



## A Collaborative Performance Evaluation Model for Construction Project Supervision in Gianyar Regency, Bali

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### ABSTRACT

Construction project supervision plays a crucial role in ensuring project success in terms of quality, time, and cost performance. However, in local government contexts, supervision practices often face challenges due to weak coordination, overlapping roles, and limited stakeholder collaboration. This study aims to develop a performance evaluation model for construction project supervision based on multi-stakeholder collaboration. A mixed-method approach was employed, combining qualitative exploration through interviews and literature review with quantitative analysis using Structural Equation Modeling-Partial Least Squares (SEM-PLS). The findings indicate that role clarity, communication effectiveness, transparency, and trust significantly influence supervision performance. The proposed model integrates input, process, and output dimensions with collaboration as a key mediating factor. This study helps bridge the gap between technical supervision and governance-based approaches, offering a practical evaluation framework for local governments to enhance accountability, efficiency, and project performance.

## **INTRODUCTION**

Infrastructure development is widely recognized as a strategic driver of regional economic growth, spatial transformation, and public service improvement. In the Indonesian context, infrastructure investment at the local government level has grown significantly over the past decade, reflecting the national agenda to strengthen regional competitiveness and promote equitable development. This trend is also evident in Kabupaten Gianyar, Bali, where infrastructure development is closely linked to tourism expansion, cultural preservation, and the provision of public facilities. The increasing number of construction projects—ranging from public buildings and road networks to tourism-supporting infrastructure—demands a robust and effective supervision system to ensure that project objectives in terms of quality, time, and cost are met.

Despite the increasing allocation of regional budgets to infrastructure development, the performance of construction projects at the local level remains a critical concern. Findings from the Audit Board of Indonesia (BPK) consistently indicate recurring issues, including project delays, cost overruns, substandard construction quality, and administrative non-compliance. These issues are not only observed at the national level but are also prevalent in regional governments, including Kabupaten Gianyar. Empirical data suggest that delays and quality deviations often stem from weaknesses in supervision practices rather than purely technical failures. This indicates that the effectiveness of construction supervision plays a pivotal role in determining overall project success.

The underlying problems in construction supervision are largely systemic. One of the main challenges is the lack of effective coordination and collaboration among key stakeholders involved in the supervision process, including project owners (OPD), Pejabat Pembuat Komitmen (PPK), supervising consultants, contractors, and internal auditors (APIP). In practice, these actors often operate within fragmented institutional frameworks, leading to overlapping roles, unclear responsibilities, and inefficient communication channels. Furthermore, supervisory activities tend to be carried out in a procedural, administrative manner, focusing primarily on compliance with documentation and regulations rather than on dynamic problem-solving and adaptive decision-making in the field.

This condition reflects the dominance of conventional supervision approaches, which are largely hierarchical and compliance-oriented. While such approaches are important for ensuring accountability, they often fail to address the complexity and uncertainty inherent in construction projects. In the context of Kabupaten Gianyar, where projects must also consider local cultural values, spatial planning regulations, and community involvement, the limitations of traditional supervision models become even more apparent. The lack of integration between technical supervision and governance mechanisms results in inefficiencies, reduced transparency, and suboptimal project outcomes.

Previous studies have emphasized that a significant proportion of construction project failures in the public sector are attributed to non-technical factors, particularly those related to coordination, communication, and

stakeholder relationships. It has been reported that up to 66% of project failures are linked to poor collaboration among stakeholders rather than deficiencies in engineering or design. This finding highlights the importance of adopting a more holistic approach to construction supervision, one that integrates technical, organizational, and relational dimensions.

In recent years, the Indonesian government has introduced various regulatory reforms and digital transformation initiatives to improve construction governance, including e-procurement systems, e-monitoring platforms, and strengthened regulatory frameworks. While these initiatives have contributed to improving transparency and efficiency, their implementation at the local level remains uneven. More importantly, these efforts have not yet been supported by a standardized evaluation model that explicitly incorporates multi-stakeholder collaboration as a key determinant of supervision performance.

The absence of such a model creates a significant research and practical gap. Existing evaluation frameworks tend to focus on measurable technical indicators such as cost, time, and quality, while overlooking the critical role of collaboration, trust, communication, and shared understanding among stakeholders. As a result, supervisory performance is often assessed in a fragmented manner, failing to capture the complexity of interactions that influence project outcomes.

Based on these considerations, this study aims to develop a collaborative performance evaluation model for construction project supervision in Kabupaten Gianyar, Bali, which integrates technical performance indicators with governance and multi-stakeholder collaboration dimensions. The proposed model adopts an input-process-output framework, with collaboration functioning as a mediating variable that influences the effectiveness of supervision processes and outcomes.

The novelty of this research lies in its integrative approach, which positions multi-stakeholder collaboration not merely as a supporting factor but as a central component in evaluating supervision performance. By incorporating elements such as trust, transparency, communication, and shared goals into the evaluation framework, this study advances theoretical understanding of construction supervision and provides a practical tool to improve governance in local government projects.

Ultimately, this research is expected to offer both academic and practical contributions. Academically, it enriches the discourse on construction management by bridging the gap between technical supervision and collaborative governance. In practice, it provides a structured, applicable model that local governments, particularly in Kabupaten Gianyar, can use to enhance the effectiveness, accountability, and sustainability of construction project supervision.

## **THEORETICAL FRAMEWORK**

This study integrates multiple theoretical perspectives to develop a comprehensive, context-sensitive evaluation model for construction project supervision, particularly in the local government setting of Kabupaten Gianyar,

Bali. The complexity of construction supervision—characterized by technical, organizational, and governance dimensions—requires a multidisciplinary theoretical foundation to adequately capture the interactions among variables and stakeholders.

Project Management Theory, as articulated in the Project Management Body of Knowledge (PMI, 2021), serves as the primary foundation for understanding supervision as part of the monitoring and controlling processes within project management. This theory emphasizes that effective supervision ensures alignment between planned objectives and actual project performance, particularly in terms of scope, schedule, cost, and quality. In this context, supervision is not merely a control mechanism but a continuous process of evaluation, feedback, and corrective action. However, while Project Management Theory provides a strong technical basis, it tends to focus on procedural and performance metrics, often overlooking relational and governance aspects that are critical to public-sector projects.

To address this limitation, Stakeholder Theory (Freeman, 1984) is incorporated to emphasize the importance of managing relationships among all actors involved in construction projects. In the context of local government projects, stakeholders include the project owner (OPD), the Pejabat Pembuat Komitmen (PPK), supervising consultants, contractors, internal auditors (APIP), and external oversight bodies. Stakeholder Theory highlights that project success depends not only on technical performance but also on the ability to balance interests, manage conflicts, and facilitate cooperation among these actors. This perspective is particularly relevant in Kabupaten Gianyar, where project implementation often involves diverse institutional and community interests.

Furthermore, Collaborative Governance Theory (Ansell & Gash, 2007) provides a critical framework for understanding how stakeholder collaboration can enhance the effectiveness of supervision. This theory posits that successful collaboration is built upon key elements such as trust, transparency, shared understanding, and inclusive decision-making. In construction supervision, these elements translate into open communication, mutual accountability, and joint problem-solving among stakeholders. The application of collaborative governance is especially important in complex and dynamic project environments, where rigid hierarchical structures may hinder responsiveness and adaptability.

In addition, Institutional Theory (DiMaggio & Powell, 1983) is employed to explain how regulatory frameworks, organizational norms, and institutional pressures shape supervision practices in local governments. In Indonesia, construction supervision is influenced by a range of regulations, including public procurement laws, construction service regulations, and regional governance policies. These institutional factors often determine how supervision is conducted, including the degree of formalization, compliance requirements, and decision-making processes. In Kabupaten Gianyar, institutional dynamics are further influenced by local governance structures and administrative practices, which can either facilitate or constrain effective supervision.

Beyond formal institutional frameworks, the local context of Gianyar introduces additional dimensions that must be considered in the theoretical framework. These include cultural values rooted in Balinese local wisdom, spatial planning regulations that integrate traditional and modern development, and the strong role of community involvement in development processes. These contextual factors reinforce the need for a supervision model that is not only technically sound but also socially and culturally adaptive.

Based on the integration of these theoretical perspectives, this study develops a conceptual model that combines technical performance evaluation with collaborative governance principles. The model is structured using an Input-Process-Output (IPO) framework, which is widely used in performance evaluation studies, and is enhanced by incorporating collaboration as a mediating variable (Figure 1).

The *input dimension* encompasses the foundational resources and conditions that influence the effectiveness of supervision. These include human resource capacity, regulatory clarity, role definition, and the availability of digital monitoring systems. These factors determine stakeholders' readiness and capability to perform supervisory tasks.

The *process dimension* reflects the dynamic interactions and mechanisms through which supervision is carried out. This includes communication, coordination, feedback mechanisms, and decision-making processes. Effective processes ensure that supervision activities are responsive, adaptive, and aligned with project needs.

The *output dimension* represents the outcomes of supervisory activities, measured in terms of project quality, time performance, cost control, and regulatory compliance. These indicators reflect the overall effectiveness of supervision in achieving project objectives.



Figure 1. Conceptual Framework

The central contribution of this model lies in its integration of *multi-stakeholder collaboration* as a key mediating variable. Collaboration is conceptualized in terms of dimensions such as trust, transparency, shared goals, and knowledge sharing. These elements influence how inputs are transformed

into effective processes and how processes lead to desired outputs. In other words, collaboration acts as a bridging mechanism that enhances the effectiveness of supervision by improving relationships, communication, and collective decision-making among stakeholders.

The conceptual framework illustrates that collaboration strengthens the relationships between input and process, and between process and output. This implies that even when technical inputs are adequate, the absence of effective collaboration may lead to suboptimal supervision outcomes. Conversely, strong collaboration can enhance the efficiency and effectiveness of supervision processes, leading to improved project performance.

In summary, the theoretical framework developed in this study provides a comprehensive basis for understanding construction supervision as a multidimensional process that integrates technical, organizational, and governance aspects. By contextualizing these theories within the specific conditions of Kabupaten Gianyar, this study offers a more relevant and applicable model for evaluating and improving construction supervision performance in local government settings.

## **METHODS**

This study adopts a *mixed-methods approach with an explanatory sequential design, integrating qualitative and quantitative methods in a structured, complementary manner*. This approach is selected to capture the complexity of construction project supervision, which involves both measurable technical variables and contextual, behavioral, and governance-related factors. The explanatory sequential design begins with a qualitative phase to explore key variables and contextual conditions, followed by a quantitative phase to statistically test the relationships among variables and validate the proposed model.

### **Study Location**

The research was conducted in *Kabupaten Gianyar, Bali*, which serves as a representative case of local government infrastructure development in Indonesia. The selection of Gianyar Regency is based on several strategic considerations. First, the region has a high intensity of infrastructure development, particularly in public buildings, tourism facilities, and urban infrastructure. Second, construction projects in Gianyar involve complex, multi-stakeholder interactions among government agencies (OPD), project owners, consultants, contractors, and oversight institutions. Third, previous audit findings and internal evaluations have documented challenges in construction supervision, such as delays, quality inconsistencies, and coordination issues. Finally, the local government has demonstrated a commitment to improving governance and adopting digital monitoring systems, making it a relevant context for developing and testing a collaborative supervision model.

### **Qualitative Phase**

The qualitative phase aims to explore the current state of construction supervision and identify key factors that influence its performance. Data were

collected through *in-depth interviews, focus group discussions (FGD), and field observations.*

In-depth interviews were conducted with key stakeholders involved in construction supervision, including Pejabat Pembuat Komitmen (PPK), supervising consultants, contractors, and representatives from the Inspectorate (APIP). These interviews were semi-structured, allowing flexibility to explore participants' experiences, perceptions, and challenges related to supervision practices.

Focus Group Discussions (FGD) were organized to facilitate collective reflection and validation of preliminary findings. Participants included representatives from various stakeholder groups, enabling cross-sectoral dialogue and identification of shared issues and perspectives.

Field observations were carried out on selected construction projects to capture real-time supervision practices, coordination mechanisms, and on-site challenges. These observations provided contextual insights that complemented interview and FGD data.

The qualitative data were analyzed using thematic analysis, involving data reduction, coding, categorization, and interpretation. The results of this phase were used to develop the initial conceptual model and define the key variables for the quantitative phase.

### **Quantitative Phase**

The quantitative phase aims to empirically test the relationships among variables and validate the proposed evaluation model. Data were collected through a structured survey distributed to stakeholders involved in construction supervision in Gianyar Regency.

The survey targeted *150–200 respondents*, which meets the minimum sample size requirements for Structural Equation Modeling (SEM) analysis. Respondents included project owners, PPK, consultants, contractors, and internal auditors.

The questionnaire was designed using a *Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree)*. The variables measured in the survey include:

- *Input variables:* human resource capacity, role clarity, regulatory framework, and digital systems
- *Process variables:* communication, coordination, feedback mechanisms, and decision-making
- *Collaboration variables:* trust, transparency, shared goals, and knowledge sharing
- *Output variables:* project quality, time performance, cost control, and regulatory compliance

Prior to distribution, the questionnaire was tested for clarity and content validity through expert review.

### **Data Analysis**

The quantitative data were analyzed using *Structural Equation Modeling-Partial Least Squares (SEM-PLS)* with SmartPLS software. This method was chosen for its suitability to exploratory models, complex relationships among variables, and relatively small sample sizes.

The analysis was conducted in two main stages:

#### 1. Measurement Model (Outer Model)

The measurement model was evaluated to assess the validity and reliability of the constructs. The following criteria were applied:

- Convergent validity: assessed through factor loadings ( $\geq 0.70$ )
- Discriminant validity: assessed using the Heterotrait-Monotrait Ratio (HTMT)
- Reliability: assessed using composite reliability ( $\geq 0.70$ )

#### 2. Structural Model (Inner Model)

The structural model was analyzed to examine the relationships among variables. The evaluation included:

- Coefficient of determination ( $R^2$ ) to measure explanatory power
- Predictive relevance ( $Q^2$ ) to assess model prediction capability
- Path coefficients to determine the strength and significance of relationships

Bootstrapping techniques were applied to test the statistical significance of the model paths.

### **Model Validation**

To ensure the robustness and applicability of the proposed model, a validation process was conducted using the *Delphi method*, involving a panel of experts from academia and professional practice. The Delphi process consisted of multiple rounds of evaluation in which experts reviewed the model structure, variables, and relationships and provided feedback for refinement.

This validation process ensures that the model is not only statistically valid but also practically relevant and applicable to construction project supervision in local government settings, particularly in Kabupaten Gianyar, Bali.

## **RESULTS**

The results of this study present both descriptive and inferential findings derived from the qualitative exploration and quantitative analysis using Structural Equation Modeling-Partial Least Squares (SEM-PLS). Overall, the findings indicate that construction project supervision performance in Kabupaten Gianyar is significantly influenced by a combination of technical factors and dimensions of multi-stakeholder collaboration.

From the qualitative phase, it was observed that supervision practices are often constrained by unclear role distribution, fragmented coordination, and limited information sharing among stakeholders. These findings provided the basis for identifying key variables that were subsequently tested in the quantitative phase.

The quantitative analysis reveals that *input variables*, particularly role clarity and regulatory alignment, significantly influence the readiness and effectiveness of supervision. Clear delineation of responsibilities among

stakeholders—such as PPK, consultants, and contractors—reduces ambiguity and enhances accountability in project implementation. In addition, the alignment between regulatory frameworks and operational practices ensures that supervision activities are conducted consistently and in accordance with established standards.

Furthermore, the *process variables*, including communication and coordination, are identified as critical determinants of supervision performance. Effective communication facilitates timely information exchange, reduces misunderstandings, and enables quick responses to on-site issues. Similarly, strong coordination mechanisms among stakeholders support integrated decision-making and improve the overall efficiency of supervision processes.

A key finding of this study is the significant role of *collaboration variables*, particularly trust and transparency. These variables exert the strongest influence in the model, indicating that relational factors are essential to enhancing supervision effectiveness. Trust among stakeholders fosters mutual confidence and reduces conflict, while transparency ensures openness in information sharing and decision-making processes.

Importantly, the analysis confirms that *collaboration acts as a mediating variable* between process and output. This means that even when communication and coordination are well established, their impact on supervision outcomes—such as quality, time, and cost performance—is significantly strengthened when supported by high levels of collaboration. This finding underscores the importance of integrating collaborative governance into supervision frameworks.

Table 1. Performance Evaluation Criteria

Scores	Criteria
50.00-100.00	Low
100.01-150.00	Medium
>150.00	High

The SEM-PLS results further support these findings through statistical validation. The structural model analysis shows a *strong positive relationship between collaboration and supervision performance*, indicating that collaboration significantly enhances supervision effectiveness.

The path coefficient analysis reveals that *communication has a significant direct effect on supervision performance*, highlighting its role as a key driver in the supervision process. Additionally, the relationship between coordination and performance is positive and significant, reinforcing the importance of integrated stakeholder interaction.

The model demonstrates satisfactory explanatory power, as indicated by the coefficient of determination ( $R^2$ ), suggesting that the selected variables adequately explain variation in supervision performance. Moreover, the predictive relevance value ( $Q^2 > 0$ ) confirms that the model has strong predictive capability and is suitable for practical application.

Overall, these results indicate that construction supervision in Kabupaten Gianyar is not solely determined by technical inputs but is highly dependent on the quality of interaction and collaboration among stakeholders. The integration of technical and collaborative factors provides a more comprehensive understanding of supervision performance and offers a robust basis for developing an effective evaluation model.

## **DISCUSSION**

The findings of this study provide strong evidence that construction supervision in Kabupaten Gianyar cannot be effectively conducted through conventional technical control mechanisms alone. While traditional approaches—rooted in Project Management Theory (PMI, 2021)—emphasize monitoring, inspection, and compliance with predefined standards, the empirical results demonstrate that these mechanisms are insufficient to address the complexity of contemporary public construction projects. Instead, supervision performance is significantly enhanced when complemented by a collaborative governance approach that integrates technical, organizational, and relational dimensions.

The results clearly show that input variables such as role clarity and regulatory alignment are necessary but not sufficient conditions for effective supervision. Although these factors establish the structural foundation of supervision, their impact on project outcomes is mediated by process and collaboration variables. This finding directly addresses the research problem of why many construction projects still experience delays and quality issues despite the presence of formal regulations and supervision systems. The answer lies in the gap between formal structures and actual implementation practices, particularly in terms of communication, coordination, and stakeholder interaction.

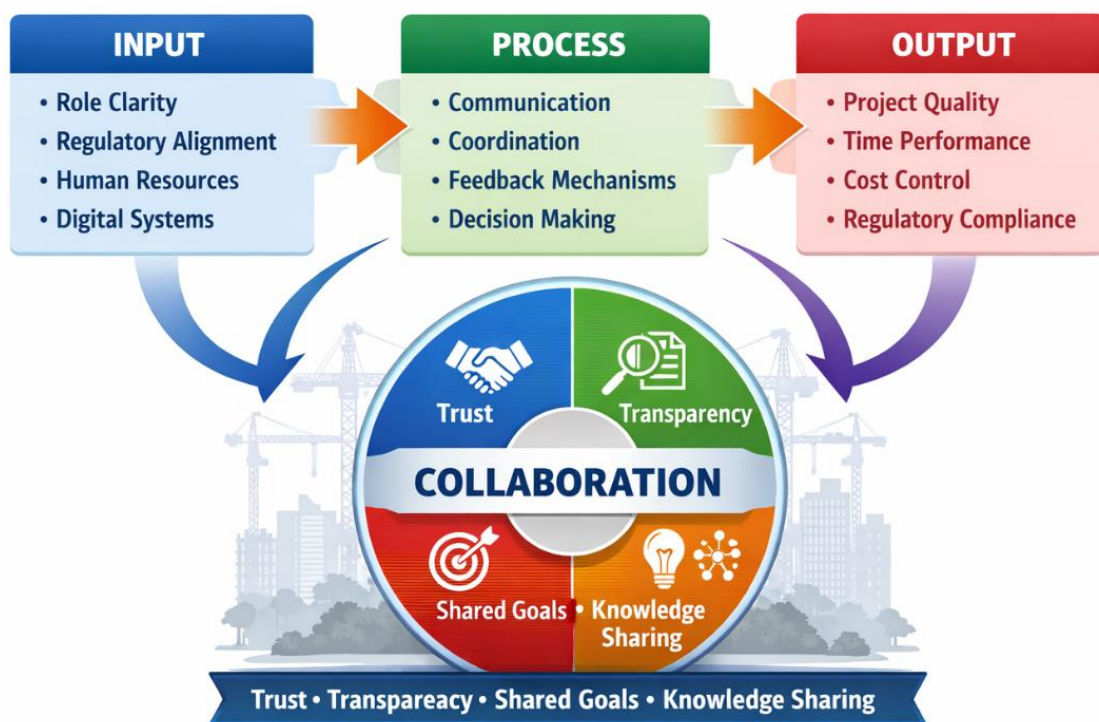
The significant influence of communication and coordination as process variables confirms the relevance of Project Management Theory, which highlights the importance of integration management and information flow in project execution. However, this study extends the theory by demonstrating that communication effectiveness is not only a technical issue but also a relational one, deeply influenced by trust and transparency among stakeholders. This finding bridges Project Management Theory and Stakeholder Theory (Freeman, 1984), which emphasizes that project success depends on the quality of relationships and interactions among the actors involved.

More importantly, the strong role of collaboration variables—particularly trust and transparency—provides empirical support for Collaborative Governance Theory (Ansell & Gash, 2007). According to this theory, successful collaboration requires face-to-face dialogue, mutual trust, shared understanding, and commitment to collective outcomes. The SEM-PLS results in this study confirm that trust and transparency are the most influential variables in enhancing supervision performance. This indicates that when stakeholders trust each other and operate transparently, they are more likely to share information, coordinate effectively, and resolve problems collaboratively.

In the specific context of Kabupaten Gianyar, these findings are further reinforced by local socio-cultural characteristics. The presence of Balinese local wisdom—such as values embedded in *Tri Hita Karana*, which emphasizes harmony between humans, the environment, and spirituality—creates a conducive environment for collaborative practices. Community engagement and cultural sensitivity also play important roles in shaping stakeholder behavior, making collaboration not only a managerial necessity but also a cultural imperative. This contextual dimension distinguishes the present study from previous research conducted in more generic or purely technical settings.

The mediating role of collaboration identified in this study is a critical contribution to both theory and practice. The results show that collaboration significantly strengthens the relationship between process variables (communication and coordination) and output variables (project performance). This means that even well-designed processes will not produce optimal results without effective collaboration. Conversely, strong collaboration can amplify the effectiveness of existing processes, leading to better supervision outcomes. This finding addresses the research objective of developing a model explaining how supervisory performance can be improved through integrative mechanisms.

From an institutional perspective, the findings also align with Institutional Theory (DiMaggio & Powell, 1983), which suggests that organizational behavior is shaped by regulatory frameworks and institutional norms. In Gianyar, the presence of formal regulations provides a structural basis for supervision, but their effectiveness depends on how stakeholders interpret and implement them. The integration of collaboration into the supervision model helps bridge the gap between formal rules and practical implementation, enabling more adaptive and context-sensitive supervision practices.



## Figure 2. A Collaborative Performance Evaluation Model for Construction Project Supervision in Gianyar Regency, Bali

Compared to conventional supervision models, which are typically linear and compliance-oriented, this study introduces a more holistic evaluation framework. The proposed model integrates input, process, output, and collaboration variables into a unified system, enabling a more comprehensive assessment of supervisory performance. By incorporating governance, communication, and relational factors, the model moves beyond traditional metrics and captures the dynamic interactions that influence project outcomes.

The model on Figure 2 illustrates that collaboration serves as a central, mediating component connecting all dimensions of supervision. It enhances the transformation of inputs into effective processes and ensures these processes yield the desired outputs. This integrative structure provides a practical tool for evaluating and improving the performance of supervision in local government construction projects.

Furthermore, the model supports the implementation of *good governance principles*, which are essential to public-sector projects. Transparency is enhanced through open communication and information sharing, accountability is strengthened through clear roles and collaborative monitoring, and participation is promoted through stakeholder engagement in decision-making processes. These principles are particularly important in the context of regional development, where public trust and institutional credibility play a crucial role.

In summary, this study not only answers the research questions on the determinants of supervision performance but also offers a novel, contextually grounded model that integrates technical and collaborative dimensions. The findings highlight that effective construction supervision in Kabupaten Gianyar requires a paradigm shift—from a purely control-based approach to a collaborative, governance-oriented framework. This shift is essential for achieving sustainable, efficient, and accountable infrastructure development in the public sector.

## CONCLUSIONS AND RECOMMENDATIONS

### Conclusions

This study concludes that the performance of construction project supervision in Kabupaten Gianyar, Bali, is not solely determined by technical control mechanisms but is significantly influenced by the quality of multi-stakeholder collaboration. The findings demonstrate that effective supervision requires an integrative approach that combines technical, organizational, and governance dimensions. This confirms that conventional supervision models—primarily focused on compliance and administrative procedures—are insufficient to address the complexity of contemporary public construction projects.

The empirical results show that several key determinants play a critical role in shaping supervision performance. Among these, *communication and coordination* are identified as fundamental process variables that ensure the

smooth flow of information and alignment of actions among stakeholders. At the same time, *trust and transparency* emerge as the most influential variables in collaboration, indicating that relational and behavioral factors are central to improving supervision effectiveness. In addition, *role clarity and regulatory alignment* are essential input variables that provide the structural foundation for supervision activities, reducing ambiguity and enhancing accountability.

Another important conclusion is the confirmation of collaboration's mediating role in the relationship between supervision processes and project outcomes. The findings indicate that collaboration significantly strengthens the impact of communication and coordination on performance indicators, including project quality, time efficiency, cost control, and regulatory compliance. This highlights that collaboration is not merely a supporting factor but a central mechanism that determines the success of supervision practices.

Furthermore, this study successfully develops a *collaborative performance evaluation model* that integrates technical performance indicators with governance and relational dimensions. The model adopts an Input-Process-Output framework, with collaboration as a mediating variable, providing a comprehensive and systematic tool for evaluating supervision performance. This integrative model represents a significant contribution to the field of construction management, particularly in the context of local government infrastructure projects.

In the specific context of Kabupaten Gianyar, the findings also reflect the importance of local socio-cultural values in supporting collaborative practices. The integration of governance principles with local wisdom enhances the model's applicability and ensures that supervision practices are not only technically effective but also socially and culturally adaptive.

## **Recommendations**

Based on the study's findings and conclusions, several strategic recommendations are proposed to improve construction supervision practices in Kabupaten Gianyar and similar local government contexts.

First, it is recommended that the *Gianyar local government adopt the collaborative supervision evaluation model* developed in this study as a formal framework for assessing and improving supervision performance. This model can be integrated into existing regulatory and administrative systems, such as project monitoring guidelines and performance evaluation mechanisms, to provide a more holistic and structured approach.

Second, strengthening *coordination mechanisms among stakeholders* is essential. This can be achieved by establishing regular coordination forums, integrated supervision teams, and clear communication protocols to facilitate information exchange and joint decision-making. Enhancing coordination will reduce fragmentation and improve the overall efficiency of supervision processes.

Third, integrating *digital monitoring systems with collaborative platforms* is highly recommended. While digital systems such as e-monitoring and SIMBG

have improved data management and transparency, their effectiveness can be further enhanced by incorporating features that support real-time communication, knowledge sharing, and collaborative problem-solving among stakeholders. This integration will enable more responsive and adaptive supervision practices.

Fourth, policies and regulatory frameworks should explicitly emphasize *transparency, accountability, and shared responsibility* among stakeholders. This includes a clear definition of roles and responsibilities, open access to project information, and mechanisms for collective evaluation and feedback. By embedding these principles into policy instruments, local governments can foster a culture of collaboration and integrity in construction supervision.

In addition, capacity-building programs should be implemented to enhance stakeholders' competencies, particularly in communication, collaboration, and digital literacy. Training and professional development initiatives will ensure stakeholders are equipped with the skills needed to implement the collaborative supervision model effectively.

Finally, it is recommended that future policy development and institutional reforms integrate *local cultural values and community participation* into supervision practices. In the context of Gianyar, leveraging local wisdom can enhance stakeholder engagement and strengthen the social legitimacy of infrastructure projects.

## FURTHER STUDY

Future research is recommended to further develop and validate the collaborative performance evaluation model proposed in this study. First, it is important to apply the model in other regencies within Bali as well as in different regions across Indonesia to test its generalizability and adaptability in diverse governance, institutional, and socio-cultural contexts. Such applications will allow researchers to examine whether relationships among variables remain consistent or vary with regional characteristics and development dynamics.

In addition, future studies are encouraged to integrate the model with *smart governance systems*, particularly within the framework of Sistem Pemerintahan Berbasis Elektronik (SPBE). The incorporation of digital governance platforms, real-time data systems, and intelligent monitoring tools can enhance collaboration, transparency, and decision-making in construction supervision. This integration will also contribute to the development of more responsive, data-driven, and adaptive supervision models in the era of digital transformation.

Furthermore, comparative studies between regions are highly recommended to identify best practices, critical success factors, and contextual differences in construction supervision performance. By comparing regions with varying levels of institutional capacity, technological adoption, and stakeholder engagement, future research can provide deeper insights into how collaborative governance mechanisms can be optimized. Such studies will also strengthen the theoretical and empirical foundation of collaborative supervision models and support their broader implementation at the national level.

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