays of -7% to -10% from the planned time
5	Highly influences the occurrence of delays in implementation time, causing delays of more than -10% from the planned time

Probability	Impact				
	1	2	3	4	5
1	1	2	3	4	5
2	2	4	6	8	10
3	3	6	9	12	15
4	4	8	12	16	20
5	5	10	15	20	25

1- 4 : Low Risk  
5-12 : Medium Risk  
15-25 : High Risk

*Figure 1. Probability – Impact Matrix*

**IV. RESULT AND DISCUSSION**

Based on the literature review conducted by the author and the expert validation results, the stages and activities

in the design and build project procurement process at KIPP, as well as the risk factors in each of these activities, were identified, as shown in the table below.

*Table 3. Stages, Activities and Risk Factors design and build project procurement process at KIPP*

No.	Stage	Activity	Code	Risk Event	Reference
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1	Procurement Planning	Identification of Goods/Services Procurement	X1	Owner does not have a comprehensive understanding of the scope of the Design and Build project to be implemented	(Chan et al., 2001)
		Determination of Goods/Services Type	X2	PPK does not combine several types of procurement into one integrated design and build package	(LKPP, 2021)
		Procurement Method	X3	PPK does not select procurement method through Provider	(LKPP, 2021)
	Procurement Budget	Utilization Time of Goods/Services	X4	Inadequate planning and scheduling	(Kardes et al., 2013; Kog, 2018; Yang & Wei, 2010; Zhong et al., 2023)
		Procurement Budget	X5	Inaccurate cost estimation during planning phase	(Frimpong et al., 2003; Kardes et al., 2013; Mohajeri Borje Ghaleh et al., 2021; Yang & Wei, 2010)
2	Procurement Preparation	Review and Determination of Design and Build Work Ceiling	X6	Inaccurate cost estimation during planning phase	(Frimpong et al., 2003; Kardes et al., 2013; Mohajeri Borje Ghaleh et al., 2021; Yang & Wei, 2010)
		Preparation and Determination of Employer's Requirement Document	X7	Poorly structured planning sequence	(Proboyo, 1999)
	X8		Changes in Urban Plan	(Budayan, 2019)	
	X9		Inadequate investigation/unexpected soil conditions	(Kog, 2018; Liu et al., 2017)	
	X10		Inaccurate budget ceiling calculation	(Frimpong et al., 2003; Yang & Wei, 2010)	
	X11		Inaccurate/incomplete project scope in Owner's Requirement	(Liu et al., 2017)	
	Preparation and Determination of Contract Design	X12	Contract design not in accordance with provisions	(LKPP, 2021; Budayan, 2019)	
3	Preparation for Tender	Review of Procurement Preparation Document	X13	Incomplete Employer's Requirement	(LKPP, 2021)
			X14	Local component usage level (TKDN) not in accordance with provisions	(LKPP, 2021)
		Establishment of Tender Method	X15	Incorrect tender method	(LKPP, 2021)
		Establishment of Qualification Method	X16	Selection using Post-Qualification method	(LKPP, 2021)
		Establishment of Qualification Requirements	X17	Incorrect establishment of Business Entity Certificate (SBU) type and relevant experience requirements	(LKPP, 2021)
		Establishment of Bid Document Submission Method	X18	Incorrect establishment of bid evaluation method type	(LKPP, 2021)

		Establishment of Bid Document Submission Method	X19	Incorrect establishment of bid document submission method type	(LKPP, 2021)
		Preparation and Establishment of Selection Schedule	X20	Tender schedule too short	(Pham et al., 2021)
		Preparation of Tender Document	X21	Selection Document not in accordance with the established PPK Procurement Preparation Document	(LKPP, 2021)
		Establishment of Bid and Appeal Guarantee	X22	Inappropriate bid and appeal guarantee amount	(LKPP, 2021)
4	Tender	Prequalification	X23	Very tight project schedule set by Owner	(Budayan, 2019; Proboyo, 1999)
			X24	Inaccurate work duration determination	(Proboyo, 1999)
			X25	Availability of Owner personnel specifically for handling design and build work	(Songer & Molenaar, 1997)
		X26	Contractor's financial feasibility	(Budayan, 2019)	
		X27	Different evaluation results among Selection Working Group members	(Budayan, 2019)	
		X28	Availability of experienced design and build contractors	(Songer & Molenaar, 1997)	
		X29	Low bidder enthusiasm	(Budayan, 2019)	
		Tender	X30	Delay in selection process execution, even tender failure	(Budayan, 2019)
			X31	Bids exceed Budget Ceiling	(MPWH, 2023)
			X32	Incomplete technical evaluation criteria for tender participants	(Budayan, 2019)
	X33		Tender schedule too short	(Pham et al., 2021)	
	X34		Incomplete supporting documents submitted in tender, hindering participants from preparing bids (incomplete/inadequate basic design)	(Budayan, 2019; Pham et al., 2021; Yang & Wei, 2010)	
	X35		Insufficient time for participants to prepare bids	(Budayan, 2019)	
	X36		Insufficient time for Owner and Selection Working Group to evaluate bid documents	(P. X. W. Zou, 2007)	
	X37		Tendency to use procurement systems biased towards the lowest bid	(Kog, 2018)	
	X38		No bidders submit proposals	(Budayan, 2019)	
	X39		Bidder objections	(LKPP, 2021)	
	X40	Undefined work scope	(Budayan, 2019)		
	X41	No bidders meet requirements, leading to tender failure	(Budayan, 2019)		
	X42	Different evaluation results among Selection Working Group members	(Budayan, 2019)		

5	Contract Implementation	Review of Tender Evaluation Report	X43	Winner's qualification data not valid	(LKPP, 2021)
		Establishment of Goods/Services Provider Appointment Letter (SPPBJ)	X44	Budget not approved	(LKPP, 2021)
		Contract Signing Preparation Meeting	X45	Incomplete Contract Documents and appendices	(LKPP, 2021; Budayan, 2019)
		Contract Signing	X46	Substantive, linguistic, editorial, numerical or alphabetical errors in contract draft	(LKPP, 2021)
		Work Site Handover	X47	Unexpected soil surface conditions	(Abd El-Karim et al., 2017)
		Establishment of Work Commencement Order (SPMK)	X48	Complexity of design and build scope provided by Owner	(Yang & Wei, 2010)
		Advance Payment	X49	Project start delay	(Mahamid, 2011)
			X50	Small advance payment amount	(LKPP, 2021)
		Quality Plan Preparation	X51	Losses from advance payment and contract payment schedule	(Pham et al., 2021)
			X52	Issues with inspection and testing procedures	(Assaf et al., 1995)
		Contract Implementation Preparation Meeting	X53	Inappropriate construction method	(Pham et al., 2021)
		Mobilization	X54	Delayed delivery of construction equipment	(Frimpong et al., 2003)
			X55	Difficult/limited project site access	(Abd El-Karim et al., 2017; Ogunsanmi et al., 2011; Proboyo, 1999)
			X56	Delayed delivery of construction materials	(Choong Kog, 2018; Frimpong et al., 2003)
			X57	Labor shortages	(Abd El-Razek et al., 2008; Frimpong et al., 2003)
			X58	Construction equipment shortages	(Abd El-Razek et al., 2008)
			X59	Construction material shortages	(Budayan, 2019; Choong Kog, 2018; Pham et al., 2021)
			Joint Inspection	X60	Inadequate supervision
		Contract Control	X61	Design or work detail changes during implementation at Owner's request	(Liu et al., 2017; Proboyo, 1999; Songer & Molenaar, 1997)
			X62	Large project complexity and size	(Lam et al., 2017; Zhong et al., 2023; Y. Zou et al., 2017)

			X63	Scope/work changes during implementation at Owner's request	(Budayan, 2019; Choong Kog, 2018; Yang & Wei, 2010)
			X64	Owner's delay in decision-making	(Abd El-Razek et al., 2008)
			X65	Owner's ability to evaluate contractor's develop design results	(Chan et al., 2001)
			X66	Slow approval process for working drawings by owner	(Choong Kog, 2018; Proboyo, 1999)
			X67	Changes in material types and specifications during implementation at Owner's request	(Yang & Wei, 2010)
			X68	Inappropriate proposed construction method	(Proboyo, 1999)
			X69	Delays in obtaining permits (e.g., import material permits)	(Choong Kog, 2018; Kog, 2018)
			X70	Land not yet cleared	(Budayan, 2019)
			X71	Design drawings not finalized	(Yang & Wei, 2010)
			X72	Requests for changes to completed work	(Proboyo, 1999)
			X73	Communication issues/lack of adequate project coordination among all parties	(Choong Kog, 2018; Liu et al., 2017)
			X74	Delays in inspection and approval of work, approval of working drawings, materials, and documents submitted by the contractor	(Choong Kog, 2018; Frimpong et al., 2003; Proboyo, 1999)
			X75	Rainy weather conditions disrupting site entry and work execution	(Abd El-Razek et al., 2008; Frimpong et al., 2003; Liu et al., 2017; Pham et al., 2021; Yang & Wei, 2010)
			X76	Infectious diseases on project site	(Yang & Wei, 2010)
			X77	Occurrence of work accidents	(Liu et al., 2017)
			X78	Impact of excessively low bid prices	(Frimpong et al., 2003)
			X79	Increase in material prices	(Pham et al., 2021)
			X80	Inflation	(Frimpong et al., 2003; Pham et al., 2021)
			X81	Difficulty in obtaining construction materials at reasonable prices	(Frimpong et al., 2003; Pham et al., 2021)
			X82	Frequent breakdowns of heavy equipment	(Assaf et al., 1995; Frimpong et al., 2003)
			X83	Low labor/equipment productivity	(Assaf et al., 1995)



			X84	Delays in receiving imported materials due to customs or shipping issues	(Frimpong et al., 2003)
			X85	Lack of professional management in handling construction and contract aspects	(Assaf et al., 1995; Frimpong et al., 2003)
			X86	Unexpected aspects found during contract implementation	(Ajayi Oluwaseyi Modupe et al., 2012)
		Manufacturer Inspection	X87	Manufacturer Inspection not conducted	(LKPP, 2021)
		Progress Payment	X88	Delayed progress payments	(Frimpong et al., 2003; Öztaş & Ökmen, 2004)
		Contract Changes	X89	Frequent contract addendums	(Yuristani et al., 2020)
		Force Majeure	X90	Unexpected natural disasters	(Zhong et al., 2023)
			X91	Different field conditions (unforeseen site conditions)	(Ajayi Oluwaseyi Modupe et al., 2012)
			X92	Occurrence of unexpected events such as fires, floods, natural disasters, etc.	(Liu et al., 2017; Pham et al., 2021)
			X93	Occurrence of riots, labor strikes, etc.	(Proboyo, 1999)
		Contract Termination or End	X94	Unexpected natural disasters	(Zhong et al., 2023)
		Contract Termination	X95	Contract termination due to Provider negligence	(LKPP, 2021)
		Opportunity Provision	X96	Provider negligence in performing the work	(LKPP, 2021)
		Penalty and Compensation	X97	Provider negligence in performing the work	(LKPP, 2021)
6	Handover of Work Results	First Handover (Provisional Handover)	X98	Incomplete documents for Handover	(Budayan, 2019)
		Maintenance Period	X99	Final check not in accordance	(Budayan, 2019)
		Final Handover	X100	Incomplete documents for Handover	(Budayan, 2019)

Risk assessments were based on primary and secondary data, gathered through questionnaires, and direct field observations concerning the risks occurring in design and build project procurement process at KIPP. After the data collection phase was completed, the obtained data from questionnaires were processed through data processing stages. Risks were formulated as a function of the likelihood and negative impact, represented by the

risk index = Likelihood Probability X Impact. Potential risks are those needing attention due to their high likelihood of occurrence and significant negative consequences.

The confirmed count after validated through probability - impact matrix are 16 high risk event in design and build project procurement process at KIPP.

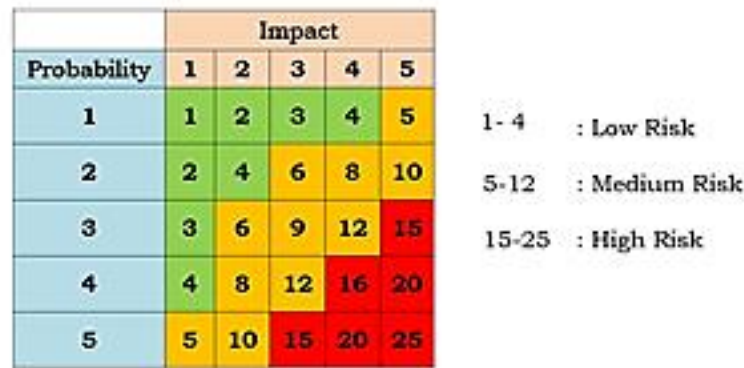


Figure 2. Probability - Impact Matrix

Table 4. High Risk Events in design and build project procurement process at KIPP

Activity	Code	Risk Event	Average Value	Risk Categorization
Procurement Budget	X5	Inaccurate cost estimation during planning phase	15,28	High Risk
Review and Determination of Design and Build Work Ceiling	X6	Inaccurate cost estimation during planning phase	15,24	High Risk
Preparation and Determination of Employer's Requirement Document	X8	Changes in Urban Plan	16,00	High Risk
	X9	Inadequate location investigation/unexpected soil conditions	15,17	High Risk
Prequalification	X26	Contractor's financial feasibility	15,34	High Risk
Work Site Handover	X47	Unexpected soil surface conditions	16,48	High Risk
Mobilization	X54	Delayed delivery of construction equipment	15,10	High Risk
	X55	Difficult/limited project site access	15,48	High Risk
	X56	Delayed delivery of construction materials	17,17	High Risk
	X57	Labor shortages	15,86	High Risk
	X59	Construction material shortages	16,48	High Risk
Contract Control	X61	Design or work detail changes during implementation at Owner's request	17,86	High Risk
	X62	Large project complexity and size	15,38	High Risk
	X63	Scope/work changes during implementation at Owner's request	16,52	High Risk
	X70	Land not yet cleared	16,21	High Risk
	X75	Rainy weather conditions disrupting site entry and work execution	15,66	High Risk

The research findings indicate that the main risks that cause delay in design and build project procurement process at KIPP are the activities of Procurement Budget (X5), Review and Determination of Design and Build Work Ceiling (X6), Preparation and Determination of Employer's Requirement Document (X8/X9), Prequalification (X26), Work Site Handover (X47), Mobilization (X54/X55/X56/X57/X59), and Contract Control (X61/X62/X63/X70/X75). The entire

procurement schedule is immediately impacted by these mishaps. The risk of design or work detail changes during implementation at Owner's request are the highest based on survey results from respondents.

Our results are consistent with earlier studies showing that one of the primary risk factor causing delays in design and build projects is design changes, as they can disrupt the construction process and require additional

time for implementation (Ajayi Oluwaseyi Modupe et al., 2012; Liu et al., 2017).

### VII. CONCLUSION

Risks in design and build project can be managed appropriately before and during execution. This research concludes:

1. The procurement of design and build projects at KIPP involves 6 stages and 42 activities based on literature study and validation by experts.
2. Risk occurrences in each activity of The procurement of design and build projects at KIPP, considering their causes and impacts, after validation by experts, resulted in 16 top risks out of 100 risk occurrences before validation.

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