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# The Impact of Safety Management, Organizational Commitment and Risk Management on Project Performance in China's Construction Industry: The Moderating Role of Project Complexity

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**Abstract**

China's construction industry is transitioning from rapid expansion to high-quality development, prompting attention to how safety management, organizational commitment, and risk management jointly predict project performance under increasing project complexity. This study systematically reviews 102 empirical studies (2013-2024) retrieved from Scopus, Web of Science, ScienceDirect, and CNKI, employing narrative synthesis and thematic analysis. The review reveals that safety management and organizational commitment drive performance through two complementary pathways-compliance-based and commitment-based-while risk management serves as the integrating mechanism calibrating the balance between them. Disaggregating project complexity through the TOE framework, the review finds that technical and organizational complexity weaken the compliance pathway but amplify the commitment pathway, whereas environmental complexity simultaneously heightens the need for resilience and erodes the psychological foundations of commitment; a resilient safety culture buffers these negative effects. This review contributes an integrated driver-adaptation-contingency framework and a TOE-based contingency matrix, while identifying critical gaps including the absence of an integrated empirical model and a scarcity of longitudinal designs.

**Keywords**: Safety Management, Organizational Commitment, Risk Management, Project Performance, Project Complexity, China's Construction Industry

## Introduction

China's construction industry is undergoing a critical transition from rapid expansion to high-quality development, driven by increasingly stringent government regulation and the growing scale and technical sophistication of projects (Zou et al., 2007; Alaloul et al., 2020). In this

context, traditional schedule-and-cost-focused management has proven insufficient, prompting scholars to examine "soft" predictors such as safety management, organizational commitment, and risk management. Yet the relationships between these factors and project performance are far from straightforward. Robust safety management systems reduce incident rates (Alruqi & Hallowell, 2019; Demirkesen, 2020), but merely increasing formal rules may induce superficial compliance without substantively mitigating risk (Choudhry & Fang, 2008). Organizational commitment, particularly affective commitment, drives work engagement (Mathieu & Zajac, 1990; Almutairi, 2016), yet high labor turnover and work-family conflict frequently erode it in the construction industry (Cao et al., 2020). Systematic risk management reduces cost and schedule deviations (Akintoye & MacLeod, 1997; De Bakker et al., 2010), but excessive risk aversion can lead to rigidity under high uncertainty (Trinh & Feng, 2020). Thus, exploring the integrated effects of these three factors and the moderating role of project complexity is vital to promote the high-quality development of China's construction industry.

Critically, these predictors are moderated by project complexity. The TOE framework (Bosch-Rekveldt et al., 2011) provides a multidimensional lens: as complexity increases, safety management's direct effect diminishes unless buffered by a resilient safety culture (Trinh & Feng, 2020), while organizational commitment's role may be amplified because formal controls cannot cover all situations (Khalid, 2022; Bjorvatn & Wald, 2018). Risk management must shift from linear processes to dynamic adaptation (Crispim et al., 2019; Zhu et al., 2020). This review addresses two research questions: i.How do safety management, organizational commitment, and risk management jointly influence project performance in China's construction industry? ii. How does project complexity moderate these relationships?

## Methods

This systematic review searched Scopus, Web of Science, ScienceDirect, and CNKI between March and May 2024. English search terms combined construction safety, organizational commitment, risk management, project performance, and project complexity; Chinese databases used corresponding terms. Studies published after 2013 were prioritized. The initial search yielded 2,663 records, reduced to 1,871 after deduplication. Two-stage screening was applied: first by title and abstract, then by full text. Inclusion criteria required construction projects as the unit of analysis, coverage of at least two core constructs, and empirical methodology reporting variable relationships. Studies examining project complexity as a moderator received particular attention. The final sample comprised 102 studies.

Given heterogeneity in variable measurement and statistical methods, narrative synthesis and thematic analysis were adopted. Studies were initially grouped into four thematic domains, then cross-domain patterns were identified, incorporating both convergent and conflicting evidence. A sub-category for China-based studies enabled context-specific analysis.

## Results

*Compliance-Based and Commitment-Based Pathways*

The literature reveals two complementary pathways to performance. The compliance-based pathway operates through formal systems that constrain behavior. Alruqi and Hallowell (2019) identified management commitment and employee involvement as robust safety

leading indicators; Alkaissy et al. (2023) demonstrated machine learning's potential to enhance safety prevention; Li et al. (2017) confirmed that team-level safety norms predict safety behaviors in Chinese construction teams. However, rule-based constraints alone are insufficient-Choudhry and Fang (2008) identified deep-seated factors underlying unsafe behaviors, and Chan et al. (2021) found perceptual gaps between workers and managers that risk superficial compliance.

The commitment-based pathway complements these limitations. Meyer and Allen's (1991) affective commitment construct remains the strongest predictor of discretionary work effort. Mathieu and Zajac (1990) provided meta-analytic support for the commitment-performance link; Fu and Deshpande (2012) identified perceived organizational support as a critical antecedent in Chinese construction firms. Critically, Basahel (2021) demonstrated that safety leadership operates simultaneously on safety knowledge (compliance) and safety attitudes (commitment). Conversely, Cao et al. (2020) showed that work-family conflict erodes affective commitment, and Oyewobi et al. (2019) revealed how gendered role expectations constrain this pathway.

*From Predictive Control to Resilient Adaptation*

Systematic risk management positively impacts project performance, as evidenced by early frameworks (Akintoye & MacLeod, 1997), meta-analyses (De Bakker et al., 2010), and mediation studies (Kassem & Ali, 2022). In China, Zou et al. (2007) identified key risk categories, and Cheng et al. (2023) demonstrated the effectiveness of risk-sharing mechanisms. However, traditional risk management has boundary conditions: static risk registers fail to capture emergent risks in complex projects (Mehdizadeh et al., 2013), and organizational maturity moderates effectiveness (Crispim et al., 2019). These limitations have catalyzed a paradigm shift toward resilient adaptation. Zhu et al. (2020) developed a resilience-based safety management framework for Chinese projects; Pilanawithana et al. (2023) advanced resilience measurement. Trinh and Feng (2020) demonstrated that resilient safety culture buffers complexity's negative impact on safety performance.

*The Moderating Role of Project Complexity*

Project complexity moderates management mechanisms differentially across TOE dimensions. Technical complexity weakens standardized safety protocols (Parsamehr et al., 2023) while raising the value of resilience (Bakhshi et al., 2024). Organizational complexity amplifies the commitment pathway's coordinating function (Khalid, 2022; Bjorvatn & Wald, 2018) while weakening top-down directives (Chan et al., 2021). Environmental complexity simultaneously increases resilience demands and erodes commitment's psychological foundations (Cao et al., 2020; Oyewobi et al., 2019). Table 1 summarizes these effects.

Table 1
*Moderating Effects of TOE Complexity Dimensions*

| Complexity Dimension | Mechanism Moderated | Nature of Moderating Effect | Representative Studies |
|---|---|---|---|
| Technical | Compliance pathway (safety) | Weakening: protocols lose applicability | Parsamehr et al. (2023); Bakhshi et al. (2024) |
| Technical | Adaptation (risk management) | Strengthening demand for resilience | Zhu et al. (2020); Crispim et al. (2019) |
| Organizational | Commitment pathway | Strengthening: commitment as substitute coordinator | Khalid (2022); Bjorvatn & Wald (2018) |
| Organizational | Compliance pathway (safety) | Weakening: responsibility diffusion | Chan et al. (2021); Choudhry & Fang (2008) |
| Environmental | Adaptation (risk management) | Strengthening demand: resilience necessary | Trinh & Feng (2020); Pilanawithana et al. (2023) |
| Environmental | Commitment pathway | Weakening: uncertainty erodes commitment | Cao et al. (2020); Oyewobi et al. (2019) |

**Discussion**

This review makes three theoretical contributions. First, it challenges the siloed treatment of safety management, organizational commitment, and risk management by proposing a unified compliance-commitment dual-pathway model in which risk management serves as the calibrating mechanism (Roberts, 1990; Weick et al., 2004). Second, it documents risk management's paradigm shift from predictive control to resilient adaptation, identifying boundary conditions of traditional approaches and the emergence of resilience-based frameworks (Zhu et al., 2020; Trinh & Feng, 2020). Third, it extends the TOE framework toward a predictive contingency logic by revealing differentiated moderating effects across complexity dimensions-most notably, the tension where environmental complexity simultaneously raises resilience demands and undermines commitment formation.

The Chinese context reveals specific mechanisms. Risks identified by Zou et al. (2007) reflect China's structural market characteristics. Safety climate operates within a hierarchical culture where directives require genuine management commitment for internalization (Li et al., 2017; Choudhry & Fang, 2008). Work-family conflict's erosion of commitment is particularly

acute given the industry's mobility demands (Cao et al., 2020), while guanxi-based reciprocal obligation may amplify the commitment pathway (Fu & Deshpande, 2012; Cropanzano & Mitchell, 2005). Loosemore et al. (2020) remind us that national culture significantly shapes safety climate perceptions, cautioning against uncritical generalization.

Key methodological limitations include the absence of integrated empirical models testing all four constructs simultaneously, the predominance of cross-sectional designs precluding causal inference, and measurement heterogeneity that hinders meta-analytic synthesis. Future research should prioritize integrated structural models, longitudinal designs tracking projects across life cycles, and comparative cross-context research.

For practice, construction managers should adopt a diagnostic approach-assessing each project's TOE complexity profile and configuring the compliance-commitment mix accordingly. High technical complexity demands adaptive judgment alongside standardized protocols; high organizational complexity requires investment in affective commitment as an informal coordination mechanism; high environmental complexity necessitates embedding resilience while proactively protecting employee commitment.

**Conclusion**

This systematic review examined how safety management, organizational commitment, and risk management jointly influence project performance in China's construction industry, and how project complexity moderates these relationships. In response to the first research question, the evidence demonstrates that the three predictors operate interactively rather than independently: safety management and organizational commitment function as complementary compliance-based and commitment-based pathways, while risk management serves to calibrate the relative emphasis on each according to the project's risk profile. In response to the second question, project complexity was found to exert differentiated rather than uniform moderating effects-technical and organizational complexity weaken the compliance pathway while amplifying the need for the commitment pathway, whereas environmental complexity creates a unique tension by simultaneously increasing the demand for resilience and undermining the psychological foundations upon which commitment depends. A resilient safety culture emerges as the critical buffer against these adverse effects. The most pressing research priorities remain the development of an integrated empirical model, the adoption of longitudinal designs, and cross-context comparative studies. For practitioners, the central insight is that construction firms must move beyond one-size-fits-all management systems toward a complexity-aware approach that diagnoses each project's TOE profile and deliberately configures the balance between compliance, commitment, and resilience mechanisms accordingly.

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