Research on Contract Management in Construction Project Management

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Abstract: Construction engineering projects are massive, long-cycle and involve many participants. Contracts not only define the limits of rights and duties, but also form the basis for risk-sharing and joint operation. Practically, delayed schedule, failure claim, cost overruns and compliance risk are common based on weak contract awareness and clauses, poor informatization practices as well as inadequate professional supports which hinder promoting qualitative benefits. It has become more imperative for the high-quality development of the industry to improve contractual governance and realize whole-process contract management. According to this, the article introduces the essence and functions of contract management, summarizes several major problems and their causes in construction projects, dig it deeply into such key control points as standardization of clauses, closed-loops of processes and integration of data，and develops systematic countermeasures suggested. Its goal is to propose actionable paths for contract management and tools useful for project owners, contractors and supervisors.

1. Introduction

The construction industry in China is facing an simultaneous adjustment of investment structure and technological transition. Project scales are larger than ever, and the relationships between organizations become complex, contracts becomes a core connection of planning design procurement construction and operation. The definition and controllability of contract performance, and the efficiency of dispute resolution directly relate to the realization of schedule, safety, cost and quality objectives. At the same time, growing competition in international engineering contracting and tighter compliance objectives make traditional experience-based construction management methods a poor fit for the highly interactive, fast-growing project ecosystem. In this context, the systematic investigation of the positioning and boundaries of construction contract management, as well as a clear delineation to specialized interfaces with schedule, cost, quality and safety is practically relevant and exemplary for industries.

2. The Essence of Contract Management

Contract management is actually all about how the contract itself serves as a vehicle to convey project goals, delineation of responsibilities, risk allocation into rules and processes that can be executed. Evidence, data and decision-making mechanisms, these are being kept and tuned during the whole process of performance [1]. It is not a matter of "signing a piece of paper" —it is about the continuous governance and discourse around "how to fulfill the value of the contract." You will get clarity and measurability of scope, standards, mechanism of action, price and schedule by identifying requirements and designing clauses at the front end. The strategies in the intermediate stage include information consistency, responsibility tracing, and controllable deviation in chain control of plan → procurement → construction → variation → settlement. Acceptance, payment, claims and dispute resolution help close out rights and interests and risk closure in the back end. Contract management has both an institutional and operational nature: it has legal effect and obligations but also plays an important role within organizational processes and resource allocation. It promotes stable expectations and calculable cooperation of parties in uncertainty, thus achieving full optimization of quality, schedule and cost with minimal transaction cost.

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3. The Functions of Contract Management

Contract management functions: The three-dimensional synergy of integration, constraint and enablement reflects the main functions of contract management. On Constraint, it establishes boundary of responsibility and performance accountable through clauses, processes and systems that evidence it, limiting moral hazard and arbitrary changes with an approval mechanism or early warning system which can be reinforced with a persistent audit and assessment. With respect to enablement, the reliance on digital ledgers; template libraries and knowledge bases enhance clause reuse/negotiation throughput, facilitates risk assessment, scheme comparison and claim strategies promote optimal resource allocation [2]. At the same time, contract management performs compliance checks and dispute resolution tasks: interfacing with laws, regulations and standards in the relevant domain, reviewing qualifications for insurance payments or safety environmental requirements; In disputes negotiation over claims and variations it organises evidence verification, manages statute of limitation periods between contract milestones, assists negotiation (between party representatives) when necessary opts for mediation arbitration or litigation. It enables goal alignment, process controllability, and value quantifiability of projects by operating these functions in coordination.

4. Main Problems of Contract Management in Construction Project Management

4.1 Weak Contract Management Awareness

In a lot of projects, contract management is seen as a paperwork exercise; done and dusted the moment you have signed on the dotted line. Ambiguous scope definition, unclear interfaces and inconsistent standards are all consequences of insufficient requirements clarification before award. Contract texts are stitched together from templates based on limited tailored review with specific clauses on the price adjustment, schedule extension and risk sharing being somewhat ambiguous or imprecise. In performance, whether through minutes of meetings, correspondence, site records or measurement data these are only partly archived so that the chain of evidence would be broken. It involves that changes and site instructions are routine executed first then recorded with inadequate approval thresholds and absence of indicative boundaries, giving rise to later disputes and claims managements. Lack of focus on the legal, insurance, taxation and compliance requirements results in gray areas emerging in procurement practices, subcontracting of work and labour management, inducing contingent risks and policy 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. Integration between the cost, finance and project management systems is not standardized, creating gaps that routinely require duplicate data elements to be input manually and/or reprocessed. There is no master data governance: The same supplier or contract can have many names in different systems and become distorted. Static reports, cannot drill down on contract section / subcontract / cost account etc, real time early warnings Key operations are difficult to trace due to incomplete audit logs.

4.4 Lack of Professional Contract Management Talent and Organizational Support

In a lot of enterprises and project organisations, contract management is treated as a secondary function rather than as a real competence: This leads to all sorts of personnel-role mismatches and systemic imbalances: Firstly, at the organizational level, dedicated contract management roles and job descriptions. Roles are divided up between legal, cost, procurement and project departments with fuzzy interfaces, ambiguous delegation of clearance levels and unclear reporting lines. This leads to disjointed initiatives, siloed decision making and missing at critical intersections. Second, there is an imbalanced talent structure. There is a shortage of professionals in this area who are fully competent across the broad range of potential activity, including contract planning, negotiation, measurement, claims and dispute resolution. Limited to Frequent job rotation limits the accumulation of experience Training on document interpretation and explanation of clauses, for example, lacks scenarios driven by cases or digital-intelligent scale of processing. As a result frontline understanding has unstable footing on the standards, evidence points and timelines. Thirdly, supporting resources are insufficient. Institutional guidelines and tool systems are not integrated; templates, ledgers, lists and voucher standards are within their own silos. Performance outcomes are loosely tied to staff and performance evaluations. There are no mechanisms for the use of outside legal, cost and insurance resources. The mechanisms for cross-department collaboration are nominal, and the information flow from site to 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

Unified standards with layered adaptability should be adopted to establish and improve the legal, regulatory and standard system of construction contracts. First, superior laws, departmental regulations and local rules can be assembled for review and strict comparison so that operations could form a searchable index on agreements as well as boundaries of application to prevent differences in the same matter being interpreted differently. Second, build model texts in these categories and guidance for what the interaction of essential clauses, optional clauses, and forbidden wording appears to be for forms like EPC, specialized subcontracting, Design-Build and Construction Management-style contracts. Arrange and Insert into ready Risk clauses for Assertions in relation to Price Adjustments, Schedule Extension, Risk Share, IPs and data and non-Disclosure Non-Devise. Standardisation of Coding and Master Data Rules Three standardise purchases — quantities, bill items, cost accounts and elements of evidence with the specification for electronic signature, electronic preservation of evidence and timestamping Fourth, establish mechanisms for continuous evaluation and iteration of versions, and regularly revise the texts based on judicial decisions, arbitration awards, and regulatory notices. Fifth, strengthen the construction of a

cross-departmental release and interpretation mechanism to clarify specific interpretations and application examples of clauses in various documents so that all units can follow the same rules when purchasing, performing contracts, settling accounts, and resolving disputes.

5.2 Establish Contract Management Systems and Practices Aligned with International Standards

For contract management to more fully reflect global standards, efforts must be aligned in institutional framework, performance processes and staff competencies:

First, basically apply common templates such as FIDIC, NEC etc and map them against local governed laws for the standardization of equivalent phrases regarding major clauses relating to risk sharing, measurement & payment, variations & claims and dispute resolution. Bilingual (Chinese-English) templates and interpretation manuals for use on cross-border projects.

Secondly, the whole process from tender → signing → performance → handover is closed-looped. Make the engineer's duties clear, specify forms of instruction and deadlines to follow, firm up evidence requirements and submission standards, and configure information systems off milestones, notices and authorities — turning them into traceable nodes.

Stage three — implement contract planning reviews at project inception; develop responders, a risk matrix and contingency plans; provide rules governing when exchange rates, price indices, force majeure and political risks are triggered and the methods used to calculate these variables.

Fourth, create composite teams and externally-based think tanks—bringing in professional capabilities such as international arbitration; insurance brokerage; taxation; and export credit insurance; enhancing authorization and communications interfaces.

Fifth, build case libraries and decision point summaries through pilots and reviews, always iterating [5].

5.3 Promote Informatization and Data Governance

The first thing is to establish data standards and master data governance. Unified coding rules for contracts or any related entities such as bills of quantities, suppliers - Code and caliber specifications configured according to field dictionary How all signatures (digital & wet) are recorded timestamps types of data preservation methods Specification of data preservation metadata - All to make data comparable and traceable from procurement until settlement Utilize process engines to specify the triggering conditions, permission levels and time limits for any variations, instructions, measurement and payment automatically enforcing consistency.

Second, create an integrated information platform and mobile apps. Connect BIM with cost, schedule, finance and document management systems to enable online flow such as documents, instructions and measurements tracking. Contract ledgers, risk matrices and alert dashboards introduced for drill-downs by contract section, subcontract and cost account with anomaly alerts and node tracking.

Last, work on a data operation mechanism and continuously improve. Implement indicators systems and quality audits, execute regular reconciliation, spot checks and audit trails as well as gather libraries of templates, branches of terminology databases and libraries of cases. Define a structure of permission levels, audit logs and encryption strategies that will be used for data security and compliance and repeat this loop in pilot→evaluate→rollout cycles.

5.4 Establish Contract Management Organization and Cultivate Professionals

Setting up contract management organizations and developing professionals need to progress through structure, capability, and incentives: create contract management organization at both HQ and project level with clear delineation of roles and delegation for planning, review, performance monitoring, claims resolution mechanism and ability to enforce penalty or mitigate disputes along unified reporting lines. Revise the job position mechanism, defining core roles under a hierarchical structure such as Contract Manager, Clause Planner, Measurement & Settlement Officer, Evidence Management Specialist and Compliance Auditor with relevant qualification and competency levels.

Based on case studies, simulated negotiations, evidence solidification drills and system operation construct the educational-practical training pathway which would further strengthen interdisciplinary knowledge including cost, law, insurance taxation and international rules. Establish an expert database and external cooperation network which introduces arbitrators, insurance brokers and tax consultants by specialty to contact as needed. Improve performance and incentives by using performance quality, claim recovery, risk handling, and compliance as inputs to assessments, with job rotation and mentorship programs to motivate experience accumulation and team stability. At the same time, enhance systems and tools standardize on template and ledger standards, build knowledge bases and issue libraries so that they can be reused across projects [6].

6. Conclusion

To summarize, in construction engineering a contract is not just a document but rather a governance enabler running from initiation through procurement, performance, all the way to handover. Its benefits are a risk that can be identified, responsibility traceable, and results quantifiable. Be it through clause design, process and data integration, or aligned talent and organization, everything heads toward the holistic optimization of health/safety/quality/schedule/cost. In the context of a new round of construction and upgrading industries, only by taking institutions as the advancement guide, taking digitalization as the basis and professionalism as the backbone can we build contract management capabilities more replicable, sustainable and repeatable to support projects and long-term competitiveness of enterprises.

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