Research on Contract Management in Construction Project Management

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Abstract: Construction engineering projects are characterized by large scale, long cycles, and numerous participants. Contracts serve not only as boundaries of rights and responsibilities but also as the core foundation for risk allocation and collaborative operation. In practice, weak contract awareness, imprecise clauses, insufficient informatization, and lack of professional support often lead to schedule delays, claim disputes, cost overruns, and compliance risks, hindering the improvement of quality and benefits. Improving contractual governance and strengthening whole-process contract management have become crucial for the high-quality development of the industry. Based on this, the article defines the essence and functions of contract management, analyzes prominent problems and their causes in construction projects, focuses on key control points such as clause standardization, process closed-loops, and data integration, and proposes systematic countermeasures. It aims to provide actionable contract management paths and tools for project owners, contractors, and supervisors.

1. Introduction

China's construction industry is undergoing simultaneous investment structure adjustment and technological transition. Project scales continue to expand, and organizational relationships become more complex, making contracts the core link connecting planning, design, procurement, construction, and operation. The clarity of contract terms, the controllability of the performance process, and the efficiency of dispute resolution directly impact the achievement of schedule, safety, cost, and quality objectives. Meanwhile, intensified competition in international engineering contracting and stricter compliance requirements render traditional experience-driven management methods inadequate for the multi-stakeholder collaborative, rapidly iterating project ecosystem. Against this background, systematically examining the positioning and boundaries of construction contract management and clarifying its interfaces with specialized management areas like schedule, cost, quality, and safety is of practical urgency and industry exemplary significance.

2. The Essence of Contract Management

The essence of contract management lies in using the contract as a vehicle to translate project objectives, responsibility boundaries, and risk allocation into executable rules and processes. These are maintained and adjusted throughout the entire performance process through evidence, data, and decision-making mechanisms[1]. Its core is not "signing a piece of paper" but rather the continuous governance revolving around "how to realize the contract's value." At the front end, clarity and measurability of scope, standards, price, and schedule are achieved through requirement identification and clause design. In the middle stage, chain control encompassing plan →procurement → construction → variation → settlement ensures information consistency, traceable responsibility, and controllable deviations. At the back end, acceptance, payment, claims, and dispute resolution facilitate the realization of rights and interests and risk closure. Contract management possesses both institutional and operational attributes: it carries legal effect and compliance requirements while also being embedded in organizational processes and resource allocation. It fosters stable expectations and calculable cooperation among parties under uncertainty, thereby achieving comprehensive optimization of quality, schedule, and cost with minimal transaction costs.

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3. The Functions of Contract Management

The functions of contract management are reflected in the three-dimensional synergy of integration, constraint, and enablement: In terms of integration, it connects key nodes from project initiation, bidding & procurement, design, construction to handover and operation, ensuring consistency in scope, standards, price, and deadlines, forming cross-departmental integrated command. Regarding constraint, it solidifies responsibility boundaries and performance obligations through clauses, processes, and evidence systems, curtailing moral hazard and arbitrary changes through approval, early warning, audit, and assessment mechanisms. Pertaining to enablement, relying on digital ledgers, template libraries, and knowledge bases, it enhances clause reuse and negotiation efficiency, supports risk assessment, scheme comparison, and claim strategies, and promotes optimal resource allocation[2]. Simultaneously, contract management undertakes compliance verification and dispute resolution functions: interfacing with laws, regulations, and industry standards, reviewing qualifications, insurance, payment, safety, and environmental requirements; during disputes, variations, and claims, organizing evidence solidification, statute of limitations management, and negotiation coordination, opting for mediation, arbitration, or litigation when necessary. Through the coordinated operation of these functions, it promotes goal alignment, process controllability, and value quantifiability in projects.

4. Main Problems of Contract Management in Construction Project Management

4.1 Weak Contract Management Awareness

In many projects, contract management is viewed as a clerical task that ends upon signing. Inadequate clarification of requirements before award leads to ambiguous scope definition, unclear interfaces, and inconsistent standards. Contract texts are often patched together from templates, lacking targeted review, with key clauses on price adjustment, schedule extension, and risk sharing being vague and general. During performance, emphasis is placed on progress over evidence; meeting minutes, correspondence, site records, and measurement data are incompletely archived, breaking the evidence chain. Variations and site instructions are habitually executed first and documented later, with inconsistent approval standards and unclear authorization boundaries, triggering subsequent settlement and claim entanglements. Insufficient attention to legal, insurance, tax, and compliance requirements creates gray areas in procurement, subcontracting, and labor management, inducing contingent risks and regulatory accountability[3].

4.2 Non-Standard and Imprecise Contract Clauses

Non-standard and imprecise clauses in many engineering contracts present systemic issues: Firstly, undefined terminology and missing definitions lead to inconsistent understanding of work scope, deliverables, quality standards, and inspection methods. Secondly, unclear price structure and adjustment mechanisms, ambiguous boundaries for provisional sums, provisional items, and dayworks, and lack of clear rules for triggering and calculating price indices, exchange rates, material price fluctuations, and quantity deviations. Thirdly, schedules only list milestones without clarifying logical relationships, parallel conditions, and critical paths; extension scenarios, application deadlines, and supporting evidence requirements are absent. In risk allocation, force majeure, policy changes, site obstructions, and external coordination are often lumped together vaguely, with responsibility and cost attribution unclear. Regarding variations, instructions, and site orders, triggering conditions, authorization levels, written form requirements, and time limits are incomplete, intertwining oral arrangements and retroactive signing. Expressions concerning intellectual property, confidentiality, and data ownership are vague; sample approval, trial operation, and performance assessment lack closed-loops. Finally, dispute resolution clauses are often blank, lacking specification for jurisdiction, dispute tiers, evidence rules, and applicable law.

4.3 Low Level of Informatization

Firstly, system silos are prominent. Contract, procurement, schedule, measurement, and

settlement platforms are independent, with inconsistent data fields, preventing data integration. Ledgers often rely on manual entry and import/export, with versions repeatedly overwritten and no clear audit trail. Permission granularity is coarse, making unauthorized actions and missed reviews hard to detect. Secondly, process and document management are weak. Variations, instructions, and site orders lack rule engines and automatic validation; approval paths change based on individuals. Documents are scattered across personal drives and chat tools, with arbitrary file names and missing metadata, leading to slow retrieval and incomplete evidence chains. Mobile data access is unstable, with insufficiently reliable timestamps and location data. Thirdly, data standards and analytical capabilities lag. Interfaces between cost, finance, and project management are not unified, leading to frequent duplicate data entry and reprocessing. Master data governance is absent; the same supplier or contract may have multiple names within systems, causing distortion. Reports are static, lacking drill-down analysis by contract section, subcontract, cost account, etc., and real-time early warnings. Audit logs are incomplete, making key operations difficult to trace.

4.4 Lack of Professional Contract Management Talent and Organizational Support

In many enterprises and project organizations, contract management is seen as an ancillary function rather than a core competency, leading to a series of personnel-role mismatches and systemic imbalances: Firstly, at the organizational level, dedicated contract management roles and job descriptions are missing. Responsibilities are split among legal, cost, procurement, and project departments, with blurred interfaces, unclear authorization levels, and reporting lines. This results in uncoordinated matters, fragmented decisions, and absence at key nodes. Secondly, the talent structure is imbalanced. Professionals with comprehensive capabilities in contract planning, negotiation, measurement, claims, and dispute resolution are scarce. Frequent job rotation prevents experience accumulation. Training focuses on document interpretation and clause explanation, lacking case-based and digital-intelligent scenarios, leading to unstable grasp of standards, evidence, and timelines at the frontline. Thirdly, supporting resources are insufficient. Institutional guidelines and tool systems are not integrated; templates, ledgers, lists, and voucher standards operate in silos. Staffing and performance evaluations are not linked to performance outcomes. Mechanisms for engaging external legal, cost, and insurance resources are absent. Cross-department collaboration mechanisms are nominal, and information flow between the site and headquarters is intermittent[4].

5. Countermeasures for Contract Management Issues in Construction Project Management

5.1 Establish and Improve the Legal, Regulatory, and Standard System for Construction Contracts

Establishing and improving the legal, regulatory, and standard system for construction contracts should focus on unified standards and layered adaptation: First, review and align existing superior laws, departmental regulations, and local rules, forming a searchable clause index and applicable boundaries to eliminate different interpretations of the same issue. Second, develop categorized model texts and supporting guidelines, setting essential clauses, optional clauses, and prohibited wording for types like EPC, specialized subcontracting, Design-Build, and Construction Management. Provide structured templates for clauses on price adjustment, schedule extension, risk sharing, intellectual property, data, and privacy. Third, establish standardized coding and master data rules, unifying quantities, bill items, cost accounts, and evidence elements, accompanied by specifications for electronic signatures, electronic evidence preservation, and timestamps. Fourth, set up continuous evaluation and version iteration mechanisms, regularly revising texts based on judicial rulings, arbitration awards, and regulatory notices. Fifth, build a cross-departmental release and interpretation mechanism, clarifying clause interpretations and application examples, ensuring all units operate by the same rules during procurement, performance, settlement, and dispute resolution.

5.2 Establish Contract Management Systems and Practices Aligned with International Standards

To truly align contract management with international rules, efforts must be synchronized in the institutional framework, performance processes, and personnel capabilities:

First, refer to common templates like FIDIC, NEC, etc., and integrate them with local regulations to restructure equivalent expressions for key clauses on risk sharing, measurement & payment, variations & claims, and dispute resolution. Develop bilingual (Chinese-English) templates and interpretation manuals to support cross-border project execution.

Second, build a closed-loop process covering tender → signing → performance → handover. Clarify the engineer's duties, instruction forms, and time limits, solidify evidence requirements and submission standards, and embed milestones, notices, and authorities into information systems for traceable nodes.

Third, conduct contract planning reviews at project initiation, establish risk matrices and contingency plans, and detail triggering and calculation rules for exchange rates, price indices, force majeure, and political risks.

Fourth, build composite teams and external think tanks, introducing professional expertise in international arbitration, insurance brokerage, taxation, and export credit insurance, improving authorization and communication interfaces.

Fifth, form case libraries and summaries of adjudication points through pilots and reviews, promoting continuous iteration[5].

5.3 Promote Informatization and Data Governance

First, define data standards and master data governance. Unify coding rules for contracts, bills of quantities, suppliers, cost accounts, etc. Establish field dictionaries and caliber descriptions, accompanied by specifications for electronic signatures, timestamps, and evidence preservation to ensure data comparability and traceability from procurement to settlement. Use process engines to solidify the triggering conditions, permission levels, and time limits for variations, instructions, measurement, and payment, automatically checking for consistency.

Second, build an integrated information platform and mobile applications. Integrate BIM, cost, schedule, finance, and document management systems to achieve online flow and tracing of documents, instructions, and measurements. Introduce contract ledgers, risk matrices, and warning dashboards, providing drill-down analysis by contract section, subcontract, and cost account, supporting anomaly alerts and node tracking.

Finally, establish a data operation mechanism and continuous improvement loop. Set up indicator systems and quality audits, conduct regular reconciliations, spot checks, and audit trails, and accumulate template libraries, terminology databases, and case libraries. Configure permission levels, audit logs, and encryption strategies to ensure data security and compliance, iterating and optimizing through pilot→evaluate→ rollout cycles.

5.4 Establish Contract Management Organization and Cultivate Professionals

Establishing contract management organizations and cultivating professionals requires simultaneous advancement in structure, capability, and incentives: Set up contract management organizations at both headquarters and project levels, clarifying division of responsibilities and authorization boundaries for planning, review, performance, claims, and dispute resolution, forming unified reporting and coordination channels. Improve the job position system, establishing roles like Contract Manager, Clause Planner, Measurement & Settlement Officer, Evidence Management Specialist, and Compliance Auditor, with corresponding qualification and competency levels. Construct a training path combining education and practical experience, based on case studies, simulated negotiations, evidence solidification drills, and system operation, strengthening interdisciplinary knowledge including cost, law, insurance, taxation, and international rules. Build an expert database and external cooperation network, introducing arbitrators, insurance brokers, and tax consultants by specialty for on-demand support. Optimize performance and incentives, incorporating performance quality, claim recovery, risk handling, and compliance into assessments, complemented by job rotation and mentorship programs to promote experience accumulation and team stability. Simultaneously, improve systems and tools, unify template and ledger standards, and

build knowledge bases and issue libraries to ensure reuse and knowledge transfer across different projects[6].

6. Conclusion

In summary, in construction engineering, a contract is not a static document but a governance tool running through initiation, procurement, performance, to handover. Its value lies in identifiable risks, traceable responsibilities, and quantifiable results. Whether through the detailed design of clauses, the integration of processes and data, or the synergistic efforts of talent and organization, the ultimate goal points to the comprehensive optimization of safety, quality, schedule, and cost. Facing a new round of construction and industrial upgrade, only by taking institutions as the guiding principle, digitalization as the foundation, and professionalism as the backbone, can we build replicable, sustainable, and iterable contract management capabilities, providing certain support for the long-term competitiveness of projects and enterprises.

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