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An Integrated Approach to Risk Identification and Assessment in Public Sector Design–Build Projects in Jakarta

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ABSTRACT: Public infrastructure projects delivered through the Design–Build (D&B) method are often promoted for their efficiency and integration potential. However, in developing countries, D&B schemes frequently face significant implementation risks due to design immaturity, contractual ambiguity, and institutional limitations. This study investigates risk factors contributing to delays in the Sub Polder Marunda and Tipala–Adhyaksa Pumping Station project in East Jakarta, a government-led urban flood control initiative. A qualitative case study methodology was employed, combining document analysis, semi-structured expert interviews, and structured risk analysis tools. Risk identification was conducted using the Ishikawa (fishbone) method, which revealed 59 preliminary risk variables across six thematic categories. These were validated and narrowed down to 29 dominant risks. The Probability–Impact Matrix (PIM) was then applied to prioritize risks based on expert judgment. Key findings indicate that insufficient design maturity at contract award, lack of clarity in risk allocation, ineffective stakeholder coordination, and regulatory delays were the most significant contributors to project disruptions. The study emphasizes the need for context-specific risk frameworks that address both technical and governance-related challenges in public D&B projects. This paper offers empirical insights and practical recommendations to improve risk management in D&B infrastructure delivery, particularly for flood mitigation projects in rapidly urbanizing regions.

KEYWORDS: Design–Build, public infrastructure, risk management, Ishikawa method, Probability–Impact Matrix, flood control, Jakarta, Indonesia

I. INTRODUCTION

Flood risk management has become increasingly critical in rapidly urbanizing regions, particularly in low-lying coastal megacities such as Jakarta. Jakarta's vulnerability to tidal inundation, river overflow, and pluvial flooding is exacerbated by land subsidence, poor drainage infrastructure, and unplanned urban development (Firman, Surtiari, & Rahmat, 2019). In response, the Indonesian government has implemented various polder systems and pumping stations, especially in flood-prone northern districts of the capital. These projects are designed not only to reduce the severity and frequency of flooding but also to improve the resilience of urban infrastructure against climate-induced hazards.

To expedite the delivery of such critical infrastructure, the government increasingly adopts the Design and Build (D&B) procurement method. D&B integrates the design and construction phases into a single contract, aiming to streamline project delivery, improve communication between design and execution teams, and reduce interface risks (Molenaar, Gransberg, & Jeong, 2018). While D&B is often promoted for its efficiency advantages, it is also associated with heightened risk exposure due to compressed timelines, limited design maturity at contract award, and reduced client control during design development (Rafiei et al., 2021).

The project "Sub Polder Marunda dan Pompa Tipala–Adhyaksa" in East Jakarta exemplifies the challenges faced in applying D&B in the public sector. Although D&B was chosen to accelerate project execution, the implementation encountered substantial delays and coordination challenges. These issues underscored the necessity of proactive risk management across all project phases. The complexity of urban drainage and pumping infrastructure projects under D&B schemes requires an integrated approach to risk identification, allocation, and mitigation—especially when multiple stakeholders are involved, such as government agencies, contractors, consultants, and local communities (Ali, Johar, & Mahadi, 2022).

Despite growing recognition of the importance of risk management in construction procurement, there remains a lack of empirical studies focusing on D&B infrastructure projects in Indonesia, particularly those involving flood control systems. Many of the risk management models adopted are derived from generic international frameworks, which may not account for local institutional, regulatory, and cultural contexts. Therefore, there is a pressing need for research that identifies context-specific risks and evaluates the effectiveness of mitigation strategies based on real project experiences.

This study addresses that gap by analyzing risk factors in the Sub Polder Marunda and Tipala-Adhyaksa project, using field data and expert perceptions to explore how risks emerged and were handled during project implementation. By doing so, it contributes to the body of knowledge on public infrastructure delivery in developing countries and provides practical insights for policymakers and practitioners on improving D&B performance in complex urban environments.

II. METHODOLOGY

This study employed a qualitative case study methodology to explore the dominant risk factors contributing to delays in the Sub Polder Marunda and Tipala–Adhyaksa Pumping Station project in East Jakarta, which was procured under a Design and Build (D&B) scheme. The research design is grounded in an exploratory approach to understand complex, context-dependent risks that typically emerge in urban infrastructure delivery projects in developing countries (Yin, 2018).

The methodology consists of three main stages: risk identification, risk validation, and risk assessment.

In the risk identification stage, the Ishikawa method (Fishbone Diagram) was used to systematically map the root causes of potential project delays. The fishbone structure facilitated categorization of risks based on contributing domains, including project owner management, planning deficiencies, field execution issues, procurement inefficiencies, project manager capabilities, and design scope ambiguities. This technique was selected for its effectiveness in organizing brainstorming results and visualizing cause–effect relationships in a structured manner (Adu, 2020). Initial brainstorming sessions were conducted with internal project team members and experts familiar with the project's operational and regulatory context. As a result, 59 initial risk variables were identified.

These risk variables were then subjected to a validation process through expert discussion and document review. Project documents such as progress reports, internal correspondence, risk logs, and audit findings were analyzed to corroborate the field-based identification. Following this step, a refined list of 29 dominant risks was obtained, which represented the most significant contributors to project delays as perceived by stakeholders and documented in project records.

In the risk assessment stage, the validated risks were evaluated using the Probability–Impact Matrix (PIM) (Kaseem et.al, 2019). This method combines qualitative likelihood and impact scoring to determine risk severity and prioritize mitigation efforts (Rafiei et al., 2021). Each risk was assessed through expert judgment from practitioners involved in the project, including representatives of the Ministry of Public Works and Housing (PUPR), contractors, and supervision consultants. Risk scores were plotted on a matrix to categorize them into high, medium, and low significance levels.

To ensure the credibility and trustworthiness of the findings, this study applied methodological triangulation by cross-verifying data obtained from interviews, project documentation, and risk evaluation results. The use of expert judgment was further strengthened through purposive sampling of experienced professionals directly involved in the project. All data were analyzed thematically to identify recurring patterns and risk interdependencies. This multi-source, multi-method approach not only enhanced the validity of the risk identification process but also ensured that the results reflected both the technical and institutional realities of Design and Build project execution in a developing country setting.

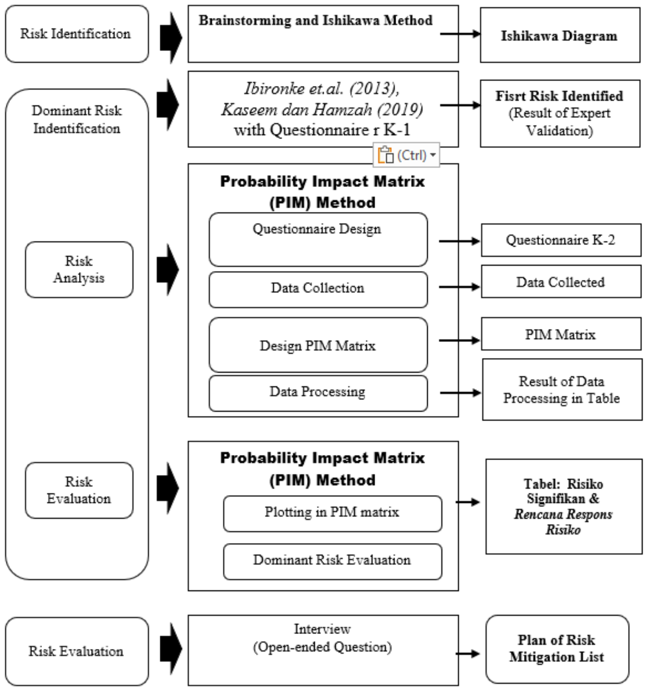

Figure 1. Flowchart methodology

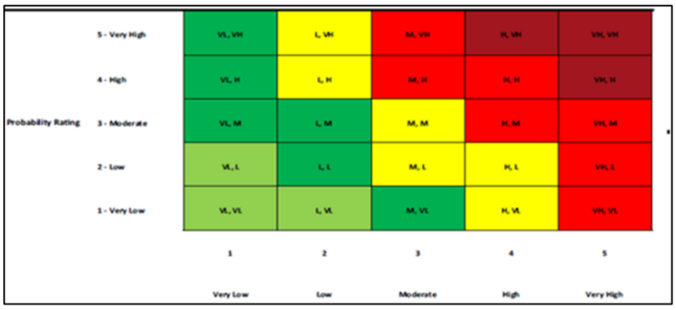

Figure 2. PIM Matrix (source: Kaseem et.al, 2019)

III. RESULT AND DISCUSSION

3.1 Overview of Risk Identification Results

Using the Ishikawa (fishbone) method, the study initially identified 59 potential risk variables contributing to delays in the Sub Polder Marunda and Tipala–Adhyaksa project. These were derived from brainstorming sessions and categorized into six major domains: (1) Owner's managerial ability, (2) Project planning and scheduling, (3) Construction field execution, (4) Procurement and logistics, (5) Project manager competency, and (6) Scope and contract clarity.

For example, in the domain of project planning, risks such as incomplete design documentation and unrealistic scheduling were highlighted. In the procurement category, delays in materials and equipment delivery were noted, often linked to poor vendor coordination and budget disbursement delays. These early risk identifications provided a comprehensive starting point for structured analysis.

3.2 Risk Consolidation and Dominant Risks

Following expert validation and document triangulation, the list of risk variables was refined to 29 dominant risks that were considered critical to project performance (Table 1). Each risk was further analyzed through the Probability–Impact Matrix (PIM) to determine its severity.

Among the highest-ranked risks were:

a) Delays in obtaining construction permits and land access, which hampered initial mobilization.
b) Incomplete or late delivery of detailed design documents, which led to construction rework and schedule fragmentation.
c) Unclear allocation of risk responsibilities in the D&B contract, leading to disputes between the design team and field execution unit.
d) Ineffective communication and coordination between stakeholders, particularly between the project owner, contractor, and supervisory consultant.
e) Weak project monitoring and change management practices, causing late detection of deviations and cost overruns.
f) These findings echo those in previous studies that emphasize contract clarity, stakeholder coordination, and early-phase design completeness as recurrent challenges in D&B projects (Molenaar et al., 2018; Ali et al., 2022).

Table 1. Twenty-nine dominant Risks

No.	Risk Level	Risk Description
1.	Very High	Lack of contractor's cash flow capacity to complete the design and build project.
2.	High	Work implementation not aligned with the agreed planning.
3.	High	Contractor's lack of attention to construction method planning, causing method changes during execution.
4.	High	Delays in reaching design agreement during development due to differing perceptions between Owner and design team.
5.	High	Inaccurate activity duration estimation by the design team for design and build work.
6.	High	Inaccurate cost estimation by the design team for design and build implementation.
7.	High	Contractor's lack of experience in executing design and build projects.
8.	High	Incompetence of contractor in executing design and build work.
9.	High	Site conditions and environment differ from initial assumptions.
10.	High	Design team's lack of experience in creating designs for design and build projects.
11.	High	Incompetence of project manager in managing design and build projects.
12.	High	Design team's lack of understanding of the owner's design requirements.
13.	High	Project manager's inability to select appropriate personnel for the design and build project.
14.	High	Contractor's lack of understanding of the agreed develop design between planner and PPK.
15.	High	Negligence and delays from subcontractors.
16.	High	Contractor's lack of innovation in work techniques and materials to expedite project execution.
17.	High	Project manager's lack of leadership, organizing, and team motivation skills.
18.	High	Project manager's inability to drive team commitment to quality, cost, and schedule.
19.	High	Lack of experienced design and build companies.
20.	High	Design team's lack of understanding of owner-requested design changes during development.
21.	High	Absence of risk identification and allocation in design and build work.
22.	High	Project manager's lack of experience in scheduling all project activities.
23.	High	Ineffective communication among design and construction team members.
24.	High	Project manager's lack of experience in task and responsibility delegation.
25.	High	Lack of project manager involvement from the beginning and throughout the design and build project.
26.	High	Design team's lack of understanding of applicable regulatory standards.
27.	High	Excessive input from contractors to the design team during design development.
28.	High	Contractor's poor capacity in management and quality control.

29.	High	Absence of standard procedures in design and build tender processes.

3.3 Key Themes from Risk Analysis

The analysis revealed several cross-cutting themes that significantly influenced project outcomes:

a) Contractual Ambiguity in D&B Projects

Several stakeholders expressed concern over unclear delineation of responsibilities within the D&B agreement. While D&B is intended to reduce fragmentation, in practice it created confusion over accountability—especially in handling design errors discovered during construction. This reinforces the argument by Rafiei et al. (2021) that contractual risk is heightened in D&B models if standard clauses are not adapted to project complexity and regulatory conditions.

b) Design Maturity at Contract Award

The study found that the design documentation included in the initial tender was not sufficiently detailed, leaving room for significant reinterpretation during execution. This led to multiple design revisions and field adjustments. Literature supports this finding; early design freeze is a known risk in D&B procurement that often results in cost and time overruns (Love et al., 2019).

c) Stakeholder Integration and Coordination Gaps

Communication breakdowns between the Ministry of Public Works and Housing, contractors, and consultants led to delayed decisions and suboptimal issue resolution. This issue is consistent with findings from Kwofie et al. (2020), who emphasized the need for integrated project delivery (IPD) principles even within D&B structures to improve collaboration.

d) Regulatory and Bureaucratic Delays

Regulatory constraints, including permit acquisition and inter-agency coordination, emerged as a non-technical but critical risk factor. These delays were largely outside the control of the contractor but significantly affected the schedule. This emphasizes the necessity of incorporating external environmental risks into the overall risk management strategy.

3.4 Lessons for Future D&B Infrastructure Projects

The findings highlight the importance of tailoring risk management approaches to suit the institutional realities of public sector infrastructure delivery in Indonesia. Specific lessons include:

a) Enhancing Design Readiness

Ensuring that detailed engineering designs are close to completion before contract award can reduce scope changes and disputes.

b) Risk Allocation Clarity

Standard D&B contracts should be reviewed and adjusted to clarify roles and responsibilities, particularly in the event of design changes or external disruptions.

e) Stakeholder Engagement Strategy

A stakeholder integration framework, including a dedicated communication protocol and escalation procedures, is essential for effective coordination.

f) Capacity Building

Training programs on D&B project execution should be provided to public sector officials to improve contract administration and risk anticipation.

These lessons are especially relevant as Indonesia continues to scale up D&B procurement models for major infrastructure initiatives under its National Medium-Term Development Plan (RPJMN).

CONCLUSION

This study explored the dominant risks contributing to delays in the Sub Polder Marunda and Tipala–Adhyaksa Pumping Station project in East Jakarta, delivered under a Design and Build (D&B) procurement scheme. By applying a combined methodological approach—starting with the Ishikawa method for systematic risk identification and followed by expert validation and prioritization using the Probability–Impact Matrix (PIM)—the research uncovered key technical, managerial, contractual, and regulatory risks that significantly impacted project performance.

Among the 29 dominant risks identified, several were found to be critical: incomplete design documentation at contract award, ambiguity in risk allocation within the D&B contract, poor coordination among stakeholders, and delays in regulatory permits. These risks not only contributed to schedule slippage and operational inefficiencies but also highlighted structural issues in the planning and governance of D&B infrastructure projects in Indonesia. The findings affirm the notion that while D&B can offer benefits such as time compression and streamlined project control, its implementation in complex public infrastructure projects demands a high level of design maturity, institutional coordination, and contract clarity. Without these prerequisites, the model may amplify rather than mitigate risk.

This study contributes to the literature by providing empirical insights into D&B risk dynamics within the context of developing countries, where legal, institutional, and capacity-related constraints often affect project execution. It underscores the importance of adapting risk management frameworks to suit local realities—particularly in flood control infrastructure where delays can have significant social and environmental consequences. Future D&B projects should incorporate proactive stakeholder engagement, ensure detailed engineering readiness, and employ adaptive risk allocation strategies. Furthermore, public agencies must invest in training and capacity-building to enhance their role as informed clients capable of managing integrated procurement systems.

By aligning methodological rigor with field-based understanding, this study offers practical and policy-relevant recommendations for improving risk governance in public sector D&B infrastructure delivery.

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REFERENCES

1. A. Kassem, M., Khoiry, M. A., & Hamzah, N. (2020). Using probability impact matrix (PIM) in analyzing risk factors affecting the success of oil and gas construction projects in Yemen. International Journal of Energy Sector Management, 14(3), 527–546. https://doi.org/10.1108/IJESM-03-2019-0011
2. Abdul Rahman, K., Ahmad, S. A., Che Soh, A., Ashari, A., Wada, C., & Gopalai, A. A. (2023). Improving Fall Detection Devices for Older Adults Using Quality Function Deployment (QFD) Approach. Gerontology and Geriatric Medicine, 9. https://doi.org/10.1177/23337214221148245
3. Adnan, H., Jusoff, K., & Salim, M. K. (2008). The Malaysian Construction Industry's Risk Management in Design and Build. Modern Applied Science, 2(5), 27–33. https://doi.org/10.5539/mas.v2n5p27
4. Adu, E. O. (2020). Application of fishbone diagram in identifying causes of construction project delays. Journal of Construction Engineering and Management, 146(5), 05020005. https://doi.org/10.1061/(ASCE)CO.1943-7862.0001801
5. AKINTOYE, A., & FITZGERALD, E. (1995). Design and build: a survey of architects' views. Engineering, Construction and Architectural Management, 2(1), 27–44. https://doi.org/10.1108/eb021001
6. Alam, T. (2011). Identifikasi Faktor-Faktor Risiko Proyek Rancang Bangun (Design And Build) Pada PT . XYZ Yang Berpengaruh Terhadap Kinerja Waktu. Tesis, 1–251.
7. Ali, M. S. B., Johar, F., & Mahadi, R. (2022). A framework for managing risk in design and build projects in developing countries. International Journal of Project Organisation and Management, 14(2), 170–188. https://doi.org/10.1504/IJPOM.2022.123456
8. Anumba, C. J., & Evbuomwan, N. F. O. (1997). Concurrent engineering in design-build projects. Construction Management and Economics, 15(3), 271–281. https://doi.org/10.1080/014461997373006
9. Ariane, F., & Dinariana, D. (2018). Earned Value Analysis Pada Pengendalian Waktu Proyek Venue Layar Di Dki Jakarta. Jurnal IKRA-ITH Teknologi, 2(3), 51–54. https://journals.upi-yai.ac.id/index.php/ikraith-teknologi/article/view/331
10. Aven, T. (2016). Risk assessment and risk management: Review of recent advances on their foundation. European Journal of Operational Research, 253(1), 1–13. https://doi.org/10.1016/j.ejor.2015.12.023
11. Chapman, C., & Ward, S. (2003). Project Risk Management. Process, Techniques and Insights. Second Edition.
12. Chen, Q., Jin, Z., Xia, B., Wu, P., & Skitmore, M. (2016). Time and Cost Performance of Design–Build Projects. Journal of Construction Engineering and Management, 142(2). https://doi.org/10.1061/(asce)co.1943-7862.0001056
13. Dinariana, D., Sebayang, E. M., & Rahardjo, H. A. (2018). Pengelolaan Risiko Proyek Gedung Bertingkat Pada PT. XYZ Di Jakarta terhadap Kinerja Waktu. Jurnal Teknik Sipil, 25(3), 229–236. https://doi.org/10.5614/jts.2018.25.3.8
14. E Masterm an, J. W., Taylor, F., Group LONDON, F., & York, N. (2013). An Introd uction to Buildi ng Procu remen t System s, 2nd edition.
15. Firman, T., Surtiari, G. A. K., & Rahmat, D. (2019). The dynamics of land subsidence in Jakarta and its policy implications. Journal of Infrastructure Systems, 25(2), 04019005. https://doi.org/10.1061/(ASCE)IS.1943-555X.0000487
16. Gransberg, D. D., & Molenaar, K. (2004). Analysis of Owner's Design and Construction Quality Management Approaches in Design/Build Projects. Journal of Management in Engineering, 20(4), 162–169. https://doi.org/10.1061/(asce)0742-597x(2004)20:4(162)
17. HAROLD KERZNER, P. D. (2009). PROJECT MANAGEMENT. In Fire Prevention and Fire Engineers Journals (Vol. 63, Issue 238). https://doi.org/10.1002/9781119020042.ch3
18. Heizer, J., Render, B., & Munson, C. (2017). Operations Mangement. In Sustainability (Switzerland) (Vol. 11, Issue 1). http://scioteca.caf.com/bitstream/handle/123456789/1091/RED2017-Eng-8ene.pdf?sequence=12&isAllowed=y%0Ahttp://dx.doi.org/10.1016/j.regsciurbeco.2008.06.005%0Ahttps://www.researchgate.net/publication/305320484_

19. Hillson and Murray (2017). (2017). Understanding and managing Risk Attitude. Second Edi, 177.
20. International Organization for Standardization (ISO). (2018). ISO 31000:2018 - Risk Management — Guidelines. Geneva, Switzerland: ISO.
21. International Organization for Standardization. (2019). ISO 31010:2019 - Risk Management — Risk Assessment Techniques. Geneva, Switzerland: ISO.
22. ISO 31000. (2018). BSI Standards Publication Risk management — Guidelines i a r t or u p g nin s e s rpo Lo y l on py o c an For Lo y l o s s o p r u p ng i i o c. BSI Standard Publication. https://lpm.uin-suka.ac.id/media/dokumen_akademik/011_20191007_ISO 31000.2018 - Risk Management - Guidelines.pdf
23. Istimawan Dipohusodo. (1967). Manajemen Proyek dan Konstruksi. In Angewandte Chemie International Edition, 6(11), 951–952. http://repo.iain-tulungagung.ac.id/5510/5/BAB 2.pdf
24. Jayady, A., & Moerdianto, E. (2022). Risk Management of Time Control on the Construction of Saumlaki Port. Indonesian Journal of Multidisciplinary Science, 1(12), 1581–1597. https://doi.org/10.55324/ijoms.v1i12.239
25. Jayady, A., Sudiarto, P., & Suryani, F. (2022). Operational Risk Management in the Cibitung Metland Waterland Building on Investment Costs. Indonesian Journal of Multidisciplinary Science, 1(12), 1612–1628. https://doi.org/10.55324/ijoms.v1i12.231
26. Kamus Bahasa Indonesia. (2008). Kamus Bahasa Indonesia. In Etika Jurnalisme Pada Koran Kuning : Sebuah Studi Mengenai Koran Lampu Hijau (Vol. 16, Issue 2).
27. Kassem, M. A., Khoiry, M. A., & Hamzah, N. (2019). Using probability impact matrix (PIM) in analyzing risk factors affecting the success of oil and gas construction projects in Yemen. International Journal of Energy Sector Management, 14(3), 527-546. https://doi.org/10.1108/IJESM-03-2019-0011
28. Kendrick, T. (2012). Identifying and Managing Project Risk Essential Tools for F.
29. Kwofie, T. E., Afram, S., & Botchway, E. A. (2020). Integrating risk management into the delivery of public infrastructure: A systems approach. Built Environment Project and Asset Management, 10(5), 651–668. https://doi.org/10.1108/BEPAM-09-2019-0087
30. Lam, E., Chan, A., & Chan, P. D. (2008). Determinants of Successful Design-Build Projects. Journal of Construction Engineering and Management-Asce - J CONSTR ENG MANAGE-ASCE, 134. https://doi.org/10.1061/(ASCE)0733-9364(2008)134:5(333)
31. Love, P. E. D., Simpson, I., Hill, A., & Standing, C. (2019). From justification to evaluation: Building information modeling and project change. Automation in Construction, 98, 218–226. https://doi.org/10.1016/j.autcon.2018.11.021
32. Mahalingam, A., Yadav, A., & Varaprasad, J. (2015). Investigating the Role of Lean Practices in Enabling BIM Adoption: Evidence from Two Indian Cases. Journal of Construction Engineering and Management, 141, 5015006. https://doi.org/10.1061/(ASCE)CO.1943-7862.0000982
33. Molenaar, K. R., Gransberg, D. D., & Jeong, H. D. (2018). Design–build procurement: Performance and lessons learned. Journal of Management in Engineering, 34(1), 04017055. https://doi.org/10.1061/(ASCE)ME.1943-5479.0000579
34. Moleong, L. J. (2010). Metodologi penelitian kualitatif / Lexy J. Moleong. https://api.semanticscholar.org/CorpusID:177121325
35. Ökmen, & Öztaş, A. (2014). A CPM-based scheduling method for construction projects with fuzzy sets and fuzzy operations. Journal of the South African Institution of Civil Engineering, 56(2), 2–8.
36. Paul Hopkin. (2015). Fundamentals of Risk Management_ Understanding, evaluating and implementing effective risk management. In Proceedings of the National Academy of Sciences (Vol. 3, Issue 1). http://dx.doi.org/10.1016/j.bpj.2015.06.056%0Ahttps://academic.oup.com/bioinformatics/article-abstract/34/13/2201/4852827%0Ainternal-pdf://semisupervised-3254828305/semisupervised.ppt%0Ahttp://dx.doi.org/10.1016/j.str.2013.02.005%0Ahttp://dx.doi.org/10.10
37. Permen PUPR Nomor 1 Tahun 2020 Tentang Standar Dan Pedoman Pengadaan Pekerjaan Konstruksi Terintegrasi Rancang Bangun Melalui Penyedia, Jdih.Pu.Go.Id 1 (2020). http://www.pu.go.id/
38. Permen PUPR NOMOR 12 /PRT/M/2014 Tentang Penyelenggaraan Sistem Drainase Perkotaan, Menteri Pekerjaan Umum Republik Indonesia 1 (2014).
39. PMBOK® Guide Sixth Edition (PMI, 2017). (2017). PMBOK® Guide Sixth Edition (PMI, 2017). In Project Management Institute (Vol. 6). http://www.citeulike.org/group/14887/article/9008974
40. Power, M. (2004). The risk management of everything. Journal of Risk Finance, 5(3), 58–65. https://doi.org/10.1108/eb023001
41. Rafiei, M. H., Akbarnezhad, A., Hosseini, M. R., & Chileshe, N. (2021). A risk taxonomy framework for design and build projects: Evidence from developing countries. Engineering, Construction and Architectural Management, 28(1), 203–227. https://doi.org/10.1108/ECAM-07-2019-0401
42. Rebeiz, K. S. (2012). Public–Private Partnership Risk Factors in Emerging Countries: BOOT Illustrative Case Study. Journal of Management in Engineering, 28(4), 421–428. https://doi.org/10.1061/(asce)me.1943-5479.0000079

43. Soeharto, I. (1999). Manajemen Proyek. In Manajemen Proyek (Vol. 60, Issue 5). https://doi.org/10.3938/jkps.60.674
44. Soekarto, D., Si, M., & Berstein, P. L. (2016). Risiko dalam Kehidupan Masyarakat. 1–38.
45. Stephanie, S., & Dinariana, D. (2016). Project Planning and Controlling Gedung Rusunawa Universitas Indonesia Dengan Ms.Project. ETHOS (Jurnal Penelitian Dan Pengabdian), 181. https://doi.org/10.29313/ethos.v0i0.1787
46. Sugiyono, 2019. (2009). Prof_dr_sugiyono_metode_penelitian_kuant.pdf.
47. Taylor, S. J., Bogdan, R., & DeVault, M. L. (2016). Introduction to Qualitative Research Methods. In Proceedings of the National Academy of Sciences (Vol. 4, Issue 1). http://dx.doi.org/10.1016/j.bpj.2015.06.056%0Ahttps://academic.oup.com/bioinformatics/article-abstract/34/13/2201/4852827%0Ainternal-pdf://semisupervised-3254828305/semisupervised.ppt%0Ahttp://dx.doi.org/10.1016/j.str.2013.02.005%0Ahttp://dx.doi.org/10.10
48. Tony Buzan, & Barry Buzan. (2020). The Mind Mapping Book (pp. 1–322).
49. Wang, S., & Zhou, L. (2017). Glacial Lake Outburst Flood Disasters and Integrated Risk Management in China. International Journal of Disaster Risk Science, 8(4), 493–497. https://doi.org/10.1007/s13753-017-0152-7
50. Weng Seng, N., & Aminah, M. Y. (2006). The Success Factors of Design and Build Procurement Method. Proceedings of the 6th Asia-Pacific Structural Engineering and Construction Conference, September, 5–6.
51. Wulfram I. Ervianto. (2002). Manajemen Proyek Konstruksi 2023. Yayasan Kita Menulis, 128.
52. Xia, B., Chan, A., Molenaar, K., & Skitmore, M. (2012). Determining the Appropriate Proportion of Owner-Provided Design in Design-Build Contracts: Content Analysis Approach. Journal of Construction Engineering and Management, 138, 1017–1022. https://doi.org/10.1061/(ASCE)CO.1943-7862.0000522
53. Yean, F., Ling, Y., Chan, S. L., Chong, E., & Ee, L. P. (2004). Predicting Performance of Design-Build and Design-Bid-Build Projects. 130(February), 75–83.
54. Yin, R. K. (2018). Case Study Research and Applications: Design and Methods (6th ed.). SAGE Publications.