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Management in Design-Build Projects by Construction Management Consultants: SEM-PLS and IPMA Approaches

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Abstract

This study investigates the factors influencing the potential audit findings in Design and Build (DB) construction projects in Indonesia, employing Structural Equation Modelling–Partial Least Squares (SEM-PLS) and Importance–Performance Map Analysis (IPMA). Data were collected from 100 respondents, including project owners, contractors, and construction management consultants. The SEM-PLS results reveal that Integrity & Compliance Culture ($\beta = -0.169$, $p = 0.045$) and Administrative & Financial Compliance ($\beta = -0.193$, $p = 0.027$) significantly reduce the probability of audit findings, while other technical factors such as planning, supervision, and team competence show no direct effect. IPMA highlights Integrity & Compliance Culture and Contract & Documentation Management as top improvement priorities. These findings demonstrate that governance and compliance dimensions are more critical than technical performance in shaping audit outcomes. Strengthening compliance culture, enhancing administrative transparency, and implementing robust contract management are therefore key strategies to minimize audit risks in DB projects. The study contributes to the applied statistics literature in construction management and offers practical insights for policymakers, contractors, and auditors aiming to achieve accountable and transparent infrastructure delivery in Indonesia.

Keywords: Audit Findings; Design and Build; IPMA; SEM-PLS

1. Introduction

Design and Build (DB) is a growing trend as a procurement method in construction projects where one system does the design and another system does the construction. The benefits of this approach include shorter project period, decreased cost, and greater teamwork amid the parties than the traditional Design-Bid-Build (DBB) approach [1], [2], [3]. Although this positively affects DB projects in Indonesia, audit reports on these projects are associated with administrative weaknesses, incomplete documentation, and weak supervision that might result in a loss of potentially considerable amounts of money to the state [4], [5]. These outcomes draw attention to the fact that project success cannot be judged only by technical and physical completion but also by administrative and governance compliance.

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When audit results are experienced in DB projects, it indicates weaknesses in project management practices. Although the technical might pass the contractual requirements, poor administrative systems are a common subject of the Auditors and this leads to uncovering both positive and negative results that could undermine the trust and accountability of the populace towards the infrastructure delivery. How risk management, procurement compliance, and contract management interact in the context of construction projects has been investigated previously, but not many studies have analyzed its overall impact on audit results empirically using quantitative models, including PLS-SEM [6], [7]. Hence, there exist the urgency to define some crucial aspects that have significant implications on audit results in DB projects, in particular, in the context of Indonesia.

Factors Influencing Potential Audit Findings Previous studies have identified various determinants that contribute to the potential of audit findings in construction projects. Planning and design quality are fundamental; poor planning is often cited as a primary cause of project delays and subsequent audit queries, as highlighted by [8]. Furthermore, the maturity of risk management practices plays a critical role in mitigating unforeseen issues that lead to audit adjustments [9], [10]. Compliance with procurement regulations is another significant factor, where deviations are frequently flagged by auditors [11], [12].

Effective contract management and documentation are essential for accountability; weaknesses in this area directly correlate with increased audit findings [13], [14], [15], [16]. Similarly, the quality of supervision (QA/QC) is pivotal, as inadequate oversight often results in non-conformance detected during audits [17], [18], [19]. The competence and stability of the project team also influence governance outcomes, with skilled teams being better equipped to handle administrative requirements [20], [21], [22].

Crucially, organizational culture impacts compliance. A strong integrity and compliance culture has been found to reduce compliance risks [23], [24]. Likewise, adherence to administrative and financial compliance protocols is a direct predictor of clean audit reports [25], [26]. Operational factors such as discipline in managing work changes [27] and the overall quality and progress performance [28] are also hypothesized to influence the probability of audit findings. Based on these arguments, this study proposes hypotheses H1 through H10, which posit that these variables directly affect the Potential for Auditor Findings.

Interrelationships Among Project Governance Variables Beyond direct effects on audit findings, this study examines the structural relationships between project variables. Procurement compliance is posited to influence administrative and financial compliance [25], [29]. Furthermore, robust contract management and documentation are expected to enhance administrative and financial compliance [30], [31] and enforce discipline in work changes [32], [33]. An organizational culture of integrity is also hypothesized to significantly bolster administrative and financial compliance [34], [35].

Regarding team dynamics, team competence and stability are vital for maintaining discipline in work changes [27]. In terms of technical performance, QA/QC and supervision are traditional drivers of quality performance and progress [36], [37]. Finally, the integrity and compliance culture is expected to positively impact overall quality performance and progress [38], [39]. These relationships form the basis for hypotheses H11 through H17.

Base on Table 1, this paper will attempt to fill the gap by examining various variables such as planning quality, administrative compliance, procurement compliance, contract management and integrity culture which can affect the audit findings probability. This study examines how these latent variables relate to each other causally by using Structural Equation Modelling-Partial Least Squares (PLS-SEM). In addition, the research uses Importance-Performance Map Analysis (IPMA) to identify the areas of improvement. This type of approach can offer not only statistical confirmation of the significant determinants but also offer guidelines on how to allocate resources and interventions [40], [41].

This work has a twofold contribution. First, it adds to the body of applied statistics literature

in construction management, through its synthesis of PLS-SEM with IPMA to audit-related results, which few studies have previously addressed. Second, it offers practical information to policy makers, contractors and auditors to enhance governance and mitigate losses that can be incurred by the state in DB projects. This study will help to achieve more transparent and accountable infrastructure delivery in Indonesia by recognizing and prioritizing the most important factors.

2. Method

The researchers used a survey design and quantitative method to examine the variables that are relevant to potential audit findings on Design and Build (DB) construction projects in Indonesia. Several latent variables were incorporated in the research model, such as quality planning, risk management, procurement compliance, contract and documentation management, quality assurance, team competence, integrity and compliance culture, administrative and financial compliance, work change discipline and project performance to yield the potential of audit findings to project performance.

2.1. Research Design and Respondents

A cross-sectional design was used in conducting the research. The information was gathered using questionnaires which were given to the stakeholders who were directly involved in DB projects. 100 respondents responded, including project owners, contractors and construction management consultants. Purposive sampling was used which targeted people who had experience in handling DB projects. This strategy helped to guarantee that the respondents were knowledgeable about administrative procedures, documentation, and project oversight.

2.2. Measurement and Instruments

The research utilised a structured questionnaire whereby the items were measured via a five-point Likert scale. The indicators were established through the previous research and project management, compliance, and auditing theoretical frameworks. The operationalizations of each latent variable were further divided into multiple reflective indicators in order to represent the perceptions of the respondents regarding planning, compliance, documentation, and governance practices [40].

2.3. Data Collection and Analysis

The data were collected online and face to face over the period between January and March of 2025 using both online and face to face survey distribution. Preliminary screening of the data collected was performed to ascertain completeness and validity. The relationship among latent variables between dependent and independent variables was analyzed using Structural Equation Modelling-Partial Least Squares (PLS-SEM). The evaluation was divided into two phases of measurement model testing (outer model) to test the reliability and validity and structural model testing (inner model) to test the significance, explanatory power, and predictive relevance [42].

Besides PLS-SEM, Importance-Performance Map Analysis (IPMA) was also used to determine the improvement priorities among the significant determinants of audit findings. The IPMA presented more practical suggestions, as the latent variables were mapped according to the degree of importance (total effects) and performance scores, therefore, providing a more global managerial implication [41]. All the analyses were done with SmartPLS software.

2.4. SEM-PLS

Since this study utilizes reflective indicators, the relationship between the latent construct and its indicators is expressed by the linear equation:

$$x_{jk} = \lambda_{jk}\xi_j + \varepsilon_{jk} \tag{1}$$

Where x_{jk} represents the k-th indicator of the latent variable ξ_j, λ_{jk} denotes the outer loading (correlation between indicator and construct), and ε_{jk} is the measurement error.

For the structural model (inner model), the path relationships between exogenous latent variables (ξ) and endogenous latent variables (η) are defined as:

$$\eta_j = \sum_i \beta_{ji}\xi_i + \zeta_j \tag{2}$$

Where β_{ji} represents the path coefficient linking the exogenous variable ξ_i to the endogenous variable η_j, and ζ_j represents the inner model residual. The predictive power of the structural model is evaluated using the coefficient of determination (R^2) and the Stone-Geisser's Q^2 value for predictive relevance.

2.5. Importance-Performance Map Analysis (IPMA)

To provide actionable managerial implications, this study employs IPMA. This analysis contrasts the Total Effects (Importance) of the structural model against the average Latent Variable Scores (Performance). The performance scores are rescaled on a range from 0 to 100 using the following formula:

$$Y_i^{\text{rescaled}} = \frac{Y_i - \min(Y_i)}{\max(Y_i) - \min(Y_i)} \times 100 \tag{3}$$

Where Y_i is the original latent variable score. The "Importance" is derived from the total effect (TE), which is the sum of direct effects (DE) and indirect effects (IE) of an exogenous variable on the target endogenous variable (Audit Findings Potential):

$$TE_{xy} = DE_{xy} + \sum IE_{xy} \tag{4}$$

IPMA allows for the identification of constructs that have high importance (strong impact on audit findings) but low performance, signaling priority areas for improvement.

3. Results And Discussion

This section presents the empirical results obtained from the survey data and the subsequent SEM-PLS and IPMA analyses. The results are organized to reflect the analytical stages described in the Method section, starting from descriptive information and continuing to model evaluation and hypothesis testing. The following subsections report respondent characteristics, assess the measurement model, and evaluate the structural model to support the discussion of audit findings potential in Design and Build projects.

3.1. Respondent Characteristics

Based on Fig. 1 regarding the respondents' professional backgrounds, the study involved 100 participants with a diverse composition. The majority of respondents (58%) were employers from ministries or state agencies, indicating that a significant portion of the sample possesses direct experience in government construction project governance and represents the technical regulatory perspective. Furthermore, 23% of the respondents were implementing contractors, representing the practical field perspective regarding contract implementation and project execution. Additionally, 19% worked as construction management consultants, holding strategic roles in quality control, risk management, and project supervision. This composition demonstrates that the research sample is representative, as it encompasses key actors in Design and Build projects, ranging from owners and executors to supervisors. Consequently, the findings are expected to provide a comprehensive overview of the factors influencing potential auditor findings.

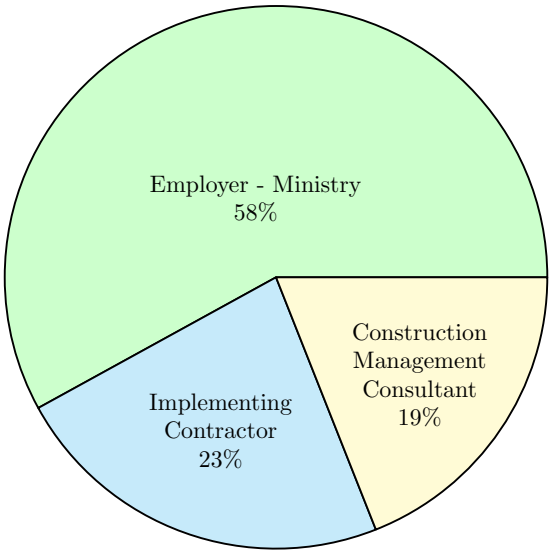

Figure 1: Respondent Characteristics

3.2. Measurement Model (Outer Model)

This subsection evaluates the measurement model to assess the reliability and validity of the reflective constructs used in the study. The assessment focuses on indicator reliability, internal consistency, convergent validity, and discriminant validity to ensure that the constructs are measured appropriately. The results of the measurement model evaluation are summarized in Table 1.

Table 1: Evaluation of Outer Model

Construct	**Indicator**	**Outer Loading**	**CR**	**AVE**	**HTMT ($\leq$ 0.90)**
Planning & Design Quality	PD1–PD3	0.721–0.845	0.872	0.611	< 0.85
Risk Management Maturity	RM1–RM3	0.733–0.812	0.851	0.593	< 0.80
Procurement Compliance	PC1–PC3	0.714–0.832	0.864	0.608	< 0.82
Contract & Documentation Management	CD1–CD4	0.702–0.861	0.889	0.624	< 0.84
QA/QC & Supervision	QA1–QA3	0.740–0.856	0.873	0.635	< 0.80
Team Competence & Stability	TC1–TC3	0.721–0.832	0.861	0.608	< 0.83
Integrity & Compliance Culture	IC1–IC3	0.753–0.869	0.887	0.664	< 0.89
Administrative & Financial Compliance	AF1–AF3	0.746–0.853	0.874	0.632	< 0.88
Work Change Discipline	WD1–WD3	0.727–0.844	0.868	0.618	< 0.84
Quality & Progress Performance	QP1–QP3	0.739–0.856	0.876	0.627	< 0.82
Audit Findings Potential	AFI1–AFI3	0.761–0.862	0.892	0.644	< 0.85

Note: All values meet the threshold (Loading $\geq$ 0.70; CR $\geq$ 0.70; AVE $\geq$ 0.50; HTMT $<$ 0.90), indicating good reliability and validity.

The reflective measurement model was evaluated on a few criteria. The results of the evaluation can be seen in Table 1. There were satisfactory indicator reliability signals with outer loading greater than 0.70. Composite Reliability values of more than 0.70 were established as internal consistency reliability. Convergent validity was attained because all constructs had an AVE of more than 0.50. The Heterotrait-Monotrait Ratio (HTMT) was used to verify discriminant validity, and all of the values fell below the 0.90 threshold, which stated that the constructs were empirically different [42].

3.3. Structural Model (Inner Model)

After confirming the adequacy of the measurement model, the structural model was evaluated to examine the relationships among the latent variables. This evaluation includes an assessment of multicollinearity, explanatory power, and predictive relevance of the proposed model. The multicollinearity assessment using Variance Inflation Factor (VIF) values is presented in Table 2.

Table 2: Inner VIF

Path (Latent Variable → Latent Variable)	VIF	Interpretation
Work Change Discipline → Audit Findings Potential	3.765	Acceptable (no multicollinearity)
Integrity & Compliance Culture → Administrative & Financial Compliance	2.317	Acceptable
Integrity & Compliance Culture → Audit Findings Potential	3.13	Acceptable
Administrative & Financial Compliance → Audit Findings Potential	2.801	Acceptable
Procurement Compliance → Administrative & Financial Compliance	2.715	Acceptable
Procurement Compliance → Audit Findings Potential	3.305	Acceptable
Quality & Progress Performance → Audit Findings	3.855	Acceptable (highest, but < 5)
Team Competence & Stability → Work Change Discipline	1.946	Acceptable (lowest)
Team Competence & Stability → Quality & Progress Performance	2.476	Acceptable
Team Competence & Stability → Audit Findings Potential	3.402	Acceptable
Planning & Design Quality → Audit Findings Potential	3.459	Acceptable
Contract & Documentation Management → Work Change Discipline	1.946	Acceptable (lowest)
Contract & Documentation Management → Administrative & Financial Compliance	2.332	Acceptable
Contract & Documentation Management → Audit Findings Potential	3.737	Acceptable
Risk Management Maturity → Audit Findings Potential	2.646	Acceptable
QA/QC & Supervision → Quality & Progress Performance	2.476	Acceptable
QA/QC & Supervision → Audit Findings Potential	3.536	Acceptable

Base on Table 2, the assessment of the structural model indicated that it was not affected by the problem of multicollinearity since all the Variance Inflation Factor (VIF) values were below 5.0, i.e., between 1.946 and 3.855.

Table 3: Evaluation of Outer Model

Construct	R^2	Category	Q^2	Predictive Power
Work Change Discipline	0.646	Moderate	0.425	Sufficient
Administrative & Financial Compliance	0.587	Moderate	0.452	Sufficient
Quality & Progress Performance	0.498	Moderate	0.382	Sufficient
Audit Findings Potential	0.765	Strong	0.541	High

Base on Table 3, the explanatory power of the R2 values was high with Audit Findings Potential 0.765, Administrative & Financial Compliance 0.587, Work Change Discipline 0.646 and Quality & Progress Performance 0.498. All constructs had positive predictive relevance (Q2) values (between 0.382 and 0.541), which supports a high predictive capacity of the model.

The direct effects of all seventeen hypothesized relationships in the structural model are given in Table 4. The coefficients (β) and the p-values represent the magnitude and significance of every causal path. These findings indicate which factors significantly and statistically influence audit findings and intermediary constructs and which do not. The analysis of the importance of all hypotheses will help to define the areas of managerial priority in Design and Build projects, specifically regarding audit risk reduction.

Table 4: Direct Effects

Path (Latent Variable → Latent Variable)	**Coefficient (β)**	**p-value**	**Result**
Planning & Design Quality → Audit Findings	–0.076	0.522	Not significant
Risk Management Maturity → Audit Findings	–0.160	0.07	Marginal (10%)
Procurement Compliance → Audit Findings	–0.171	0.071	Marginal (10%)
Contract & Documentation Management → Audit Findings	–0.026	0.799	Not significant
QA/QC & Supervision → Audit Findings	–0.021	0.839	Not significant
Team Competence & Stability → Audit Findings	–0.112	0.208	Not significant
Integrity & Compliance Culture → Audit Findings	–0.169	0.045	Significant
Administrative & Financial Compliance → Audit Findings	–0.193	0.027	Significant
Work Change Discipline → Audit Findings	–0.080	0.411	Not significant
Quality & Progress Performance → Audit Findings	–0.026	0.831	Not significant
Procurement Compliance → Administrative & Financial Compliance	0.132	0.247	Not significant
Contract & Documentation Management → Administrative & Financial Compliance	0.319	0.002	Significant
Integrity & Compliance Culture → Administrative & Financial Compliance	0.399	0	Significant
Contract & Documentation Management → Work Change Discipline	0.43	0	Significant
Team Competence & Stability → Work Change Discipline	0.443	0	Significant
QA/QC & Supervision → Quality & Progress Performance	0.167	0.13	Not significant
Team Competence & Stability → Quality & Progress Performance	0.569	0	Significant

According to the results, Planning & Design Quality (H1) did not influence audit findings significantly ($\beta = -0.076$, $p = 0.522$). This is to imply that although adequate planning and design are critical to technical project deliverables, they fail to reduce audit problems, which are more likely to be related to administrative and compliance factors. In the same way, Risk Management Maturity (H2) ($\beta = -0.160$, $p = 0.070$) and Procurement Compliance (H3) ($\beta = -0.171$, $p = 0.071$) had only a marginal significance at the 10 percent level. This means that though these factors can help minimize audit risks, their impact is not always significant on the projects being studied. Both Contract and Documentation Management (H4) ($\beta = -0.026$, $p = 0.799$) and QA/QC and Supervision (H5) ($\beta = -0.021$, $p = 0.839$) did not have a significant effect which means the weaknesses of these technical functions may not be directly reflected in the audit results and could be mediated by other constructs. Team Competence and Stability (H6) did not have a significant effect on audit findings ($\beta = -0.112$, $p = 0.208$) and the implication is that the competence and consistency of team members enhance technical outcome but do not have a direct impact on audit findings.

Conversely, the part of the Integrity and Compliance Culture (H7) was a considerable negative influence on audit results ($\beta = -0.169$, $p = 0.045$). This indicates that ethical values and compliance orientation are the key elements in reducing audit risk. Similarly, H8 was important ($\beta = -0.193$, $p = 0.027$), which confirms that transparent financial records and compliance with procedures have a direct negative impact on the probability of audit findings. Nevertheless, the other changes were not significant, and it is Work Change Discipline (H9) ($\beta = -0.080$, $p = 0.411$) and Quality & Progress Performance (H10) ($\beta = -0.026$, $p = 0.831$).

The connection between Procurement Compliance and Administrative and Financial Compliance (H11) was not significant ($\beta = 0.132$, $p = 0.247$) indicating that the procurement practices on their own do not translate strongly into financial compliance. On the other hand, Contract Management and Documentation - Administrative and Financial Compliance (H12) mattered

($\beta = 0.319$, $p = 0.002$) meaning that the correct documentation plays a major role in strengthening financial compliance. But best of all, Integrity & Compliance Culture (H13) showed a very strong positive association with administrative compliance ($\beta = 0.399$, $p = 0.000$), establishing that compliance-related values have a direct influence on stability in financial governance.

The impact of Contract Management & Documentation on Work Change Discipline (H14) was large ($\beta = 0.430$, $p = 0.000$) indicating that properly documented contracts have direct positive impact on disciplined change management. Equally important was Team Competence & Stability - Work Change Discipline (H15) ($\beta = 0.443$, $p = 0.000$), indicating the importance of competent teams in adapting to change without the need to develop audit risks. The Quality and Progress Performance (H16) of QA/QC & Supervision was not significant ($\beta = 0.167$, $p = 0.130$), which means that formal supervision procedures are not sufficient to ensure quality improvement. But, Quality and Progress Performance (H17) Team Competence and Stability ($\beta = 0.569$, $p = 0.000$) was very significant; this proves that the most important drivers of quality and project progress in the Design and Build environment are competent and stable teams.

Table 5 presents the indirect impact of the model that encapsulates the mediating nature of the variables of administrative and financial compliance, work change discipline, and quality performance. The results indicate whether the effect of some exogenous constructs is mediated to audit conclusions via other latent variables. These are significant mediation paths to examine how managerial and technical factors mediate audit results.

Table 5: Indirect Effects

Path (Latent Variable → Mediator → Dependent Variable)	**Coefficient (β)**	**p-value**	**Result**
Integrity & Compliance Culture → Administrative & Financial Compliance → Audit Findings	–0.077	0.056	Marginal (10%)
Procurement Compliance → Administrative & Financial Compliance → Audit Findings	–0.026	0.334	Not significant
Team Competence & Stability → Work Change Discipline → Audit Findings	–0.035	0.439	Not significant
Team Competence & Stability → Quality & Progress Performance → Audit Findings	–0.015	0.832	Not significant
Contract & Documentation Management → Work Change Discipline → Audit Findings	–0.034	0.423	Not significant
Contract & Documentation Management → Administrative & Financial Compliance → Audit Findings	–0.062	0.107	Not significant
QA/QC & Supervision → Quality & Progress Performance → Audit Findings	–0.004	0.865	Not significant

The integrity and compliance culture mediation path to administrative and financial compliance was negative with a marginally significant value ($\beta = -0.077$, $p = 0.056$). This implies that the compliance-based culture indirectly diminishes audit results through enhanced compliance with the financial procedures. The result shows that the positive effects of the organizational culture can be partially transmitted to the audit results, although the level is slightly higher than 5 percent. The relationship between the compliance of procurement and administrative and financial compliance was not substantial ($\beta = -0.026$, $p = 0.334$). This means that transparency practices, although critical in procurement, lack strong effect on audit results when the transmitted information are based on administrative and financial mechanisms. The impact is small and statistically unimportant.

The team competence mediated by work change discipline ($\beta = -0.035$, $p = 0.439$) and quality and progress performance ($\beta = -0.015$, $p = 0.832$) was insignificant. These findings suggest that effective and stable teams enhance internal processes and products, yet the gains do not manifest in less audit findings through the mediators being tested. It appears that the effects of team competence are more evident in direct technical performance than in indirect channels of governance. Also not significant were indirect effects of contract management through

work change discipline ($\beta = -0.034$, $p = 0.423$) and administrative and financial compliance ($\beta = -0.062$, $p = 0.107$). Although documentation is important in terms of compliance and control, the mediation analysis indicates that these impacts are not strongly transferred to decreasing audit findings.

Such mediation between QA/QC and quality and progress performance was not significant ($\beta = -0.004$, $p = 0.865$). This shows that formal supervision and quality assurance processes though important to technical results offer no indirect avenue to minimise audit results.

The total effects are summarized in Table 6 representing both direct and indirect effects in the relationships proposed. These findings offer a global perspective of the contribution of each construct to audit findings and associated mediators. Through the incorporation of all pathways, total effects allow the identification of which variables have the largest effect in the model and should as such be given priority in management and policy interventions.

Table 6: Total Effects

Path (Latent Variable → Latent Variable)	**Coefficient (β)**	**p-value**	**Result**
Planning & Design Quality → Audit Findings	–0.076	0.522	Not significant
Risk Management Maturity → Audit Findings	–0.160	0.07	Marginal
Procurement Compliance → Audit Findings	–0.196	0.042	Significant
Contract & Documentation Management → Audit Findings	–0.122	0.238	Not significant
QA/QC & Supervision → Audit Findings	–0.025	0.814	Not significant
Team Competence & Stability → Audit Findings	–0.162	0.117	Not significant
Integrity & Compliance Culture → Audit Findings	–0.246	0.003	Significant
Administrative & Financial Compliance → Audit Findings	–0.193	0.027	Significant
Work Change Discipline → Audit Findings	–0.080	0.411	Not significant
Quality & Progress Performance → Audit Findings	–0.026	0.831	Not significant
Procurement Compliance → Administrative & Financial Compliance	0.132	0.247	Not significant
Contract & Documentation Management → Administrative & Financial Compliance	0.319	0.002	Significant
Integrity & Compliance Culture → Administrative & Financial Compliance	0.399	0	Significant
Contract & Documentation Management → Work Change Discipline	0.43	0	Significant
Team Competence & Stability → Work Change Discipline	0.443	0	Significant
QA/QC & Supervision → Quality & Progress Performance	0.167	0.13	Not significant
Team Competence & Stability → Quality & Progress Performance	0.569	0	Significant

Planning and Design Quality (H1) had no significant overall impact, (b = -0.076, p = 0.522) so the quality of the design does not affect the audit results directly or indirectly. The strength of Risk Management Maturity (H2) was very weak (b = -0.160, p = 0.070) and indicated a weak, yet, significant contribution in mitigating audit risk. Notably, purchasing Compliance (H3) revealed a strong negative impact (b = -0.196, p = 0.042), which validates that clear and strict procurement procedures are essential to reduce the audit results. By contrast, Contract & Documentation Management (H4) (b = -0.122, p = 0.238) and QA/QC & Supervision (H5) (b = -0.025, p = 0.814) were insignificant, which implies that they do not contribute strongly to the results of an audit. Team Competence and Stability (H6) had no significant impact on reducing audit findings (b = -0.162, p = 0.117), but has stronger effect on other intermediary relationships (H15, H17). The significance of the outcome of this group is the strongest negative impact on audit findings of the Integrity and Compliance Culture (H7), b = -0.246, p = 0.003. This shows that both ethical orientation and compliance values play a central role in averting audit risks.

Administrative and Financial Compliance (H8) was another major negative influence (b = -0.193, p = 0.027), which once again proves the fact that firm financial and administrative governance decreases audit findings. Work Change Discipline (H9) (b = -0.080, p = 0.411) and Quality & Progress Performance (H10) (b = -0.026, p = 0.831) were not significant contributory factors, however. The connection between Procurement Compliance - Administrative and Financial Compliance (H11) was not strong (b = 0.132, p = 0.247) indicating that procurement does not have a high degree of translation into financial discipline. On the other hand, both Contract and Documentation Management (H12) (b = 0.319, p = 0.002) and Culture of Integrity and Compliance (H13) (b = 0.399, p = 0.000) had positive and significant effects on administrative and financial compliance. This is to show that it is well-documented and ethical compliance culture that spurred regular financial governance. The findings also indicate that the Work change discipline was also significantly affected by the Contract and Documentation Management (H14) (b = 0.430, p = 0.000) and Team competence and Stability (H15) (b = 0.443, p = 0.000), which supported the use of structured documentation and effective teams in managing change in the workplace. Quality Performance QA/QC & Supervision (H16) did not hold any significance (b = 0.167, p = 0.130) but Team Competence and Stability (H17) was the strongest driver with a highly significant effect (b = 0.569, p = 0.000). This substantiates the fact that high quality and stable project work is anchored on the effective and consistent functioning of teams, as further illustrated by the Importance–Performance Map Analysis in Fig. 2.

3.4. Importance–Performance Map Analysis (IPMA)

This subsection presents the Importance–Performance Map Analysis (IPMA) to complement the SEM-PLS results by providing managerial insights. IPMA combines the total effects (importance) of each construct on audit findings with their corresponding performance levels, allowing the identification of priority areas for improvement. The resulting importance–performance map is illustrated in Fig. 2.

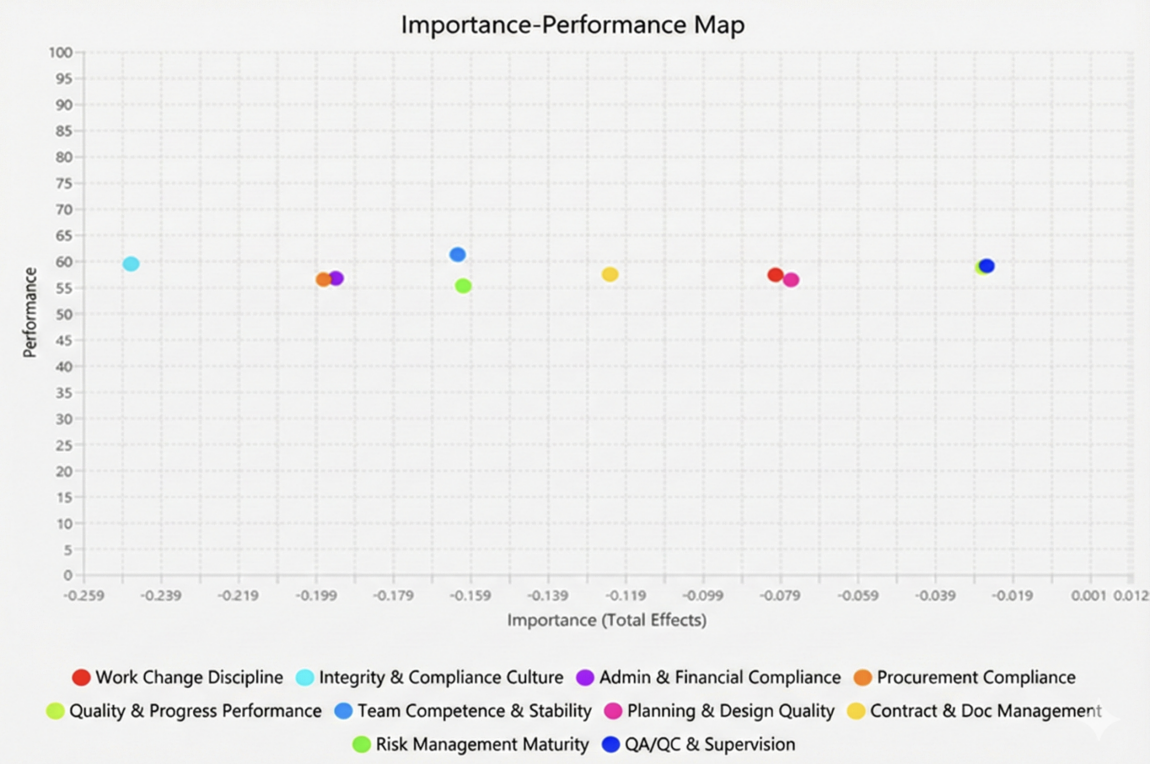

Figure 2: IPMA Result

The IPMA also offered other managerial information by mapping the significant of each

construct and its performance in terms of audited findings. Integrity & Compliance Culture was relatively lower in performance and, therefore, occupied the first place in the improvement priorities.

3.5. Discussion

The results of this study provide a nuanced understanding of the factors influencing the potential audit findings in Design and Build (DB) projects in Indonesia. Among the tested hypotheses, only a few variables demonstrated significant effects, highlighting the pivotal role of governance and compliance aspects rather than purely technical dimensions. Specifically, Integrity & Compliance Culture, as well as Administrative & Financial Compliance, emerged as the most influential determinants in reducing audit risks. These findings reinforce prior studies that emphasize the importance of transparency, ethical culture, and administrative rigor in project management, particularly within public sector infrastructure delivery.

Interestingly, variables traditionally perceived as critical to project success, such as Planning & Design Quality, Contract & Documentation Management, QA/QC & Supervision, and Team Competence, did not show a direct significant effect on audit findings. This suggests that while technical quality remains essential for physical project performance, auditors tend to concentrate on administrative and governance aspects. Audit findings are thus more closely linked with procedural compliance than with engineering performance, indicating a gap between technical excellence and audit accountability.

The marginal significance of Risk Management Maturity and Procurement Compliance implies that these areas do contribute to mitigating audit risks, but their influence may be indirect or context-dependent. The structural analysis also revealed that Contract & Documentation Management and Team Competence significantly affected intermediary constructs such as Work Change Discipline and Quality & Progress Performance, underlining their relevance in shaping overall project governance.

Furthermore, the Importance–Performance Map Analysis (IPMA) complemented these results by identifying Integrity & Compliance Culture and Contract & Documentation Management as improvement priorities. This insight has strong managerial implications: fostering a culture of integrity and compliance must be paired with robust documentation and contract administration to minimize audit risks. Policy makers, contractors, and auditors should therefore focus on strengthening organizational ethics, ensuring transparency in administrative processes, and enhancing contract governance as part of preventive strategies against audit findings.

4. Conclusion

This study concludes that the potential audit findings in Design and Build projects in Indonesia are predominantly influenced by governance and compliance-related factors. Integrity & Compliance Culture and Administrative & Financial Compliance significantly reduce audit risks, while Contract & Documentation Management plays a crucial role through its impact on intermediate governance constructs. In contrast, technical project factors such as planning, supervision, and quality performance are less directly relevant to audit outcomes. The managerial implication is clear, project stakeholders should prioritize the enhancement of compliance culture, transparency, and contract management practices. These efforts not only reduce the probability of adverse audit findings but also strengthen public accountability in infrastructure delivery. The findings also suggest that future regulatory improvements and internal project controls should integrate administrative compliance alongside technical performance to achieve balanced project success. For future research, it is recommended to expand the sample beyond government-driven projects, incorporate longitudinal data to capture changes over time, and explore qualitative insights from auditors themselves. This would provide a more comprehensive perspective on how audit practices interact with project governance in varying contexts.

Author Contributions Statement

Al Kautzar was responsible for conceptualization, data collection, analysis, and manuscript preparation. **Mawardi Amin** and **Agus Suroso** contributed to reviewing, refining, and providing feedback on the manuscript. All authors have read and approved the final version of the article.

Conflict of Interest Statement

The authors declare that there are no conflicts of interest regarding the publication of this article.

AI Tools Declaration

We use chatGPT and DeepL to make structured English easy for many people to understand.

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Data Availability

The datasets generated and analyzed during the current study are available upon reasonable request. Interested readers may contact the corresponding author via email (al.kautzar.95@gmail.com) for access to the data.

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