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Relational Governance and Project Performance: Unveiling the Mediating Role of Organizational Resilience

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Abstract: Relational governance, as a flexible and informal mechanism, plays a critical role in addressing the challenges of construction projects in the VUCA environment. However, existing research has rarely examined relational governance mechanisms from a resilience perspective. Furthermore, current studies on organizational resilience often overlook static characteristics, leaving the interplay between static and dynamic resilience underexplored. To address this gap, this study aims to explore how relational governance influences project performance through organizational resilience, with a focus on the mediating roles of static resilience and dynamic resilience. Empirical data were collected through 270 construction professionals, with questionnaire design refined through expert interviews and a pilot study to ensure validity and reliability. Partial least squares structural equation modeling (PLS-SEM) was employed to assess relationships. The findings indicate that relational governance positively influences addressing opportunistic behaviors of construction participants and improving project performance. Mutual trust and timely commitment among project participants in relational governance significantly impact both the static characteristics and dynamic capabilities of construction projects. Additionally, organizational resilience partially mediates the relationship between relational governance and project performance. This study advances the understanding of the mechanisms linking relational governance and project performance from a resilience perspective and provides actionable insights for fostering efficient governance practices.



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1. Introduction

In the context of globalization and VUCA (volatility, uncertainty, complexity, ambiguity), the construction project is faced with an increasingly complex risk environment and multiple challenges, such as supply chain interruption, frequent emergencies, and stakeholder conflicts, and continuous improvement of project performance has become more urgent [1]. However, the rigid characteristics of traditional governance mechanisms (such as contractual governance, hybrid governance, and hierarchical governance) have exposed significant flaws in dealing with uncertain environments. For instance, under contractual governance, over-reliance on contract terms leads to rigidity, making it unable to respond to environmental changes or emergencies [2]. The hybrid governance model requires managing both contract execution and relationship maintenance, leading to efficiency dilemmas due to high coordination costs [3]. Hierarchical governance, centered on administrative authority, necessitates hierarchical approval processes, which may delay critical decisions [4]. Transaction cost economics (TCE) argues that transacting

through contracts could have serious hold-up problems under uncertainty, information asymmetry, and transaction-specific investments [5,6]. There may be opportunistic behaviors among the project participants, which leading repeated negotiation and modification of the contracts, increasing transaction costs, and eventually causing the decline of the project performance [7,8].

Relational governance based on trust, reciprocity, and long-term cooperation, is a new path and paradigm to mitigate contractual hazards or opportunism [9,10]. It relies on informal norms (such as reputation and social capital) and flexible negotiation to coordinate the behavior of all parties and contributes to enhancing information sharing and risk sharing, responding quickly to environmental changes, and reducing opportunistic behavior [11]. Miller et al. believe that relational governance is one of the important strategic choices to restrain the tendency of opportunism in construction projects [12]. When all parties of a project establish positive relationships (relational resilience) based on trust and reciprocity, the timeliness and accuracy of information sharing can be significantly improved, and the ability to identify potential crises can be improved [13]. Poppo et al. argue that the use of social-relational norms can limit the opportunistic behaviors of the parties involved in the project which promotes cooperation and thereby maximizes the overall benefits [14]. Lovallo et al. argue that the behavior of project stakeholders is constrained by social relational norms, which can be used to constrain the opportunistic behaviors of stakeholders, thereby promoting project performance [15]. Song et al. show that the combined effect of trust and relational norms can enhance the satisfaction and relational performance among the parties involved in the project through a meta-analysis of inter-organizational relationships [16]. Zhang et al. argue that trust can reduce the costs of internal conflicts between partners and other transaction costs, thereby promoting improvements in cooperation performance [17].

Despite existing research confirming the significant positive impact of relational governance on project performance, most of them focus on direct effects, such as communication efficiency improvement and transaction cost reduction. Empirical studies in recent years found that the promoting effect of relational governance on project performance in uncertainty situations showed a marginal diminishing phenomenon [17,18]. Especially in emergencies (such as epidemics and supply chain interruption), the performance promotion effect of relational governance fluctuates significantly, the mechanism and conduction path of its action still lack systematic explanation, and the paths and mediating variables under different situations need to be further explored [19].

Resilience theory points out that the ability of a system to resist shocks not only depends on resource reserves, but also stems from the dynamic adaptation process, and organizational resilience can serve as a key bridge connecting governance structure and performance results [20]. Relational governance may indirectly influence project performance by promoting resilience because high-elasticity organizations can transform partnerships into crisis response actions more quickly [21]. Lenton et al. find that trust improves project delivery efficiency by enhancing overall resilience [22]. Roeder et al. demonstrate that communication reduces disruption losses but does not differentiate between types of resilience [23]. Ma et al. find that relational governance strengthens resilience, which mediates improved cost and schedule performance [24]. Bakker et al. explore how relational coordination in temporary project teams enhances resilience, enabling creative adaptation under tight deadlines [25].

However, the mechanisms by which relational governance affects project performance remain unclear, especially how the four core elements of relational governance (trust, commitment, communication, collaboration) can empower different dimensions of organizational resilience in various contexts, have not been systematically validated in the field of

project governance. Furthermore, current studies of organizational resilience often focus on the role of relational governance in innovation or adaptability (dynamic resilience) and overlook its value in maintaining system stability (static resilience), leaving the interplay between static and dynamic resilience underexplored.

Therefore, this study seeks to investigate and answer the following questions:

- (1) Does organizational resilience mediate the relationship between relational governance and project performance?
- (2) How do the four core elements of relational governance (trust, commitment, communication, collaboration) have different impacts on static and dynamic resilience?
- (3) What are the specific pathways through which static and dynamic resilience affect project performance?

To answer these questions in this study, the PLS-SEM model was employed to empirically analyze the path relationship between relational governance, organizational resilience, and project performance, while the Bootstrap method was used to verify the significance of the mediation effect. This study aims to investigate organizational resilience, as static and dynamic dimensions, as a mediator between relational governance and project performance, and to clarify how relational governance elements shape resilience to improve project performance. To achieve this aim, the following objectives were proposed:

- (1) Examine organizational resilience, categorized as static and dynamic, as a mediator between relational governance and project performance.
- (2) Investigate how trust, commitment, communication, and collaboration in relational governance shape static and dynamic resilience.
- (3) Empirically validate the pathways linking relational governance, resilience, and project performance using PLS-SEM and the bootstrap method.

The research advances the understanding of the linkage mechanism between relational governance and project performance from a resilience perspective. It not only makes up for the deficiency of traditional governance theory in dynamic adaptability and systematic risk response, but also provides a new theoretical and practical framework for project management in complex environments. Moreover, the research provides targeted resilience enhancement strategies that contribute to promoting construction projects from “passive response” to “active immunity”, and improve the ability of complex projects to resist risks, so as to reduce the cost of project failure and improve project performance more accurately.

The prior findings, gaps, and originality of this study are shown in Table 1.

Table 1. Summary of prior findings, gaps, and originality.

Prior Findings	Gaps	Originality
1. Relational governance (e.g., trust, commitment, communication, collaboration) significantly enhances project performance by reducing transaction costs, inhibiting opportunistic behaviors, and promoting knowledge sharing. 2. Traditional contractual governance exhibits limitations (e.g., lack of flexibility) in complex and volatile environments. As a supplementary mechanism, relational governance is proposed to strengthen cooperation and reduce conflicts. 3. Organizational resilience is preliminarily recognized as a means to help projects address uncertainties. However, existing studies often treat it as a single dimension (e.g., risk resistance), failing to explicitly distinguish between static resilience (social networks, organizational culture) and dynamic resilience (prediction, response, learning capabilities).	1. The interaction between static and dynamic resilience and their respective impacts on project performance remain underexplored. 2. The mechanisms by which relational governance affects project performance remain unclear, especially how the four core elements of relational governance (trust, commitment, communication, collaboration) can empower different dimensions of organizational resilience in various contexts, have not been systematically validated in the field of project governance.	1. For the first time, organizational resilience is explicitly divided into static resilience (structural characteristics) and dynamic resilience (capability dimensions), with their independent mediating roles between relational governance and project performance empirically validated. 2. A dual-resilience mediation model is constructed to systematically reveal the specific pathways through which the four elements of relational governance (trust, commitment, communication, collaboration) influence project performance via static resilience (e.g., strengthening social networks) and dynamic resilience (e.g., crisis response capabilities). 3. The critical role of organizational resilience is empirically verified, and targeted management strategies (e.g., establishing early warning systems, enhancing informal communication networks) are proposed to provide theoretical and practical guidance for improving construction project performance.

2. Literature Review and Hypothesis Development

2.1. Relational Governance and Project Performance

Relational governance, often referred to as “informal contractual governance”, constitutes a governance framework that emphasizes the significance of interpersonal relationships among the parties engaged in a transaction. It originated from Macneil’s relational contract theory (RCT) [8]. Currently, there is no unified definition for the concept of relational governance. Scholars have explained it from different perspectives. Early scholars defined relational governance as a social system that manages and guides exchange partners based on cooperation principles and collaborative behaviors [26]. Unlike contractual governance, which relies on authority and enforcement, relational governance mainly depends on mutual trust and commitment to maintain stable and sustained cooperation. The primary goal is the fair distribution of benefits [27].

Lv et al. focus on approaches such as mutual trust, mutual respect, coordination and communication, and joint action [28]. These approaches aim to foster the establishment of close collaborative relationships among alliance members and create a harmonious organizational atmosphere. Through an analysis of existing relevant literature, this study defines relational governance as the use of relational means, based on informal contracts, between parties involved in engineering projects. These means are employed to ensure the smooth execution of incomplete contracts. Additionally, through trust, communication, dialogue, and commitment, it promotes the development of strong collaborative relationships between the parties.

The relational network in construction projects is extremely complex. Numerous stakeholders play important roles at various stages throughout the entire project life cycle. Moreover, the diverse social network relational norms add another layer of complexity. The academic community has different views on the dimensions that constitute relational governance. However, trust, commitment, communication, and reciprocity are widely recognized as key dimensions of inter-organizational relational governance. For example, EL et al. point out that relational governance includes trust, facilitating communication, resource sharing, and conflict resolution [29]. Li et al. contend that relational governance is comprised of essential components, including transparent communication, the exchange of information, trust, interdependence, and collaborative efforts [30]. Fareed and Su define the structural components of relational governance as trust, information sharing, joint problem-solving, role completeness, and flexibility [31]. Relational governance has the potential to improve collaborative performance by fostering greater investments in trust, facilitating learning, and promoting knowledge sharing among stakeholders. The objective of this study is to promote collaboration and address conflicts, thereby decreasing transaction costs and enhancing overall organizational performance. Consequently, this paper evaluates relational governance across four distinct dimensions.

Comprehensive studies within the domain of construction projects have indicated that trust is established based on favorable anticipations regarding the conduct of the other party, as well as a readiness to embrace the inherent risks involved [32]. Trust represents the confidence of construction participants in one’s trust value and integrity of each other. Mutual trust forms the basis for cooperation, otherwise, significant time and effort will be spent to prevent opportunistic behavior, which may seriously affect the project’s performance [33]. Furthermore, trust plays a crucial role in fostering a sense of identity among project participants, reinforcing cohesion, and facilitating the exchange of information. This, in turn, diminishes opportunistic behaviors and enhances the quality and efficiency of collaboration, ultimately leading to improved project outcomes [8].

The establishment of effective commitment among partners serves to mitigate opportunistic behaviors and foster a conducive environment for collaboration [34]. The

establishment of effective commitment among partners serves to mitigate opportunistic behaviors and foster a conducive environment for collaboration. Commitment includes both attitudes and actions. Attitude commitment denotes the readiness of the involved parties to dedicate resources to the relationship, whereas action commitment pertains to the behaviors undertaken to sustain the relationship [35]. The presence of commitment in construction projects can promote long-term partnerships, enhance collaboration and communication, and improve overall alliance performance [36]. This instilled confidence in handling unforeseen situations during construction, as continuous commitment and interaction ensured engineering quality [37].

Additionally, communication also plays a vital role as a part of the normative content of interpersonal relationships. In construction projects, various participants engage in informal information sharing [38]. It has the potential to endanger the whole project due to different supply chains and complex construction technology. Good attitudes and friendly methods of communication can effectively solve conflicts caused by differences of opinion.

Finally, collaboration is the main means for construction participants to deal with accidents. When project stakeholders are in crisis, their ability to cooperate helps to eliminate conflicts between both sides, which has a significant impact on achieving project goals and improving project performance. Therefore, we propose the following hypotheses:

- H1a: trust positively influences project performance.
- H1b: commitment positively influences project performance.
- H1c: communication positively influences project performance.
- H1d: collaboration positively influences project performance.

2.2. Relational Governance and Organizational Resilience

Organizational resilience refers to the ability of a project organization to anticipate unexpected events and quickly recover and adapt [39]. It's a multi-dimensional and cross-level concept, that describes the ability of the system to maintain key relationship functions, withstand impact and recover from impact. When an engineering project faces unexpected events, it is necessary to comprehensively consider the collaborative relationships established through contracts among multiple temporary organizations, mobilizing various organizational resources to actively respond [18]. Therefore, it is not only necessary to focus on the primary responsible party but also to comprehensively consider the formal and informal relational constraints among multiple stakeholders. This helps to reduce the conflicts of interest caused by the dependencies between parties during the crisis response process.

The Lengnick-Hall organizational resilience model is a classic theoretical framework that explains how organizations respond to uncertainty and challenges [33]. This model conceptualizes organizational resilience as a three-phase, multi-dimensional process—preparation, response, and adaptation. It encompasses capabilities ranging from pre-crisis resource accumulation to post-crisis growth and learning. Organizational resilience is a key capability for responding to complex and dynamic environments. It not only helps organizations survive crises but also provides opportunities for sustained development after facing challenges [40].

In the literature, organizational resilience could be understood from two perspectives: the static view and the dynamic view. From a static standpoint, scholars such as Andersson et al. have emphasized resilience as the capacity to absorb disruptions through structural attributes like cooperation preferences and risk awareness [41]. Kahan et al. further argue that organizational resilience is rooted in both external social networks and internal team cohesion, with strong interpersonal connections fostering trust and facilitating resilience during crises [42]. In the Lengnick-Hall model, static resilience is primarily reflected in the Preparedness stage of the organization, which focuses on stable organizational factors such

as resource reserves, the shaping of organizational culture, and the development of leadership. This form of resilience enables organizations to maintain their core functions and order when facing external changes [43]. Specifically, static resilience includes enhancing the cohesion and responsiveness of employees internally and supporting the organizational social network of information flow and resource sharing externally. Furthermore, static resilience involves resource redundancy, ensuring that the organization can quickly mobilize the necessary resources in times of crisis.

From the perspective of dynamic resilience, it emphasizes how an organization rapidly responds and adapts to changes when facing a crisis. Dynamic resilience refers to the emergent adaptive capacity of organizations to proactively detect threats activate resources, and self-organize adjustments in turbulent environments, enabling sustained functionality, restored efficacy, and the ability to seize developmental opportunities through inherent and adaptive qualities [44]. Unlike static resilience, in the Lengnick-Hall organizational resilience model, dynamic resilience is reflected in the response and adaptation stages of the organization wherein organizations must make timely decisions, coordinate effectively, and adjust strategies post-crisis to maintain or even enhance performance [45]. Dynamic resilience also includes the organization's learning capability, which involves extracting lessons from the crisis and improving future emergency preparedness and response strategies.

Although static resilience and dynamic resilience are closely related, they differ in concept and function [46]. Static resilience can be viewed as the organization's "infrastructure", encompassing factors such as culture, resources, structure, and leadership. These factors provide stable support for the organization, allowing it to maintain its core functions when facing external challenges [47]. In contrast, dynamic resilience reflects the organization's ability to leverage this foundation to act flexibly, adapt strategically, and recover effectively in real time [48]. These two dimensions are complementary: static resilience ensures continuity and preparedness, while dynamic resilience empowers agile action and continuous improvement [49]. By integrating both dimensions, organizations can balance short-term responsiveness with long-term stability, thereby enhancing their overall resilience [50]. To capture the dual nature of organizational resilience, this study explicitly distinguishes between the two dimensions and develops corresponding measurement constructs. Static resilience is achieved through two core components: the strength and cohesion of social network relationships, and the organization's resource integration capability. Dynamic resilience encompasses a set of interrelated capabilities, including the ability to anticipate potential risks, respond effectively to sudden disruptions, and learn and recover post-crisis—altogether reflecting the organization's dynamic capacity to withstand and adapt to volatility [51].

Prior studies indicate that relational governance influences an organization's static resilience by establishing social network relationships. Trust is the prerequisite for establishing social network relationships. The establishment of positive relationships among project stakeholders, grounded in trust and reciprocity, markedly improves the timeliness and accuracy of information dissemination, as well as the capacity to recognize potential crises [52]. Specifically, trust enhances an organization's static resilience by establishing long-term and stable social network relationships (such as informal interactions across organizations and shared values) and resource redundancy (such as knowledge reserves and emergency supplies) [53], enabling it to have a solid infrastructure (such as cultural cohesion and resource buffering) before a crisis [54]. For example, trust reduces information asymmetry and prompts all parties to proactively share backup resources (such as the list of suppliers), thereby forming a risk buffer mechanism [55]. The breakdown of trust leads to the collapse of relationships. This affects the collaboration capabilities between organizations and reduces the project's ability to adapt to crises [56]. Good relationships can promote communication among the participants. It contributes to mitigating uncertainty

and improving the organization's capacity to foresee potential crises [57]. When a project faces the impact of uncertain events, the project participants, through communication and negotiation, unite various organizations and their members, forming a strong sense of cohesion to ensure the project can overcome difficulties together. Commitment, through long-term resource investment (such as human resources, funds, and technology) and a common goal orientation, shapes the organization's risk-sharing mechanism (such as joint emergency funds and responsibility allocation agreements), and further strengthens static resilience (such as resource reserves and stability before crises) [58]. When all parties form emotional dependence based on commitments, the rapid acquisition and matching of resources become possible, providing institutional guarantees for responding to emergencies [59]. When various participants establish a positive cooperative relationship on the basis of trust and commitment, this will markedly enhance the promptness and precision of information dissemination, thereby bolstering the crisis awareness of the entire project organization [16,60].

- H2a: trust positively influences static resilience.
- H2b: commitment positively influences static resilience.
- H2c: communication positively influences static resilience.
- H2d: collaboration positively influences static resilience.

At the same time, relational governance influences organizational dynamic resilience by establishing emergency response procedures. Trust plays a core role in uniting project members [61]. It stimulates their improvisational creativity by creating a positive working environment (such as reducing suspicion and encouraging innovation), enabling them to predict and respond to emergencies more efficiently and thereby enhancing the overall situational awareness of the project [62]. On this basis, communication directly enhances the organization's dynamic response capability to emergencies (such as rapid coordination and flexible decision-making) by optimizing information-sharing channels (such as regular cross-departmental meetings and instant feedback systems) [63]. For example, when facing supply chain disruptions, the real-time communication mechanism can promptly convey risk information (such as raw material shortages) [64], prompting all parties to adjust their procurement strategies and shorten the crisis response time. This open information flow not only broadens the channels for data acquisition but also enhances response speed and flexibility by optimizing sharing mechanisms (such as cloud collaboration platforms), ensuring that organizations remain resilient in a dynamically changing environment [65]. Collaboration further strengthens the ability of dynamic adaptation and learning [66]. Collaborative relationships based on commitments (such as the Joint Emergency Response Fund Agreement) encourage all parties to actively fulfill their responsibilities and jointly solve crises rather than shirk problems. For instance, during the epidemic lockdown period, contractors and suppliers integrated resources through cross-organizational joint plans (such as backup logistics networks), quickly formed joint action teams, and ensured that the construction progress was not severely affected. Collaboration not only promotes the rational allocation of resources in crises (such as human resource scheduling and equipment sharing) [67], but also drives the summary of post-disaster experiences and process optimization (such as review meetings and standardized emergency manuals), thereby transforming temporary response measures into long-term learning outcomes. Furthermore, the commitment is made to prompt all parties to continuously invest resources in crisis recovery (such as additional funds for repairing damaged projects) [68], and enhance future adaptability through post-event reflection (such as improving construction processes).

Therefore, we propose the following hypotheses:

- H3a: trust positively influences dynamic resilience.
- H3b: commitment positively influences dynamic resilience.

- H3c: communication positively influences dynamic resilience.
- H3d: collaboration positively influences dynamic resilience.

2.3. Organizational Resilience and Project Performance

The occurrence of uncertain events in VUCA is the key reason why organizational resilience research has become important [69]. The VUCA is specifically divided into two categories: One category consists of unexpected, short-term, low-impact uncertainty events (often referred to as “Black swan”). The other category includes routine, long-term, high-impact uncertainty events (often referred to as “Grey rhino”) [70]. There are numerous uncertain events during the process of achieving project performance objectives. Organizational resilience helps project organizations transform crises into opportunities in highly uncertain environments, thereby achieving performance objectives. Static resilience embeds resilience as a core characteristic within the project organization, enabling it to better handle “Grey rhino” encountered during project implementation. Dynamic resilience, with its strong ability to manage uncertain events in a timely manner, is more adept at handling “Black swan”. Organizational resilience effectively manages different types of uncertain events in engineering projects. This helps to significantly promote the achievement of project performance objectives [71].

Static resilience involves strong social network relationships and other organizational characteristics. When an organization faces uncertain events, the temporary project organization formed by project stakeholders can fully utilize the organization’s social network relationships [72]. This helps resolve the crisis and promote project performance. Organizational resilience can establish formal or informal inter-organizational connections between project participants, facilitating information sharing and the establishment of trust among members [6]. Therefore, when uncertain events occur, all parties can strive to collaborate and jointly respond to the crisis. This not only promotes the achievement of project performance objectives such as cost, quality, and schedule but also helps create a positive team atmosphere within the project organization, improving satisfaction among the participants. All of these are key objectives of project performance.

Compared to static resilience, dynamic resilience specifically manifests as the ability to predict in advance, respond during, and learn and grow after events. This enables effective management of uncertain events. When project participants encounter uncertain events, they can allocate resources appropriately, demonstrating the ability to predict the crisis in advance, respond during the event, and learn from it afterward. The ability to leverage organizational resilience plays a crucial role in improving project performance. Dynamic resilience can rely on the long-term management experience of project managers to make reasonable predictions for certain uncertain events. If the prediction fails, the project organization can still integrate organizational resources to respond quickly when uncertain events occur. After the crisis is resolved, the organization can learn from past experiences in handling uncertain events. This helps members become more familiar with crisis response processes, enabling continuous organizational growth [51]. Therefore, dynamic resilience enhances the project organization’s ability to handle similar uncertain events. This ensures the achievement of project performance objectives such as schedule, cost, and quality, and is dedicated to the overall success of the project. In summary, under the synergistic effect of static resilience and dynamic resilience, the project organization can continuously improve project performance.

Therefore, we propose the following hypotheses:

- H4a: static resilience positively influences project performance.
- H4b: dynamic resilience positively influences project performance.

2.4. Mediating Role of Organizational Resilience

Informal systems, such as social capital and trust, can improve project performance in specific contexts through the mediating role of organizational resilience [73,74]. Resilient organizations demonstrate superior performance compared to their competitors when confronted with uncertainty and instability. They exhibit a capacity to adapt effectively, allowing them to capitalize on emerging opportunities and secure competitive advantages [75]. Resilient organizations are more effective in attaining their objectives and demonstrate a greater capacity to adapt to evolving circumstances. This adaptability is attributed to their ability to confront an uncertain future with creativity and a positive outlook [76,77].

Organizational resilience, as an implicit resource within the project organization, optimizes the collaboration among participants. It builds a communication and coordination bridge between them, enabling good communication and thus promoting the achievement of project performance objectives [78]. When there is a lack of good social network relationships among project participants, distrust and self-interest increase transaction costs in their cooperation, thereby harming project performance [79]. Relationship capital is a key factor in forming organizational resilience. When an organization faces a crisis, long-term stable organizational relationships help the project cope with difficulties and resume operations [80]. Trust-based, reciprocity-driven relational capital, supported by social networks, is part of the static dimension of organizational resilience.

- H5a: static resilience mediates the relationship between trust and project performance.
- H5b: static resilience mediates the relationship between commitment and project performance.
- H5c: static resilience mediates the relationship between communication and project performance.
- H5d: static resilience mediates the relationship between collaboration and project performance.

The dynamic dimension of organizational resilience includes the ability to continuously monitor, respond to, and learn from uncertain events or crises. It enables the integration of various organizational resources to form a competitive advantage, timely counteracting the impact of unexpected events, thereby improving project performance. Project organization characterized by high-level trust facilitates timely dissemination of information and enhances the ability to anticipate potential risks. When confronted with unforeseen crises, construction stakeholders refrain from engaging in mutual blame and instead swiftly mobilize and integrate internal and external resources, and coordinate and collaborate to collectively address the crisis [81]. This enables the construction project organization to deliver on time within the specified parameters, even in highly uncertain contexts.

Therefore, we propose the following hypotheses:

- H6a: dynamic resilience mediates the relationship between trust and project performance.
- H6b: dynamic resilience mediates the relationship between commitment and project performance.
- H6c: dynamic resilience mediates the relationship between communication and project performance.
- H6d: dynamic resilience mediates the relationship between collaboration and project performance.

Based on the above analysis and research hypotheses, a theoretical model is proposed, as shown in Figure 1.

Figure 1 presents the theoretical framework in which relational governance influences project performance through the mediating effects of static resilience and dynamic resilience. The core parts of the model include independent variables (relational governance): trust,

commitment, communication, and collaboration; mediating variables: static resilience and dynamic resilience; and the dependent variable: project performance. The path relationship among variables is clearly defined in the figure: In terms of direct effects, the relational governance directly and positively affects the project performance (H1a–H1d). Meanwhile, they positively affect static resilience and dynamic resilience, respectively, through H2a–H2d and H3a–H3d, while the two types of resilience (H4a–H4b) further directly promote project performance. In terms of mediating effects, static resilience (H5a–H5d) and dynamic resilience (H6a–H6d), respectively, mediate the paths from relational governance (trust/commitment/communication/collaboration) to project performance, forming a transmission mechanism of “Relational Governance → Resilience (static or dynamic) → Project Performance”.

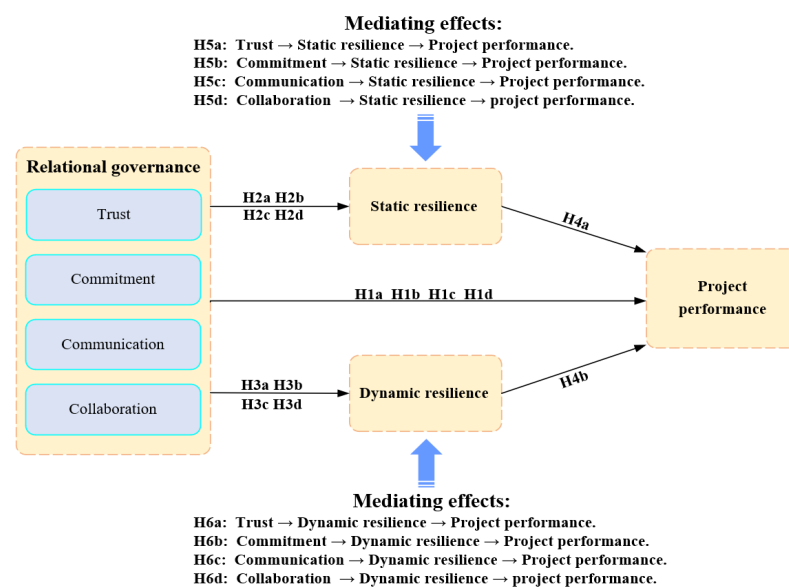


Figure 1. Conceptual framework.

3. Research Methodology

3.1. Measures

3.1.1. Independent Variable: Relational Governance

Relational governance reflects the quality of relationships among various construction participants within an engineering project. It includes the degree of trust (TT) between the parties, their expectations, and behaviors regarding commitment (CT) between them, the extent of communication (CN), as well as the quality of collaboration (CBN) during unexpected crises. The twelve measurement items of relational governance were derived from the work of Mathew et al. [82] and Chow et al. [83] and adjusted to fit the background of this study.

3.1.2. Mediating Variable: Organizational Resilience

This study posits that organizational resilience can be measured through the static characteristics and dynamic capabilities exhibited within the engineering project organization. The measurement items of static resilience (SR) were derived from McManus et al. [84] and Lee et al. [85], with four items measuring aspects such as social network relationships and organizational culture. The measurement items of dynamic resilience (DR) were derived from Prayag et al. [86] and Mousa et al. [87], with six items measuring aspects such as prediction, response, and learning. Based on the research context and the study’s objectives, the measurement items were refined, resulting in a total of 10 measurement items.

3.1.3. Dependent Variables: Project Performance

Currently, research on the project performance (PP) evaluation scale is relatively abundant. Lu et al. proposed the “iron triangle” of project duration, cost, and quality, as well as dimensions such as public demand, and developed a project performance evaluation scale [88]. Han et al. incorporated stakeholder satisfaction indicators into the performance evaluation system [89]. Based on the fundamental ideas of questionnaire design and the research context, this study optimized the measurement items and designed a total of five measurement items.

The details of the questionnaire items are listed in Table 2.

Table 2. Measurement items.

	Constructs	Items	Sources
Trust (TT)	TT1	Participants in the construction project trust each other and are willing to share their experiences and technologies.	Mathew and Chen [82] Chow et al. [83]
	TT2	We believe that the proactive sharing of technical expertise among construction project participants (e.g., design insights, construction best practices) enhances project outcomes, including quality, efficiency, and adherence to timelines.	
	TT3	We believe that trust among the construction project participants promotes the sharing of technology and experience.	
Commitment (CT)	CT1	We think that all parties to the construction project will strictly abide by the verbal commitments made and the contracts signed.	
	CT2	Our firm attaches great importance to the relationships with other construction participants and promises not to do anything harmful to each other.	
	CT3	All parties have invested significant energy and resources into the project.	
Communication (CN)	CN1	Our firm frequently holds meetings to discuss problems encountered during the process of project implementation.	
	CN2	We believe that the differences of opinion among the project construction participants are mainly resolved through effective communication.	
	CN3	Employees can learn from each other through communication and sharing their experiences.	
Collaboration (CBN)	CBN1	We believe that other construction participants do not seek to benefit from themselves at the expense of others.	
	CBN2	We believe that all parties to the construction project are willing to collaborate to facilitate the better implementation of the project.	
	CBN3	We believe that all parties to the construction are willing to cooperate with each other and actively solve problems when the project is in crisis.	

Table 2. *Cont.*

	Constructs	Items	Sources
Static Resilience (SR)	SR1	There is frequent informal communication between our firm and other construction participants, including daily interactions (e.g., casual discussions, instant messaging) and social gatherings (e.g., team-building events, informal meetups).	McManus et al. [84] Lee et al. [85]
	SR2	The temporary organization formed by our firm and other construction participants has strong cohesion.	
	SR3	We believe that useful resources can contribute to the successful completion of the project.	
	SR4	Our firm can make full use of the integrated resources to access additional favorable resources.	
Dynamic Resilience (DR)	DR1	Our firm has a clear understanding of the risks faced and prepares accordingly.	Prayag et al. [86] Mousa et al. [87]
	DR2	Our firm establishes crisis warning mechanisms in advance to identify potential challenges in the construction process.	
	DR3	Our firm can respond and integrate promptly and return to the previous normal production state in the face of a shortage of external resources.	
	DR4	In the face of a crisis, all parties to the construction project can coordinate with each other and come up with a clear solution.	
	DR5	After the crisis, our firm can draw lessons and define important priorities.	
	DR6	Our firm can successfully learn from past crises and ensure that these lessons are carried out into future work.	
Project Performance (PP)	PP1	There was no negative impact on the environment during the project implementation process.	Lu et al. [88] Han and Liu [89]
	PP2	The construction quality and delivery quality of the project meet the relevant national standards and contract standards.	
	PP3	The delivery of the project satisfied the owner and earned a good reputation.	
	PP4	All the project participants are satisfied with the completed project.	
	PP5	The duration, quality, and cost of the construction project all align with the contract provisions.	

3.2. Sample and Data Collection

This research is fundamentally anchored in Positivist Epistemology. Unlike Interpretive Epistemology, which emphasizes the comprehension of subjective meanings attributed by individuals and groups, Positivist Epistemology asserts that knowledge must be based on observable and quantifiable objective facts, with a focus on the identification of universal causal laws [90]. In alignment with its objective of generating objective and replicable scientific knowledge, Positivist Epistemology predominantly utilizes quantitative research methodologies [91]. This approach is centered on articulating hypotheses or causal relationships among variables, employing data collection and statistical analysis to substantiate and elucidate these relationships. Among the various methodologies employed, the questionnaire survey is a widely utilized quantitative research technique. By crafting standardized

questionnaires, researchers can amass substantial volumes of numerical data. In the context of this study, data were collected through the distribution of questionnaires to management representing different stakeholders.

We adopt a positive quantitative research method and use online survey questionnaires to collect data. The questionnaire was designed specially to address the research objectives of this study. It was divided into four sections: (1) Section A gathers basic demographic information about the participants and the firms they are employed in, including variables such as education, position, and work experience. (2) Section B examines the satisfaction of the implementation process and delivery of the construction project, focusing on aspects such as trust, commitment, communication, and collaboration. (3) Section C collects data on evaluating the cooperation process by all participants in the construction process of projects. (4) Section D focuses on the evaluation of organization prediction, sudden crises, organizational culture, and the intensity of social network relationships. The main part of the questionnaire uses a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) for its balance between simplicity and precision.

To ensure the validity and reliability of the questionnaire survey on construction projects, a pilot study was conducted in collaboration with industry professionals and academic experts. A preliminary version of the questionnaire was distributed to five experienced experts with a minimum of ten years in project management in China, three of them are industry and two are scholars. Their extensive industry knowledge is instrumental in assessing the survey's alignment with industry practices. To ensure convenience, this study used an online platform and distributed the questionnaire through a web link. Each interview lasted 30 to 40 min and aimed to optimize the comprehensibility and comprehensiveness of the project to ensure that the respondents from different cultural backgrounds could fully understand the content of the questionnaire. Based on their input, the questionnaire's wording, sentence structure, and inter-item correlations were revised to improve clarity and coherence. The optimized items are shown in Table 3.

Table 3. Expert interview optimization items.

Items Before the Interview	Items After the Interview
The temporary organization formed with other construction participants has strong cohesion.	The temporary organization formed with other construction participants was very united and had strong cohesion.
It is posited that the availability of valuable resources can enhance the quality of project completion.	It is believed that useful resources can promote the smooth implementation of the project, such as building materials, equipment solutions, multi-party collaboration, talent, etc.
The technical knowledge shared by the construction participants can promote the better completion of the project.	We believe that the technical knowledge shared by the construction participants can facilitate the better completion of the project.
We communicate with other construction participants frequently and any problems encountered will be resolved timely.	We communicate frequently with other participants and any problems encountered during the construction process will be resolved in a timely manner.
Other construction participants in the project are very satisfied with the delivery result.	All parties involved in the construction project are very satisfied with the delivery result.
During the project implementation, we were very satisfied with the behavior of other construction participants.	During the implementation of the project, all construction parties were satisfied with each other's behavior.

In order to uphold data quality and reduce bias, the items within the questionnaire were subjected to several rounds of refinement conducted by experts and scholars possess-

ing engineering expertise. This process emphasized the importance of ensuring consistency between the Chinese and English versions of the questionnaire. Additionally, data-cleaning protocols were established to detect and eliminate inconsistencies, errors, and outliers. To evaluate data quality and mitigate potential biases, analyses for common method bias and various statistical techniques were utilized [17].

The survey questionnaire targets management representatives from different key stakeholders who are directly involved in construction projects in mainland China, such as owners, design companies, construction enterprises, supervision companies, and suppliers. Given China's status as one of the world's largest construction markets, with a projected total output value reaching RMB 32.65 trillion (approximately USD 4.585 trillion based on the average 2024 exchange rate), the empirical context offers valuable insights into large-scale project environments. The survey was conducted exclusively in mainland China, encompassing 12 provinces and municipalities (e.g., Beijing, Shanghai, Guangdong, Anhui) to account for regional differences in construction practices. Participants were selected using a combination of stratified random sampling and snowball sampling methods: (1) stratification was based on project type (residential, commercial, infrastructure) and sector (public versus private), with 60% of respondents representing large-scale projects (defined as having a budget of at least RMB 100 million and a duration of two years or more) and 40% from medium and small projects; (2) initial participants were sourced through industry associations and professional networks, followed by referrals to promote diversity. Despite these efforts, due to accessibility limitations, the samples may not be sufficient to represent other countries. A diverse and comprehensive sample composition significantly contributes to improving the accuracy of research results.

A total of 306 samples were collected, and 270 valid samples remained after eliminating incomplete samples, which resulted in an effective response rate of 88.24%. Demographic analysis was conducted using IBM SPSS Statistics 22.0 with the objective of verifying whether the sample's demographic distribution was scientifically and reasonably structured. Detailed demographics are provided in Table 4.

Table 4. Demographics and profiles of respondents.

Category	Item	Number	Percent (%)
Gender	Male	152	56.30
	Female	118	43.70
Work experience	1–3 years	22	8.15
	4–5 years	91	33.70
	6–10 years	102	37.78
	11–15 years	35	12.96
	16–20 years	20	7.41
	18–25 years	29	10.74
Age	26–30years	92	34.07
	31–35years	65	24.07
	36–40years	55	20.37
	41 years and above	29	10.74

Table 4. Cont.

Category	Item	Number	Percent (%)
Educational level	Junior college and below	53	19.63
	Undergraduate	84	31.11
	Graduate	102	37.78
	Masters	19	7.04
	PhD	12	4.44
Work department	Owner/developer	56	20.74
	Design enterprise	76	28.15
	Construction enterprise	49	18.15
	Supervision enterprise	33	12.22
	Suppliers	30	11.11
	Other enterprise	26	9.63
Position	Technical specialist	88	32.59
	Basic management	92	34.07
	Middle management	38	14.07
	Senior management	22	8.15
	Other	30	11.11

3.3. Data Analysis

In this study, partial least squares structural equation modeling (PLS-SEM) was utilized to evaluate the proposed hypotheses based on the gathered data. The analysis was conducted using SmartPLS4.0, a specialized software for PLS analysis. Unlike covariance-based structural equation modeling (CB-SEM), which estimates parameters by striving for consistency between theoretical frameworks and empirical data to evaluate the fit of the theoretical model, PLS-SEM prioritizes the explanation of variance in endogenous variables [64]. Consequently, PLS-SEM is deemed more appropriate for this research, as it investigates the influence of exogenous variables on endogenous variables within the context of established theoretical relationships. Furthermore, the sample size ($N = 270$) is robust, exceeding the minimum threshold recommended by Hair et al., which requires the sample to be at least 10 times the number of structural paths directed at the most complex latent construct [92]. In this model, project performance, with 6 incoming paths, requires a minimum of 60 responses ($6 \times 10 = 60$), a threshold comfortably met by our 270 valid responses. Additionally, PLS-SEM's robustness for small-to-moderate samples and focus on predictive power further validate our approach [93]. A power analysis indicates that $N = 270$ ensures over 80% power to detect moderate effect sizes, supporting the reliability of our findings.

Prior to engaging in hypothesis testing utilizing partial least squares (PLS), it is imperative to first establish the reliability and validity of the model. This step is crucial to confirm that the relationships between latent variables and their corresponding observed indicators are both robust and justifiable. Reliability and validity testing provides a solid foundation for subsequent path analysis by confirming the reliability and validity of the data.

Path analysis is used to test the direct relationship between variables and is usually employed to analyze the causal paths between potential variables (i.e., variables that cannot be directly observed). In our study, the path coefficients were calculated using SmartPLS4.0 software, and their significance was tested using the Bootstrapping method with 5000 resamples.

After confirming the results of the path analysis, a mediating effect analysis was also conducted in this study. The purpose of mediation analysis is to explore the mediating role of certain variables between the independent variable and the dependent variable, that is, whether they indirectly affect the dependent variable through a certain mediating variable. We adopted the methodology established by Batra and Rastogi to perform mediation analysis within a comparable research framework [94]. Initially, we assessed the significance of the indirect effects, subsequently evaluating the significance of the direct effects. To determine significance, we employed a bootstrapping technique utilizing the default parameters available in SmartPLS4.0 [95]. This non-parametric resampling technique allows for robust estimation of standard errors and confidence intervals without relying on distributional assumptions. The bi-as-corrected percentile method was utilized to generate 95% confidence intervals, ensuring the reliability of the indirect and direct effect estimates.

4. Results

4.1. Measurement Validation

In this study, all variables are treated as reflective measurements. The assessment of the measurement model will involve evaluating reliability, convergent validity, and discriminant validity. Convergent validity pertains to the extent to which multiple items associated with a construct collectively measure the same underlying factor. This is verified by analyzing factor loading and the average variance extracted (AVE), which ensures that the observed variables adequately represent the latent variable and that the variance of the latent variable is sufficiently accounted for. As indicated in Table 5, the AVE values for all constructs surpass the recommended threshold of 0.5 [96]. Furthermore, as illustrated in Table 6, the majority of items exhibit standardized factor loading on their respective constructs that exceed the threshold of 0.7. This suggests that the observed variables possess significant explanatory power for their associated latent variables. Discriminant validity is essential in confirming the independence of latent variables, thereby affirming that each latent variable signifies a unique construct and meaning. As evidenced in Table 5, the square root of the average variance extracted (AVE) values for each variable surpasses the absolute values of the inter-construct correlations, indicating that the constructs demonstrate adequate discriminant validity.

Table 5. Measurement validity and construct correlations.

Construct	Mean	SD	CR	AVE	Correlation Matrix ^a						
					TT	CT	CN	CBN	SR	DR	PP
Trust (TT)	3.486	1.136	0.933	0.878	0.947						
Commitment (CT)	3.398	1.079	0.868	0.786	0.372	0.897					
Communication (CN)	3.839	1.054	0.939	0.881	0.273	0.412	0.949				
Collaboration (CBN)	3.393	1.209	0.930	0.871	0.409	0.333	0.256	0.933			
Static Resilience (SR)	3.610	1.134	0.926	0.816	0.465	0.461	0.451	0.400	0.903		
Dynamic Resilience (DR)	3.578	1.096	0.931	0.740	0.450	0.407	0.419	0.410	0.577	0.860	
Project Performance (PP)	3.689	1.025	0.898	0.710	0.536	0.494	0.487	0.504	0.627	0.616	0.843

Notes: SD (standard deviation) = $\frac{1}{N} \sum_{i=1}^N (x_i - \mu)^2$; CR (composite reliability) = $\frac{(\sum \lambda)^2}{[(\sum \lambda)^2 + \sum \theta]}$; AVE (average variance extracted) = $\frac{\sum_{i=1}^n \lambda_i^2}{\sum_{i=1}^n \lambda_i^2 + \sum_{i=1}^n \theta_i}$. ^a. Values on the diagonal represent the square root of AVE.

Table 6. Factor loadings for multi-item constructs.

Construct	Items	Mean	SD ^a	Standardized Factor Loadings ^b							T-Value
				TT	CT	CN	CBN	SR	DR	PP	
Trust (TT)	TT1	3.548	1.212	0.996	0.368	0.253	0.382	0.438	0.421	0.484	61.642
	TT2	3.419	1.244	1.032	0.361	0.275	0.386	0.440	0.440	0.540	63.681
	TT3	3.493	1.179	0.971	0.318	0.238	0.382	0.430	0.402	0.480	61.440
Commitment (CT)	CT1	3.422	1.145	0.267	0.925	0.372	0.302	0.380	0.307	0.427	32.714
	CT2	3.370	1.252	0.355	1.033	0.360	0.301	0.427	0.415	0.445	39.249
	CT3	3.404	1.252	0.363	1.041	0.365	0.284	0.417	0.354	0.443	39.062
Communication (CN)	CN1	3.752	1.119	0.233	0.366	0.973	0.201	0.372	0.350	0.425	55.333
	CN2	3.963	1.122	0.251	0.363	0.995	0.270	0.443	0.428	0.463	59.380
	CN3	3.789	1.124	0.283	0.428	1.029	0.244	0.450	0.397	0.482	77.370
Collaboration (CBN)	CBN1	3.319	1.306	0.378	0.263	0.242	0.997	0.390	0.384	0.488	48.741
	CBN2	3.407	1.296	0.370	0.337	0.198	0.977	0.334	0.367	0.437	45.576
	CBN3	3.452	1.284	0.396	0.335	0.271	1.023	0.391	0.398	0.484	73.759
Static Resilience (SR)	SR1	3.722	1.227	0.408	0.405	0.426	0.347	0.975	0.505	0.545	39.087
	SR2	3.548	1.340	0.435	0.383	0.393	0.384	1.057	0.535	0.589	42.191
	SR3	3.589	1.279	0.437	0.453	0.411	0.354	1.032	0.531	0.585	46.661
	SR4	3.578	1.180	0.400	0.424	0.401	0.358	0.940	0.512	0.545	36.163
Dynamic Resilience (DR)	DR1	3.541	1.222	0.374	0.380	0.351	0.290	0.488	0.966	0.544	29.849
	DR2	3.644	1.297	0.386	0.382	0.336	0.418	0.488	1.028	0.526	37.123
	DR3	3.596	1.290	0.385	0.369	0.431	0.349	0.528	1.034	0.544	38.202
	DR4	3.567	1.257	0.361	0.309	0.373	0.354	0.479	0.975	0.530	31.823
	DR5	3.567	1.262	0.386	0.316	0.317	0.351	0.479	0.965	0.479	29.319
	DR6	3.556	1.315	0.430	0.343	0.350	0.355	0.511	1.031	0.554	28.593
Project Performance (PP)	PP1	3.626	1.201	0.428	0.352	0.403	0.441	0.532	0.506	0.931	27.118
	PP2	3.696	1.258	0.490	0.421	0.378	0.415	0.549	0.511	1.055	30.527
	PP3	3.722	1.183	0.429	0.434	0.411	0.441	0.536	0.540	0.985	30.146
	PP4	3.719	1.239	0.437	0.434	0.434	0.400	0.517	0.548	1.033	32.179
	PP5	3.681	1.203	0.473	0.441	0.428	0.428	0.507	0.491	0.998	29.945

Notes: Bold values represent standardized factor loadings of the items on their respective constructs, and T-values are for these loadings. a. SD = standard deviation. b. All factor loadings are significant at the 0.1% level.

4.2. Hypothesis Testing

Path analysis is the most commonly used method to simultaneously explore all complex relationships among model constructs. In this study, PLS-SEM was utilized to investigate the impact of relational governance on project performance. The significance of the model assumptions is determined by the Bootstrapping method. The results are shown in Figure 2. The R^2 value for project performance is 0.592, indicating that more than half of the variance in this construct can be explained by the proposed model. As shown in Figure 2, the influences of trust ($\beta = 0.157$, $p < 0.01$), commitment ($\beta = 0.107$, $p < 0.05$), communication ($\beta = 0.148$, $p < 0.01$), and collaboration ($\beta = 0.147$, $p < 0.01$) on project performance are all positively correlated and statistically significant, thus hypotheses H1a, H1b, H1c, and H1d are all supported. Regarding the influence of relational governance on static resilience, we hypothesized that trust, commitment, communication, and collaboration are positively correlated with static resilience (H2a, H2b, H2c, H2d). As shown in Figure 2, the

path coefficient for the influence of trust on static resilience is $\beta = 0.251$, $p < 0.01$; the path coefficient for the influence of commitment on static resilience is $\beta = 0.219$, $p < 0.01$; the path coefficient for the influence of communication on static resilience is $\beta = 0.275$, $p < 0.01$; and the path coefficient for the influence of collaboration on static resilience is $\beta = 0.152$, $p < 0.01$. Therefore, hypotheses H2a, H2b, H2c, and H2d are all supported. Regarding the influence of relational governance on dynamic resilience, we hypothesized that trust, commitment, communication, and collaboration are positively correlated with dynamic resilience (H3a, H3b, H3c, H3d). As shown in Figure 2, the path coefficient for the influence of trust on dynamic resilience is $\beta = 0.239$, $p < 0.01$; the path coefficient for the influence of commitment on dynamic resilience is $\beta = 0.153$, $p < 0.01$; the path coefficient for the influence of communication on dynamic resilience is $\beta = 0.248$, $p < 0.01$; and the path coefficient for the influence of collaboration on dynamic resilience is $\beta = 0.179$, $p < 0.01$. Therefore, hypotheses H3a, H3b, H3c, and H3d are all supported. As for the impact of static resilience and dynamic resilience on project performance, Figure 2 shows that the path coefficients for both are $\beta = 0.204$ and $\beta = 0.212$, respectively, both of which are statistically significant at the 0.001 level, supporting hypotheses H4a and H4b.

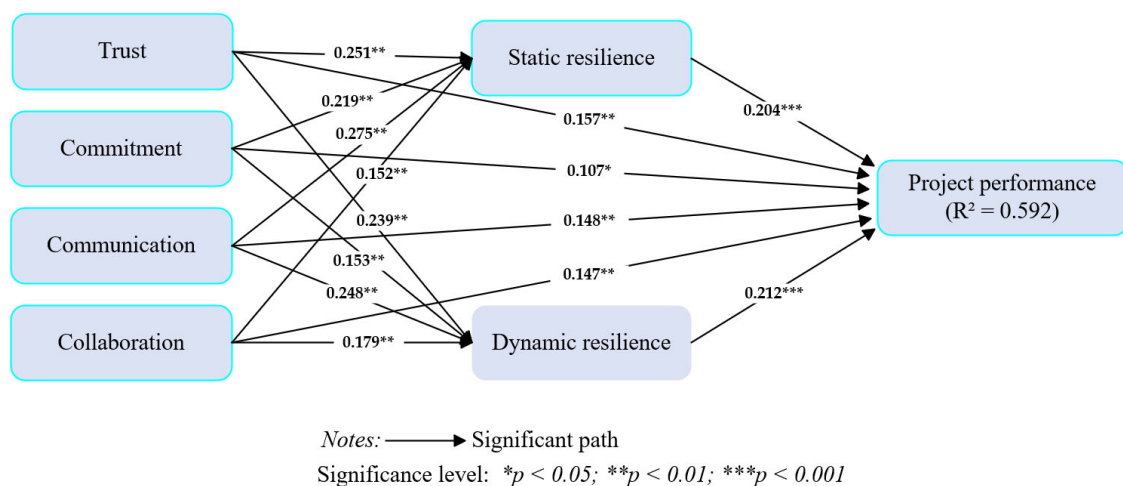


Figure 2. Results of PLS analyses for the research model.

4.3. Mediation Analysis of Organizational Resilience

The results obtained by the bootstrapping method (see Table 7) for the indirect effect of trust → static resilience → project performance indicate that the bias-corrected confidence interval does not include zero, demonstrating a significant positive relationship ($\beta = 0.051$, CI = [0.020, 0.097]); the indirect effect of commitment → static resilience → project performance indicate that the bias-corrected confidence interval does not include zero, demonstrating a significant positive relationship ($\beta = 0.044$, CI = [0.017, 0.090]); the indirect effect of communication → static resilience → project performance indicate that the bias-corrected confidence interval does not include zero, demonstrating a significant positive relationship ($\beta = 0.056$, CI = [0.026, 0.098]); the indirect effect of collaboration → static resilience → project performance indicate that the bias-corrected confidence interval does not include zero, demonstrating a significant positive relationship ($\beta = 0.031$, CI = [0.009, 0.067]). Similarly, the indirect effect of trust → dynamic resilience → project performance was significant, as the confidence interval does not include zero ($\beta = 0.051$, CI = [0.020, 0.099]); the indirect effect of commitment → dynamic resilience → project performance was significant, as the confidence interval does not include zero ($\beta = 0.033$, CI = [0.008, 0.077]); the indirect effect of communication → dynamic resilience → project performance was significant, as the confidence interval does not include zero ($\beta = 0.053$,

CI = [0.022, 0.100]); the indirect effect of collaboration → dynamic resilience → project performance was significant, as the confidence interval does not include zero ($\beta = 0.038$, CI = [0.010, 0.080]);

Table 7. Mediation effect values and test results.

Paths	Indirect Effect Value	Bias	2.50%	97.50%
TT → SR → PP	0.051	0.001	0.020	0.097
CT → SR → PP	0.044	0.001	0.017	0.090
CN → SR → PP	0.056	0.000	0.026	0.098
CBN → SR → PP	0.031	0.001	0.009	0.067
TT → DR → PP	0.051	0.001	0.020	0.099
CT → DR → PP	0.033	0.001	0.008	0.077
CN → DR → PP	0.053	0.001	0.022	0.100
CBN → DR → PP	0.038	0.001	0.012	0.084
TT → PP	0.259	−0.001	0.156	0.367
CT → PP	0.184	0.001	0.077	0.294
CN → PP	0.257	0.001	0.150	0.363
CBN → PP	0.216	−0.001	0.121	0.309

In addition, the direct effect of relational governance → project performance was found to be significant, as the confidence interval also did not include zero (H1a: $\beta = 0.102$, CI = [0.055, 0.163]; H1b: $\beta = 0.077$, CI = [0.033, 0.136]; H1c: $\beta = 0.109$, CI = [0.066, 0.159]; H1d: $\beta = 0.069$, CI = [0.028, 0.123]). These results suggest that relational governance not only has a direct positive impact on project performance but also exerts an indirect influence through the mediators' static resilience and dynamic resilience.

According to Hair et al. [92], when both the direct and indirect effects are statistically significant and the product of the path coefficients yields a positive value, it indicates the presence of complementary partial mediation between the constructs. Thus, our findings demonstrate that the relationships between relational governance → static resilience → project performance and relational governance → dynamic resilience → project performance are characterized by complementary partial mediation. The results provide meaningful insights into the complex interactions between relational governance, static resilience, dynamic resilience, and project performance, reinforcing the importance of these mediating pathways in understanding the overall impact of relational governance on project performance. Table 8 systematically integrates these conclusive findings.

Table 8. Summary of the results of the hypothesis testing.

Hypotheses	Supported or Not
• H1a: trust positively influences project performance.	Supported
• H1b: commitment positively influences project performance.	Supported
• H1c: communication positively influences project performance.	Supported
• H1d: collaboration positively influences project performance.	Supported
• H2a: trust positively influences static resilience.	Supported
• H2b: commitment positively influences static resilience.	Supported
• H2c: communication positively influences static resilience.	Supported
• H2d: collaboration positively influences static resilience.	Supported
• H3a: trust positively influences dynamic resilience.	Supported
• H3b: commitment positively influences dynamic resilience.	Supported
• H3c: communication positively influences dynamic resilience.	Supported
• H3d: collaboration positively influences dynamic resilience.	Supported

Table 8. *Cont.*

Hypotheses	Supported or Not
• H4a: static resilience positively influences project performance.	Supported
• H4b: dynamic resilience positively influences project performance.	Supported
• H5a: static resilience mediates the relationship between trust and project performance.	Supported
• H5b: static resilience mediates the relationship between commitment and project performance.	Supported
• H5c: static resilience mediates the relationship between communication and project performance.	Supported
• H5d: static resilience mediates the relationship between collaboration and project performance.	Supported
• H6a: dynamic resilience mediates the relationship between trust and project performance.	Supported
• H6b: dynamic resilience mediates the relationship between commitment and project performance.	Supported
• H6c: dynamic resilience mediates the relationship between communication and project performance.	Supported
• H6d: dynamic resilience mediates the relationship between collaboration and project performance.	Supported

5. Discussion

This study introduces static characteristics and dynamic capabilities in organizational resilience as key mediating variables and explores the interaction mechanism between relational governance and construction projects more comprehensively [97,98]. The findings conclude that relational governance, as a flexible management system, plays a crucial role in addressing opportunistic behaviors of construction participants and improving project performance. Additionally, both static characteristics and dynamic capabilities in project organizational resilience play a positive mediating role throughout the process [86,99].

5.1. Key Findings of This Study

5.1.1. Relational Governance and Project Performance

Hypothesis H1 suggests a positive correlation between relational governance and project performance. Trust, commitment, communication, and collaboration significantly contribute to the improvement of project performance. This finding demonstrates that trust-based relationships among construction participants, along with an emphasis on communication and collaboration, facilitate timely issue resolution and enhance project performance. This aligns with the research of Chen et al. [74], who emphasized the importance of trust, communication, and collaboration in accumulating organizational competitive advantages in uncertain environments.

For construction projects, these factors are particularly important in the industry, which faces the complexity of projects and high-risk environments. While formal contractual relationships possess the capacity to regulate participant behavior throughout the course of project development, their inherent limitations are evident. Conversely, informal governance grounded in trust markedly fosters collaboration among organizations and diminishes communication and coordination expenses, ultimately leading to enhanced efficiency in project management [100]. Strengthening relational governance is recognized as a crucial aspect of construction project management, complementing formal contract governance and serving as a vital measure for improving project performance [101].

5.1.2. The Mediating Role of Organizational Resilience

Hypothesis H5 and H6 investigate how organizational resilience mediates the relationship between relational governance and project performance [60,74]. The results indicate that relational governance promotes both static resilience and dynamic resilience, thereby supporting major construction projects. This finding is consistent with the research of Liu et al. [60], who focused on the role of organizational resilience. Relational governance, as a flexible governance mechanism, enhances the perceived value of construction participation for all stakeholders, aiming to maximize overall benefits. Trust, commitment, communication, and collaboration among construction participants foster a positive organi-

zational climate, strengthening internal cohesion and promoting the accumulation of social resources within the organization [102]. This enables the mobilization and coordination of more internal and external resources when crises arise [103].

Furthermore, the study supports Wu's [104] point of view. Relational governance fosters information sharing, continuous environmental monitoring, and the rapid identification of potential risks using external information. These measures improve the anticipatory capabilities of projects, enabling them to respond swiftly to crises and effectively utilize resources, thereby enhancing project performance. Previous studies have focused more on the dynamic process of projects and ignored the static characteristics of project organizations [105]. This study combines the characteristics of engineering projects and integrates the two to explore the role of resilience.

5.2. Contribution to the Body of Knowledge

Frequent conflicts among project participants often lead to poor project performance. Relational governance, as a flexible governance mechanism, has gained increasing attention from scholars. However, the mechanisms through which relational governance enhances project performance require further exploration. From a resilience perspective, this study developed a theoretical model with static specialization and dynamic capability of the project organization as key mediating variables. Using SEM and the Bootstrap method, this study examines how relational governance can improve the performance of construction projects through organizational resilience and draws several significant conclusions. The results show that relational governance positively influences both project performance and organizational resilience. Mutual trust and timely commitment among project participants in relational governance significantly impact both the static characteristics and dynamic capabilities of construction projects. Additionally, mutual commitment has the most substantial positive influence on creating a favorable organizational atmosphere. Organizational resilience partially mediates the relationship between relational governance and project performance.

This study makes several important contributions to the field of project governance. First, compensates for the rigid characteristics of traditional governance mechanisms (such as contractual governance, hybrid governance, and hierarchical governance) in dealing with uncertain environments, particularly in its role in enhancing organizational resilience. By demonstrating how relational governance mechanisms—such as mutual trust, communication, commitment, and collaboration—positively influence project performance to make them more flexible and adaptable in dealing with complex projects, this research advances theoretical understanding of relational governance in construction projects and enriches existing theoretical foundations. Furthermore, the study introduces organizational resilience as a key mediating variable between relational governance and project performance, shedding light on how resilience, cultivated through relational governance, can strengthen project outcomes, particularly in construction settings. Additionally, the research highlights the role of dynamic capabilities, emphasizing the need for project organizations to adapt and respond effectively to challenges, contributing to the broader literature on resilience and dynamic capabilities in project management.

5.3. Managerial Implication

In terms of practical implications, the findings offer valuable insights for project managers. They should recognize the importance of relationships as an essential mechanism for managing unforeseen crises and minimizing internal conflicts. Firstly, it is crucial to strengthen organizational leadership and align relational governance with overall construction objectives, which involves flexibly adjusting the cooperation mode, forming dedicated

committees with multiple participants (such as owner representatives, contractors, supervisors, etc.) explicit roles and responsibilities. Use the conflict transformation capability of organizational resilience to coordinate the contradictions among stakeholders. It is necessary to carry out distributed leadership authorization, delegate compliance management authority to the project level, and reduce the approval level through the trust mechanism of relational governance in a complex regulatory environment [94]. At the same time, it should focus on cultivating an atmosphere of trust, commitment, communication, and collaboration, transforming the collaborative advantages of relational governance into quantifiable organizational resilience capabilities (such as recovery speed and adaptation cost), so as to reduce opportunistic behavior and conflict events among project participants [106].

Secondly, to identify potential conflicts in relational governance (such as contract disputes and stakeholder disagreements) and to compensate for the rigidity of formal contracts, informal exchanges or cross-departmental collaboration meetings should be organized regularly, while “flexible contract clauses” should be embedded in relational governance (e.g., contingency supply plan) [80,107]. For example, in the interview, it was found that an EPC project had an “early warning mechanism for critical path delays” in the contract, which allows prefabricated components to be used instead of cast-in-place construction when a risk event occurs, significantly improving the efficiency of project delivery.

Additionally, enhancing dynamic capability resilience and social capital resilience is critical to improving project performance. Project managers should incorporate relational governance and resilience into the organization’s strategic objectives, focusing on cultivating organizational resilience throughout the project life cycle, including pre-adversity, adversity, and post-adversity [108]. This can be achieved by establishing early warning systems, crisis management protocols, and transparent resource sharing, ensuring that the project is well-prepared to navigate challenges [109]. Gradually promote resilient organizational culture through institutional design and cultural guidance, and ensure that projects are well prepared to meet challenges through the ability of organizational resilience to iterate quickly (such as daily cross-team problem reviews) [110]. For instance, in the interview, it was found that the general contractor of a construction project shares the project progress in real time through the cloud collaboration platform every week, and the owner can check and mark problems at any time, which reduces the doubts caused by information asymmetry and improves stakeholders’ satisfaction.

6. Conclusions

In this study, we explore the transmission mechanism between relational governance and project performance from the perspective of resilience. The study has confirmed that relational governance can positively influence addressing opportunistic behaviors of construction participants and improving project performance. The novelty is that this study has clarified whether organizational resilience plays a mediating role between relational governance and project performance, and how different dimensions of relational governance differently affect the construction of resilience, which not only makes up for the deficiency of traditional governance theory in dynamic adaptability and systematic risk response, but also provides a new theoretical and practical framework for project management under complex environment.

While this study has explored the role of organizational resilience in the relationship between relational governance and project performance, it did not examine the integration of contract governance with relational governance or explore the complementary impact of both on project performance. Future research should investigate how contract governance and relational governance work together in construction projects to improve performance. Additionally, exploring how project scale and management structures in different enter-

prises influence these mechanisms is a promising avenue for future studies. Despite these efforts, the sample's exclusive focus on China may limit the generalization of the findings to other national contexts. Cultural and institutional specificity—such as the influence of Confucian values on relational governance practices—may not translate directly to countries where formal, contract-based mechanisms dominate. To address this limitation, future research should incorporate cross-national samples to explore how cultural and regulatory environments moderate the relationship between relational governance, organizational resilience, and project performance.

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References

1. Hassan, A.M.; Negash, Y.T.; Hanum, F. An assessment of barriers to digital transformation in circular construction: An application of stakeholder theory. *Ain Shams Eng. J.* **2024**, *15*, 102787. [[CrossRef](#)]
2. Yan, L.; Shi, Z.; Yan, M.; Deng, J. Contractual governance and relational governance in public construction project: Substitutes or complements? *China Civ. Eng. J.* **2016**, *49*, 115–128.
3. Williamson, O.E. The economics of organization: The transaction cost approach. *Am. J. Sociol.* **1981**, *87*, 548–577. [[CrossRef](#)]
4. Ahola, T.; Ruuska, I.; Artto, K.; Kujala, J. Transaction costs in project business: A review and future research directions. *Int. J. Manag. Proj. Bus.* **2022**, *15*, 328–350.
5. Winch, G.; Leiringer, R. Owner project capabilities for infrastructure development: A review and development of the 'strong owner' concept. *Int. J. Proj. Manag.* **2022**, *34*, 271–281. [[CrossRef](#)]
6. Zhao, D.; Gu, F.F.; Wang, L. The impact of contractual governance on forms of opportunism. *Ind. Mark. Manag.* **2022**, *102*, 89–103. [[CrossRef](#)]
7. Yang, J.; Cheng, Q. The conditional limitation of relational governance: The moderating role of project complexity. *Adv. Civ. Eng.* **2021**, *2021*, 8886913. [[CrossRef](#)]
8. Rahman, M.M.; Kumaraswamy, M. Relational contracting and teambuilding: Assessing potential contractual and noncontractual incentives. *J. Manag. Eng.* **2008**, *24*, 48–63. [[CrossRef](#)]
9. Fernandes, E.B.; Wegner, D.; Möllering, G. Governance of interorganizational projects: A process-based approach applied to a Latin American–European case. *Proj. Manag. J.* **2023**, *54*, 219–234. [[CrossRef](#)]
10. Wang, D.; Wu, Y. Research on the impact of project governance on organizational resilience of megaproject. *Proj. Manag. Technol.* **2022**, *11*, 39–43.
11. Eriksson, P.E.; Westerberg, M. Effects of cooperative procurement procedures on construction project performance: A conceptual framework. *Int. J. Proj. Manag.* **2011**, *29*, 197–208. [[CrossRef](#)]
12. Miller, R.; Hobbs, B. Governance regimes for large complex projects. *Proj. Manag. J.* **2005**, *36*, 42–50. [[CrossRef](#)]
13. Lin, Y.-H.; Guo, Y.; Kim, C.-J.; Chen, P.-H.; Qian, M. The impact of relational governance on the adaptability of international contractors: A comparative study between China and Korea. *Engineering. Constr. Archit. Manag.* **2020**, *27*, 3235–3259. [[CrossRef](#)]
14. Poppo, L.; Zenger, T. Do formal contracts and relational governance function as substitutes or complements? *Strateg. Manag. J.* **2002**, *23*, 707–725. [[CrossRef](#)]
15. Lovallo, D.; Cristofaro, M.; Flyvbjerg, B. Governing large projects: A three-stage process to get it right. *Acad. Manag. Perspect.* **2023**, *37*, 138–156. [[CrossRef](#)]
16. Song, H.; Hou, J.; Tang, S. From contractual flexibility to contractor's cooperative behavior in construction projects: The multiple mediation effects of ongoing trust and justice perception. *Sustainability* **2021**, *13*, 13654. [[CrossRef](#)]
17. Zhang, L.; Fu, Y.; Lai, J.; Chen, Y. Complements or substitutes? Recipes of contract design, contract enforcement, and trust for enhanced project performance. *Int. J. Proj. Manag.* **2024**, *42*, 102587. [[CrossRef](#)]

18. Abdi, M.; Aulakh, P.S. Locus of uncertainty and the relationship between contractual and relational governance in cross-border interfirm relationships. *J. Manag.* **2017**, *43*, 771–803. [\[CrossRef\]](#)
19. Adewusi, A.O.; Komolafe, A.M.; Ejairu, E.; Aderotoye, I.A.; Abiona, O.O.; Oyeniran, O.C. The role of predictive analytics in optimizing supply chain resilience: A review of techniques and case studies. *Int. J. Manag. Entrep. Res.* **2024**, *6*, 815–837. [\[CrossRef\]](#)
20. Poppo, L.; Zhou, K.Z.; Ryu, S. Alternative origins to interorganizational trust: An interdependence perspective on the shadow of the past and the shadow of the future. *Organ. Sci.* **2008**, *19*, 39–55. [\[CrossRef\]](#)
21. Luo, Y. Contract, cooperation, and performance in international joint ventures. *Strateg. Manag. J.* **2002**, *23*, 903–919. [\[CrossRef\]](#)
22. Lenton, T.M.; Boulton, C.A.; Scheffer, M. Resilience of countries to COVID-19 correlated with trust. *Sci. Rep.* **2022**, *12*, 75. [\[CrossRef\]](#) [\[PubMed\]](#)
23. Roeder, A.C.; Bisel, R.S. Managing disruption(s) at work: A longitudinal study of communicative resilience and high-reliability organizing. *Commun. Monogr.* **2024**, *91*, 56–78. [\[CrossRef\]](#)
24. Ma, B.; Zhang, J. Tie strength, organizational resilience and enterprise crisis management: An empirical study in pandemic time. *Int. J. Disaster Risk Reduct.* **2022**, *81*, 103240. [\[CrossRef\]](#)
25. Bakker, R.M.; DeFillippi, R.J.; Schwab, A.; Sydow, J. Temporary Organizing: Promises, Processes, Problems. *Organ. Stud.* **2016**, *37*, 1703–1729. [\[CrossRef\]](#)
26. Li, X.; Yin, Y.; Zhang, Y. Examining the Impact of Relationship-Related and Process-Related Factors on Project Success: The Paradigm of Stimulus-Organism-Response. *J. Asian Archit. Build. Eng.* **2022**, *21*, 93–109. [\[CrossRef\]](#)
27. Cantù, C.L.; Schepis, D.; Minunno, R.; Morrison, G. The Role of Relational Governance in Innovation Platform Growth: The Context of Living Labs. *J. Bus. Ind. Mark.* **2022**, *36*, 236–249. [\[CrossRef\]](#)
28. Lv, L.L.; Chen, C.J.; Wang, Z.F. Resource and Cognitive Perspectives: Unraveling the Influence Mechanism of Project Governance on Organizational Resilience in Infrastructure Projects. *Buildings* **2023**, *13*, 2878. [\[CrossRef\]](#)
29. El Idrissi, M.; El Waatmani, A. Relational Governance and conflict, the moderating role of justice: A study on construction companies in a region of Morocco. *J. Acad. Financ.* **2024**, *15*, 2. [\[CrossRef\]](#)
30. Li, X.; Yin, Y.; Mu, W.; Li, H.; Liu, R.; Zhang, R. Re-examining the link between relational governance and project management performance: An integrated framework. *J. Asian Archit. Build. Eng.* **2023**, *23*, 707–725. [\[CrossRef\]](#)
31. Fareed, M.Z.; Su, Q. Project governance and project performance: The moderating role of top management support. *Sustainability* **2022**, *14*, 2516. [\[CrossRef\]](#)
32. Lu, P.; Qian, L.; Chu, Z.; Xu, X. Role of opportunism and trust in construction projects: Empirical evidence from China. *J. Manag. Eng.* **2016**, *32*, 05015007. [\[CrossRef\]](#)
33. Yang, J.; Liu, Y.; Jia, Y. Influence of trust relationships with suppliers on manufacturer resilience in COVID-19 era. *Sustainability* **2022**, *14*, 9235. [\[CrossRef\]](#)
34. Villena, V.H.; Revilla, E.; Choi, T.Y. The dark side of buyer–supplier relationships: A social capital perspective. *J. Oper. Manag.* **2011**, *29*, 561–576. [\[CrossRef\]](#)
35. Jiang, X.; Li, M.; Gao, S.; Bao, Y.; Jiang, F. Managing knowledge leakage in strategic alliances: The effects of trust and formal contracts. *Ind. Mark. Manag.* **2013**, *42*, 983–991. [\[CrossRef\]](#)
36. Shah, J.; Higgins, T.; Friedman, R.S. Performance incentives and means: How regulatory focus influences goal attainment. *J. Personal. Soc. Psychol.* **1998**, *74*, 285. [\[CrossRef\]](#)
37. Yan, L.; Deng, J.J.; Wu, S.Y. Localization of the core elements of relational governance mechanisms in the temporary organization. *Chin. J. Manag.* **2014**, *11*, 906–914.
38. Fu, J.-Y.; Ding, H.-P. Construction Enterprise Resource Integration Based on the Improvement of the Value Creation Capabilities. In Proceedings of the 2007 International Conference on Management Science and Engineering, Harbin, China, 20–22 August 2007; IEEE: Piscataway, NJ, USA, 2007; pp. 2299–2305.
39. Peñaloza, G.A.; Saurin, T.A.; Formoso, C.T. Monitoring complexity and resilience in construction projects: The contribution of safety performance measurement systems. *Appl. Ergon.* **2020**, *82*, 102978. [\[CrossRef\]](#)
40. Linnenluecke, M.K.; Andrew, G. Assessing organizational resilience to climate and weather extremes: Complexities and methodological pathways. *Clim. Change* **2012**, *113*, 933–947. [\[CrossRef\]](#)
41. Andersson, T.; Cäker, M.; Tengblad, S.; Wickelgren, M. Building traits for organizational resilience through balancing organizational structures. *Scand. J. Manag.* **2019**, *35*, 36–45. [\[CrossRef\]](#)
42. Kahan, J.H.; Allen, A.C.; George, J.K. An operational framework for resilience. *J. Homel. Secur. Emerg. Manag.* **2009**, *6*, 83. [\[CrossRef\]](#)
43. Madni, A.M.; Scott, J. Towards a conceptual framework for resilience engineering. *IEEE Syst. J.* **2009**, *3*, 181–191. [\[CrossRef\]](#)
44. Burnard, K.; Bhamra, R. Organisational resilience: Development of a conceptual framework for organisational responses. *Int. J. Prod. Res.* **2011**, *49*, 5581–5599. [\[CrossRef\]](#)

45. Jaques, T. Issue management and crisis management: An integrated, non-linear, relational construct. *Public Relat. Rev.* **2007**, *33*, 147–157. [\[CrossRef\]](#)
46. Annarelli, A.; Battistella, C.; Nonino, F. A framework to evaluate the effects of organizational resilience on service quality. *Sustainability* **2020**, *12*, 958. [\[CrossRef\]](#)
47. Pant, R.; Barker, K.; Zobel, C.W. Static and dynamic metrics of economic resilience for interdependent infrastructure and industry sectors. *Reliab. Eng. Syst. Saf.* **2014**, *125*, 92–102. [\[CrossRef\]](#)
48. Ma, Z.; Xiao, L.; Yin, J. Toward a dynamic model of organizational resilience. *Nankai Bus. Rev. Int.* **2018**, *9*, 246–263. [\[CrossRef\]](#)
49. Vlikangas, L.; Hamel, G. The quest for resilience. *Harv. Bus. Rev.* **2003**, *81*, 52–63.
50. Bhamra, R.; Dani, S.; Burnard, K. Resilience: The concept, a literature review and future directions. *Int. J. Prod. Res.* **2011**, *49*, 5375–5393. [\[CrossRef\]](#)
51. Akpan, E.E.; Johnny, E.; Sylva, W. Dynamic capabilities and organizational resilience of manufacturing firms in Nigeria. *Vision* **2022**, *26*, 48–64. [\[CrossRef\]](#)
52. Wang, D.; Chen, X. The Effect of Governance and Resource Factors on the Organizational Resilience of Megaprojects. *J. Eng. Manag./Gongcheng Guanli Xuebao* **2022**, *36*, 5.
53. Gong, Z.; Wang, H.; Guo, W. Measuring trust in social networks based on linear uncertainty theory. *Inf. Sci.* **2020**, *508*, 154–172. [\[CrossRef\]](#)
54. Lichte, D.; Torres, F.S.; Engler, E. Framework for operational resilience management of critical infrastructures and organizations. *Infrastructures* **2022**, *7*, 70. [\[CrossRef\]](#)
55. Zavolokina, L.; Schlegel, M.; Schwabe, G. How can we reduce information asymmetries and enhance trust in ‘The Market for Lemons’? *Inf. Syst. E-Bus. Manag.* **2021**, *19*, 883–908. [\[CrossRef\]](#)
56. Ha, B.C.; Park, Y.K.; Cho, S. Suppliers’ affective trust and trust in competency in buyers: Its effect on collaboration and logistics efficiency. *Int. J. Oper. Prod. Manag.* **2011**, *31*, 56–77. [\[CrossRef\]](#)
57. Zafari, K.; Biggemann, S.; Garry, T. Mindful management of relationships during periods of crises: A model of trust, doubt and relational adjustments. *Ind. Mark. Manag.* **2020**, *88*, 278–286. [\[CrossRef\]](#)
58. Clarvis, M.H.; Bohensky, E.; Yarime, M. Can resilience thinking inform resilience investments? Learning from resilience principles for disaster risk reduction. *Sustainability* **2015**, *7*, 9048–9066. [\[CrossRef\]](#)
59. Trucco, P.; Nocetti, C.; Sannicandro, R.; Carlucci, M.; Weinstein, E.S.; Faccincani, R. Assessing hospital adaptive resource allocation strategies in responding to mass casualty incidents. *Disaster Med. Public Health Prep.* **2022**, *16*, 1105–1115. [\[CrossRef\]](#)
60. Liu, T.; Chong, H.-Y.; Zhang, W.; Lee, C.-Y.; Tang, X. Effects of contractual and relational governance on BIM collaboration and implementation for project performance improvement. *J. Constr. Eng. Manag.* **2022**, *148*, 04022029. [\[CrossRef\]](#)
61. Jørgensen, L.; Åsgård, T. Trust and control in project management. *Procedia Comput. Sci.* **2019**, *164*, 397–406. [\[CrossRef\]](#)
62. Wang, D.; Wu, Y.; Zhang, K. Interplay of resources and institutions in improving organizational resilience of construction projects: A dynamic perspective. *Eng. Manag. J.* **2023**, *35*, 346–357. [\[CrossRef\]](#)
63. Al Shatti, L.; Bischoff, J.E.; Willy, C.J. Investigating the effectiveness of team communication and the balance of member contributions on knowledge acquisition. *Knowl. Manag. Res. Pract.* **2018**, *16*, 51–65. [\[CrossRef\]](#)
64. Henderson, L.S. The impact of project managers’ communication competencies: Validation and extension of a research model for virtuality, satisfaction, and productivity on project teams. *Proj. Manag. J.* **2008**, *39*, 48–59. [\[CrossRef\]](#)
65. Faems, D.; Janssens, M.; Madhok, A.; Van Looy, B. Toward an integrative perspective on alliance governance: Connecting contract design, trust dynamics, and contract application. *Acad. Manag. J.* **2008**, *51*, 1053–1078. [\[CrossRef\]](#)
66. Dietrich, P.; Eskerod, P.; Dalcher, D. The dynamics of collaboration in multipartner projects. *Proj. Manag. J.* **2010**, *41*, 59–78. [\[CrossRef\]](#)
67. Galvez, V.; Rojas, R. Collaboration and integrated water resources management: A literature review. *World Water Policy* **2019**, *5*, 179–191. [\[CrossRef\]](#)
68. Gifford, R.E.; van de Baan, F.C.; Westra, D. There and back again. Examining the development of employee commitment during a prolonged crisis. *SSM-Qual. Res. Health* **2022**, *2*, 100053. [\[CrossRef\]](#)
69. Bennett, N.; Lemoine, G.J. What a difference a word makes: Understanding threats to performance in a VUCA world. *Bus. Horiz.* **2014**, *57*, 311–317. [\[CrossRef\]](#)
70. De Wit, J. Black swans or gray rhinos on the runway? The role of uncertainty in airport strategic planning. In *The Air Transportation Industry*; Elsevier: Amsterdam, The Netherlands, 2022; pp. 225–245.
71. You, J.J.; Williams, C. Organizational resilience and interorganizational relationships: An exploration of Chinese business service firms. *Eur. Manag. Rev.* **2023**, *20*, 591–609. [\[CrossRef\]](#)
72. Fasey, K.J.; Sarkar, M.; Wagstaff, C.R.; Johnston, J. Defining and characterizing organizational resilience in elite sport. *Psychol. Sport Exerc.* **2021**, *52*, 101834. [\[CrossRef\]](#)
73. Salzano, A.; Cascone, S.; Zitiello, E.P.; Nicolella, M. Construction Safety and Efficiency: Integrating Building Information Modeling into Risk Management and Project Execution. *Sustainability* **2024**, *16*, 4094. [\[CrossRef\]](#)

74. Chen, G.; Chen, J.; Tang, Y.; Li, Q.; Luo, X. Identifying effective collaborative behaviors in building information modeling-enabled construction projects. *J. Constr. Eng. Manag.* **2022**, *148*, 04022026. [\[CrossRef\]](#)
75. Hillmann, J.; Guenther, E. Organizational resilience: A valuable construct for management research? *Int. J. Manag. Rev.* **2021**, *23*, 7–44. [\[CrossRef\]](#)
76. Ayala Calvo, J.C.; García, G.M. Established business owners' success: Influencing factors. *J. Dev. Entrep.* **2010**, *15*, 263–286. [\[CrossRef\]](#)
77. Do, H.; Budhwar, P.; Shipton, H.; Nguyen, H.-D.; Nguyen, B. Building organizational resilience, innovation through resource-based management initiatives, organizational learning and environmental dynamism. *J. Bus. Res.* **2022**, *141*, 808–821. [\[CrossRef\]](#)
78. Chen, R.; Liu, Y.; Zhou, F. Turning danger into safety: The origin, research context and theoretical framework of organizational resilience. *IEEE Access* **2021**, *9*, 48899–48913. [\[CrossRef\]](#)
79. Mai, Y.; Zheng, W.; Wu, Y.J.; Dong, T.-P. Impact of entrepreneurial team contractual governance on new venture resilience: The mediating role of resource bricolage. *Sustainability* **2023**, *15*, 3518. [\[CrossRef\]](#)
80. Lu, Q.; Wang, X.; Wang, Y. Enhancing supply chain resilience with supply chain governance and finance: The enabling role of digital technology adoption. *Bus. Process Manag. J.* **2023**, *29*, 944–964. [\[CrossRef\]](#)
81. Yang, X.; Wang, L.; Zhu, F.; Müller, R. Prior and governed stakeholder relationships: The key to resilience of inter-organizational projects. *Int. J. Proj. Manag.* **2022**, *40*, 64–75. [\[CrossRef\]](#)
82. Mathew, S.K.; Chen, Y. Achieving offshore software development success: An empirical analysis of risk mitigation through relational norms. *J. Strateg. Inf. Syst.* **2013**, *22*, 298–314. [\[CrossRef\]](#)
83. Chow, P.T.; Cheung, S.O.; Chan, K.Y. Trust-building in construction contracting: Mechanism and expectation. *Int. J. Proj. Manag.* **2012**, *30*, 927–937. [\[CrossRef\]](#)
84. McManus, S.; Seville, E.; Vargo, J.; Brunsdon, D. Facilitated process for improving organizational resilience. *Nat. Hazards Rev.* **2008**, *9*, 81–90. [\[CrossRef\]](#)
85. Lee, A.V.; Vargo, J.; Seville, E. Developing a tool to measure and compare organizations' resilience. *Nat. Hazards Rev.* **2013**, *14*, 29–41. [\[CrossRef\]](#)
86. Prayag, G.; Chowdhury, M.; Spector, S.; Orchiston, C. Organizational resilience and financial performance. *Ann. Tour. Res.* **2018**, *73*, 193–196. [\[CrossRef\]](#)
87. Mousa, M.; Abdelgaffar, H.A.; Chaouali, W.; Aboramadan, M. Organizational learning, organizational resilience and the mediating role of multi-stakeholder networks: A study of Egyptian academics. *J. Workplace Learn.* **2020**, *32*, 161–181. [\[CrossRef\]](#)
88. Lu, P.; Guo, S.; Qian, L.; He, P.; Xu, X. The effectiveness of contractual and relational governances in construction projects in China. *Int. J. Proj. Manag.* **2015**, *33*, 212–222. [\[CrossRef\]](#)
89. Han, X.; Liu, W. Research on Performance Evaluation of Public-Private Partnership (PPP) Project based on KPI Method. *Constr. Econ.* **2019**, *40*, 45–50.
90. Orlikowski, W.J.; Baroudi, J.J. Studying information technology in organizations: Research approaches and assumptions. *Inf. Syst. Res.* **1991**, *2*, 1–28. [\[CrossRef\]](#)
91. Creswell, J.W.; Creswell, J.D. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*; Sage Publications: Thousand Oaks, CA, USA, 2017.
92. Hair, J.F., Jr.; Hult, G.T.M.; Ringle, C.M.; Sarstedt, M.; Danks, N.P.; Ray, S. *Partial Least Squares Structural Equation Modeling (PLS-SEM) Using R: A Workbook*; Springer Nature: Berlin/Heidelberg, Germany, 2021; p. 197.
93. Astrachan, C.B.; Patel, V.K.; Wanzenried, G. A comparative study of CB-SEM and PLS-SEM for theory development in family firm research. *J. Fam. Bus. Strategy* **2014**, *5*, 116–128. [\[CrossRef\]](#)
94. Batra, S.; Rastogi, A. Authentic Leadership, Future Prospects and Affective Commitment in Early Career Employees: A Mediation Model. *S. Asian J. Hum. Resour. Manag.* **2024**, *11*, 228–252. [\[CrossRef\]](#)
95. Ringle, C.; Wende, S.; Becker, J.-M. SmartPLS 4, SmartPLS GmbH, Oststeinbek. Available online: <http://www.smartpls.com> (accessed on 20 June 2024).
96. Fornell, C.; Larcker, D.F. Evaluating structural equation models with unobservable variables and measurement error. *J. Mark. Res.* **1981**, *18*, 39–50. [\[CrossRef\]](#)
97. Hundleby, J.D. Reviews: Nunnally, J. Psychometric Theory. New York: McGraw-Hill, 1967. 640+ xiii pp. \$12.95. *Am. Educ. Res. J.* **1968**, *5*, 431–433. [\[CrossRef\]](#)
98. Tu, B.; Zuo, J.; Chang, R.-D.; Webber, R.J.; Xiong, F.; Dong, N. A system dynamic model for assessing the level of BIM implementation in construction phase: A China case study. *Eng. Constr. Archit. Manag.* **2023**, *30*, 1321–1343. [\[CrossRef\]](#)
99. Pérez, Y.; Ávila, J.; Sánchez, O. Influence of BIM and Lean on mitigating delay factors in building projects. *Results Eng.* **2024**, *22*, 102236. [\[CrossRef\]](#)
100. Lee, C.-Y.; Chong, H.-Y.; Li, Q.; Wang, X. Joint contract–function effects on BIM-enabled EPC project performance. *J. Constr. Eng. Manag.* **2020**, *146*, 04020008. [\[CrossRef\]](#)

101. Zhang, H.M.; Chong, H.-Y.; Zeng, Y.; Zhang, W. The effective mediating role of stakeholder management in the relationship between BIM implementation and project performance. *Eng. Constr. Archit. Manag.* **2023**, *30*, 2503–2522. [\[CrossRef\]](#)
102. Wu, G.; Li, H.; Wu, C.; Hu, Z. How different strengths of ties impact project performance in megaprojects: The mediating role of trust. *Int. J. Manag. Proj. Bus.* **2020**, *13*, 889–912. [\[CrossRef\]](#)
103. Wang, D.; Zhao, X. Effect of resource integration on organizational resilience of megaprojects: Role of dynamic capability and resource availability. *J. Asian Archit. Build. Eng.* **2024**, *24*, 1578–1593. [\[CrossRef\]](#)
104. Wu, Q.; Zhu, J.; Cheng, Y. The effect of cross-organizational governance on supply chain resilience: A mediating and moderating model. *J. Purch. Supply Manag.* **2023**, *29*, 100817. [\[CrossRef\]](#)
105. Dickens, J.M.; Anderson, J.R.; Reiman, A.; Uvet, H.; Nowicki, D.R. Supply chain resilience: An empirical examination of the bouncing back or forward phenomenon. *Int. J. Logist. Res. Appl.* **2023**, *26*, 190–210. [\[CrossRef\]](#)
106. Hua, Y.Y.; Kang, M.L.; Yao, H.J.; Fu, Y.F. How to foster project organization resilience in the construction industry: The role of data governance capabilities. *Buildings* **2025**, *15*, 1219. [\[CrossRef\]](#)
107. Tarigan, M.K.; Simatupang, T.M.; Bangun, Y.R. Building resilience through digital transformation: A systematic literature review and comprehensive framework for large enterprise. *Bus. Innov. Res.* **2025**, *36*, 1751–0252. [\[CrossRef\]](#)
108. Jiao, P.Y.; Bu, W.W. The Impact of Organizational Learning on Organizational Resilience in Construction Projects. *Buildings* **2024**, *14*, 975. [\[CrossRef\]](#)
109. Su, W.J.; Junge, S. Unlocking the Recipe for Organizational Resilience: A Review and Future Research Directions. *Eur. Manag. J.* **2023**, *41*, 1086–1105. [\[CrossRef\]](#)
110. Chao, K.; Wang, S.; Wang, M. Human capital investment, technological innovation, and resilience of Chinese high-end manufacturing enterprises. *Sustainability* **2025**, *17*, 247. [\[CrossRef\]](#)

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