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SCHOOL OF BUILT ENVIRONMENT · MSC CONSTRUCTION PROJECT MANAGEMENT

Risk Management in Construction Projects

An Empirical Investigation of Risk Identification, Assessment and Response Practices and Their Effect on Cost and Schedule Performance in UK Construction

A Research Proposal submitted in partial fulfilment of the requirements for the degree of Master of Science

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1 Introduction and Background

Construction is among the most risk-exposed of all project environments. Projects are long-duration, capital-intensive, and executed through fragmented supply chains under conditions — weather, ground, regulation, and price — that shift throughout delivery. The consequence is chronic cost and schedule overrun: large construction projects routinely exceed budget and programme, and the sector's productivity has stagnated for decades relative to manufacturing. Arcadis (2023) documents sustained construction cost inflation and material-price volatility across international markets, while Turner and Townsend (2023) records persistent labour and supply-chain pressure driving tender-price uncertainty — both direct, quantifiable sources of project risk that risk management practice must absorb. In the UK specifically, the Office for National Statistics (2023) reports construction output volatility against a backdrop of margin compression, and the Health and Safety Executive (2023) continues to record construction as one of the highest-risk sectors for workforce safety, underlining that risk in construction is simultaneously financial, temporal, and physical.

Formal risk management exists precisely to manage this exposure. The discipline is well codified: ISO 31000:2018 specifies a generic risk process — establish context, identify, analyse, evaluate, treat, monitor — and the PMI (2021) PMBOK Guide and PRINCE2 provide project-specific machinery including the risk register, the probability-impact matrix, and quantitative techniques such as Monte Carlo schedule analysis. The Project Management Institute (2023) reports that organisations with mature risk practices meaningfully outperform those without on delivery outcomes, positioning risk management capability as a determinant of project success rather than a compliance overhead.

The problem this study addresses is the gap between codified practice and realised outcomes. Despite mature, widely available frameworks, construction projects continue to overrun — which implies that the frameworks are either inconsistently applied, applied too late in the project lifecycle, or applied without the organisational conditions that make them effective. What is under-evidenced, particularly for UK construction, is *which specific risk management practices, applied at which project stages, most strongly reduce cost and schedule overrun*. This study investigates that question empirically, moving beyond the well-documented existence of risk frameworks to measure their differential effectiveness in practice.

2 Research Aim, Questions and Objectives

The aim of this research is to investigate how risk management is practised on UK construction projects — how risks are identified, assessed, and responded to — and to determine which practices most strongly reduce cost and schedule overrun, in order to produce evidence-based guidance for improving construction risk management maturity.

> *Which risk management practices most effectively reduce cost and schedule overrun on UK construction projects, and why are effective practices inconsistently applied?*

1. How are risks currently identified, assessed, and responded to across UK construction projects, and at what project stages?
2. Which risk management practices are most strongly associated with reduced cost and schedule overrun?
3. How does risk management maturity differ between large contractors and SME contractors, and with what effect on outcomes?
4. What organisational and behavioural barriers explain the gap between available risk frameworks and their inconsistent application in practice?

REF	OBJECTIVE	WINDOW
O1	Critically review construction risk literature and the ISO 31000 / PMBOK / PRINCE2 frameworks to establish a risk-practice taxonomy and maturity model.	Months 1–2
O2	Survey UK construction professionals to measure current risk practices, maturity, and their association with self-reported cost/schedule performance.	Months 3–5
O3	Rank risk practices by association with reduced overrun and compare maturity between large and SME contractors.	Months 5–6
O4	Explain barriers to effective application through semi-structured interviews with risk and project managers.	Months 6–7
O5	Synthesise an evidence-based construction risk management maturity guide and recommendations.	Months 8–9

Table 1. SMART objectives across a nine-month schedule.

3 Literature Review

3.1 The risk management process in construction

The dominant frameworks converge on a sequential process. ISO 31000:2018 structures risk management as context-setting, identification, analysis, evaluation, treatment, and monitoring; the PMI (2021) PMBOK Guide operationalises this for projects through the risk register and probability-impact assessment; and PRINCE2 embeds the same logic in a management-by-exception governance structure. Construction risk taxonomies typically classify risks by source — financial (price, funding), technical (design, ground conditions), environmental (weather, planning), contractual (allocation, disputes), and health-and-safety — a categorisation this study adopts. The frameworks are prescriptively mature; the empirical literature, however, shows their application in construction is frequently reactive and concentrated at tender stage rather than sustained across delivery, which is where much residual risk actually crystallises.

3.2 Risk practice and project performance

The Project Management Institute (2023) links risk management maturity to superior delivery performance, and construction-specific evidence associates structured risk processes with reduced overrun. Yet the sector's overrun problem persists (Arcadis, 2023; Turner and Townsend, 2023), suggesting the relationship between having a risk process and achieving good outcomes is mediated by *how* the process is applied — timing, ownership, quantitative rigour, and whether risk response is actively managed or merely documented. This mediation is the analytical focus of RQ2: not whether risk management is present, but which of its practices actually move outcomes.

3.3 The maturity gap and its causes

A consistent finding is a maturity gap between large contractors — which typically operate formal enterprise risk functions — and SME contractors, which often manage risk informally under resource and expertise constraints. Given that SMEs constitute the large majority of the UK construction supply chain, this gap has sector-wide consequences for aggregate delivery performance. The literature attributes inconsistent application to organisational and behavioural barriers: risk-management effort perceived as non-productive overhead, optimism bias in estimating, weak risk ownership, and cultural resistance to surfacing bad news early. Characterising these barriers empirically (RQ4) is essential, because a maturity guide that ignores why good practice is not adopted will not be adopted either.

4 Conceptual Framework and Risk Register

The framework models risk management maturity as the independent variable and project performance (cost variance, schedule variance, safety outcomes) as the dependent variable, with contractor size (large vs SME) as a moderator and project type and value as controls. Maturity is decomposed into the practice dimensions the survey measures — identification breadth, assessment rigour, response management, monitoring continuity, and risk ownership — allowing RQ2 to test which dimensions carry the strongest association with reduced overrun.

Central to both the framework and construction practice is the **probability-impact matrix**, which converts qualitative risk judgements into a prioritised ranking. Figure 1 shows the assessment matrix this study will use to classify risks in the instrument, and Table 2 presents an illustrative construction risk register of the form participants will be asked to reflect on.

PROBABILITY ↓ / IMPACT →	IMPACT SEVERITY				
	NEGLIGIBLE	MINOR	MODERATE	MAJOR	SEVERE
Almost certain	M	H	H	E	E
Likely	L	M	H	H	E
Possible	L	M	M	H	H
Unlikely	L	L	M	M	H
Rare	L	L	L	M	M

Figure 1. Probability-impact assessment matrix (L = low, M = medium, H = high, E = extreme), consistent with PMI (2021) and PRINCE2 risk-rating conventions.

ID	CATEGORY	RISK EVENT	PROB.	IMPACT	RATING	RESPONSE STRATEGY
R1	Financial	Material price inflation exceeds tender allowance	Likely	Major	H	Mitigate — index-linked contract, early procurement
R2	Technical	Unforeseen ground conditions on excavation	Possible	Major	H	Transfer — ground investigation, contractual allocation
R3	Environmental	Adverse weather delays critical-path works	Likely	Moderate	H	Mitigate — programme float, seasonal sequencing
R4	Contractual	Subcontractor insolvency mid-delivery	Possible	Major	H	Mitigate — supply-chain vetting, retention, bonds
R5	Health & safety	Working-at-height incident	Unlikely	Severe	H	Mitigate — controls, training, method statements
R6	Financial	Client-driven scope change without variation	Possible	Moderate	M	Accept/manage — change control, early warning notices

Table 2. Illustrative construction risk register aligned to ISO 31000 treatment options (mitigate, transfer, accept, avoid). Presented to participants as a reflective anchor in Phase 2.

5 Research Methodology

The study adopts a **pragmatist** philosophy and an **abductive** approach, suited to measuring practice-outcome associations quantitatively while explaining behavioural barriers qualitatively (Saunders, Lewis

and Thornhill, 2023). It employs a **sequential explanatory mixed-methods** strategy with a **cross-sectional** design. Table 3 specifies the design.

ELEMENT	PHASE 1 — QUANTITATIVE	PHASE 2 — QUALITATIVE
Method	Structured online survey	Semi-structured interviews (online / on-site)
Instrument	Risk-practice and maturity batteries across five dimensions; cost/schedule performance measures; probability-impact classification task (5-point Likert)	10 open questions on barriers to application, risk ownership, and the maturity gap
Sample	≥120 UK construction professionals — project managers, risk managers, quantity surveyors, site managers, across large and SME contractors	12–15 purposively selected, stratified by contractor size (large vs SME)
Analysis	Descriptive stats; reliability (Cronbach's α >0.70); multiple regression (maturity → performance); moderation by contractor size; comparison of means	Reflexive thematic analysis (Braun and Clarke) in NVivo 14; deductive barrier coding plus inductive themes
Tool	IBM SPSS Statistics 29	NVivo 14

Table 3. Mixed-methods design. Recruitment via CIOB, RICS and APM (2023) professional networks and construction-sector LinkedIn communities; screening confirms active UK construction project involvement.

Reliability and validity: multi-item maturity scales are piloted and tested with Cronbach's alpha; construct validity is supported by grounding items in ISO 31000 and PMBOK practice dimensions; qualitative credibility is reinforced through member checking. **Ethics:** University Research Ethics Committee approval; voluntary, anonymised, UK GDPR-compliant participation; no commercially confidential project data collected; safety-incident discussion handled sensitively without identifying individuals. **Limitations:** self-reported performance is a perceptual proxy for audited project data; cross-sectional design cannot observe risk evolution across a project lifecycle; and practitioner samples may over-represent larger, more mature organisations, a bias the SME-stratified sampling explicitly counters.

6 Timeline, Ethics and Expected Contribution

Schedule (9 months): literature and taxonomy (M1–2); ethics approval and survey design (M2–3); survey deployment (M3–5); quantitative analysis and practice ranking (M5–6); interviews (M6–7); thematic analysis (M7); synthesis and maturity guide (M8); write-up and submission (M8–9).

Expected contribution. Empirically, the study will produce a ranked account of which risk management practices most reduce cost and schedule overrun on UK construction projects — evidence that moves beyond the well-established existence of risk frameworks to their differential effectiveness (RQ2). Analytically, it will quantify the maturity gap between large and SME contractors (RQ3) and characterise the behavioural barriers that keep good practice unadopted (RQ4), addressing why frameworks fail in application rather than merely restating that they exist. Practically, the output is an evidence-based

construction risk management maturity guide targeted at the SME segment that dominates the UK supply chain — where, given the sustained cost pressure documented by Arcadis (2023) and Turner and Townsend (2023) and the safety exposure recorded by the HSE (2023), improved risk practice yields the greatest sector-level return.

Source verification note. Five references are confirmed 2023 publications verifiable at their organisational URLs (PMI, HSE, Turner & Townsend, Arcadis, ONS — the ONS bulletin period to be confirmed). Three require confirmation of exact 2023 titles before submission and are marked **[verify]**: RICS, KPMG Global Construction Survey, and the Association for Project Management; the Saunders et al. (2023) 9th edition should be confirmed via the Pearson catalogue. Risk standards (ISO 31000:2018, PMI PMBOK 7th edn 2021, PRINCE2, APM Body of Knowledge) are cited as standing standards, not dated literature. Seminal risk concepts are cited via the 2023 PMI source. Supplementary peer-reviewed sources should be drawn from the *International Journal of Project Management* and the *Journal of Construction Engineering and Management*, each verified individually.

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