

Advanced contracting and delivery to address employer's priorities, risk management and insurance needs through the use of the Progressive Partnership Framework

J. Reilly

John Reilly International, East Greenwich, RI, USA

P. Sander, B. Stangl, R.G. Lösch and C.P. Friedinger

University of the Bundeswehr Munich, Germany

M. Spiegl

RiskConsult, Innsbruck, Austria

ABSTRACT: Conflicts in complex underground projects arise from inequitable contractual provisions, risk allocation and frameworks. Contracts should balance owner and contractor needs and requirements and use advanced risk management and risk sharing. Bonding and insurance availability may limit contractors who will bid. Fixed-price contracts may not adequately address the uncertainty of underground works, which may lead to changes, claims, disputes and litigation. To avoid this, the project delivery model should be designed first and used as the foundation for contract drafting. This paper introduces the Progressive Partnership Framework (PPF), a structured method for developing a project-specific delivery model. The PPF provides a structure tailored to the specific conditions of a project and presents successful results, as applied to major projects in Europe.

1 INTRODUCTION

Complex underground projects face persistent challenges related to poor or inappropriate contractual structures, risk allocation and cost uncertainty. Conventional fixed-price models are often unsuited to high levels of geotechnical and organizational risk, resulting in claims, disputes and litigation (Sander et al. 2021, Reilly et al. 2018). Alternative collaborative approaches such as Early Contractor Involvement, Progressive Design-Build and Alliancing have improved cooperation (Friedinger et al. 2024), but they frequently lack sufficient structure in risk quantification, transparent cost development and contractual clarity (Moergeli et al. 2015; Sander et al. 2009). The purpose of this paper is to present the Progressive Partnership Framework (PPF), a structured, modular and risk-based contracting methodology developed and applied in major European projects. The PPF provides a systematic pathway from project definition to contract formulation, integrating probabilistic risk modeling, transparent cost structures and tailored compensation mechanisms. The paper is organized as follows: Section 1 outlines the characteristics of complex megaprojects, the need for advanced contracting approaches and introduces the PPF. Section 2 describes the methodology of the PPF, including its four stages and nine principles. Section 3 illustrates the technical implementation of PPF. Section 4 presents case applications, including the Progressive Partnering Contract Civil Engineering by Amprion GmbH and the Bavarian

IPA Compact. Section 5 discusses the findings, draws conclusions and outlines future research needs.

1.1 *Characteristics of Complex Megaprojects, Advanced Management Requirements*

Complex Megaprojects are characterized by their large size, cost of multiple billions, a high level of public involvement and scrutiny, multiple stakeholders and interest groups and significant Governmental involvement and requirements. They have extended schedules, frequently stretching over multiple political cycles. They are complex and often unusual in many respects. They have multiple contractors, sub-contractors and suppliers and complex risk structures with interdependent and inter-related risk conditions (Reilly, 2024).

To successfully deliver such projects on budget and schedule, we need to increase our management capability and use advanced delivery processes, scaled to the needs of these projects, which processes consider and address the many complex interfaces and interrelationships of the participants and stakeholders. We need more advanced management, risk and contracting procedures than might be acceptable for smaller, more routine projects. A very experienced colleague (Prieto, 2015) has noted: “Project management theory as it currently exists and is applied to large complex projects falls short, significantly short, of what these projects require.”

1.2 *Need for more advanced contracting methodologies*

The contracting method is a critical determinant of success. It is necessary to match the contracting process to the project and its environment, considering necessary practices, regulations, the owner’s experience and capability plus, increasingly, the needs of owners, contractors, suppliers and designers, the public and key stakeholders. We need to develop more structured methods to accomplish this, one such method is the subject of this paper. Of interest are delivery processes developed over the past 30 years which, in general, have moved from fixed-price hard money contracting to more inclusive, flexible and collaborative methods - with the potential to better control cost exposure for owners and increase profits for contractors.

1.3 *Background, contracting and delivery methods, issues of concern*

Traditional (earlier) contracting procedures have often focused on price as a determinant for contractor selection. This was especially the case in the US up until some 10 years ago. International practices generally do not have such a high focus only on cost and, in many cases, use advanced procedures which have included FIDIC (Emerald Book), Alliance Contracting (NEC4), and Project 13 (UK). In particular, the use of Alliancing has grown significantly over the last 25 years (e.g. UK Channel Tunnel Rail Link, Sydney Northside Tunnel, Auckland NZ Waterview Tunnel).

In North America, Design-Bid-Build (DBB) and Design-Build (DB) methods, often with a prime focus on low cost, have led to considerations of other more advanced, collaborative methods, including Construction Manager/General Contractor (CMGC) and Construction Manager at Risk (CMAR), Progressive Design-Build and, in a few cases, Alliancing/Relationship Contracting.

1.4 *Fundamentals - comments on “Low-Bid”*

“Low-bid” does not always result in the lowest cost for the public at the end of the day – or the best value. The low-bid environment is characterized by the ability of each party to treat the other party as an adversary – for their gain at the potential expense of the other (Quick 2002). Each party enters a contract at their own risk. This frequently sets up an adversarial environment which may lead to disputes, claims and litigation.

To be the “low bidder”, the contractor must do at least two things: 1) determine the lowest cost to deliver the work at minimum acceptable quality and 2) determine a strategy to bid that cost – or lower – in order to secure the work, with the expectation that deficiencies in price can be made up by claims and changes. This is one reason that more integrated and

cooperative working relationships have been developed, with a goal of improving project delivery and adding value for both owners and contractors.

As a result, alternative contracting models such as Early Contractor Involvement, Progressive Design-Build, and Alliancing have evolved to address these issues by fostering early collaboration with joint risk identification and management. While these models have improved alignment between owners and contractors, they frequently lack sufficient structure in risk identification and response, transparent cost development and contractual clarity. Nor do they always sufficiently consider the owner's and contractor's key goals and objectives - a better process would be welcome. One such process is described following.

2 PROGRESSIVE PARTNERSHIP FRAMEWORK

To further advance improved contracting, the PPF process has been developed and applied on major infrastructure projects in Germany.

The PPF is a structured methodology for the development and implementation of project delivery models. It enables project participants to design approaches that are tailored to the specific requirements and conditions of each project.

Project Delivery Model is defined as a specific combination of project organisational form, award type and contract type for the execution. Bucker (2005).

The framework was developed in cooperation of the IPD Innovation Hub established from the Institute of Construction Management at the University of the Bundeswehr Munich, Germany and the RiskConsult GmbH in Innsbruck, Austria. It is based on experience from a variety of projects, including more than 20 national and international partnership-based projects. The PPF is especially suitable for complex mega-projects in infrastructure such as tunneling projects (Friedinger & Zimmermann et al. 2025).

The PPF offers a structured, modular, and transparent process that integrates technical, financial, and risk considerations into a project-specific delivery model. The delivery model is tailored to the unique characteristics of the project considering complexity, level of maturity, risk profile and the owner's key objectives.

This project-specific delivery method is the basis of the contractual structure, whereby contractual terms are directly aligned with jointly developed cost models, risk assessments, and delivery mechanisms - reducing ambiguities and potential for disputes. These terms also consider the owner's key goals and risk tolerance (Sander et al. 2019).

Central elements of the PPF include joint risk identification through probabilistic risk modeling, transparent open-book cost development based on standardized cost structures, and fully integrated cost-schedule-risk models (Digital Risk Twin, Sander et al. 2022). Projects can be divided into distinct sections, each with customized pricing and incentive structures, reflecting the segment's individual risks and uncertainties.

By clarifying risks, costs, and delivery mechanisms prior to contract award, the PPF creates stable and verifiable target costs, balanced risk allocation, and equitable incentive structures that align contractor profitability with project success. This approach increases bidder confidence, improves insurability and bankability, and ultimately delivers greater cost and schedule certainty for underground works. Following are specifics of the PPF methodology and examples of its application to recent underground projects in Europe, in terms of structures and outcomes.

Applications include Amprion GmbH's Progressive Partnering Contract Civil Engineering for large-scale infrastructure projects such as the Rhine-Main Link and Corridor B, the compact IPD pilot project of the Bavarian State Ministry of Housing, Construction and Transport, and the ongoing integration of PPF elements into Deutsche Bahn's rail project management. (Koch et al. 2024).

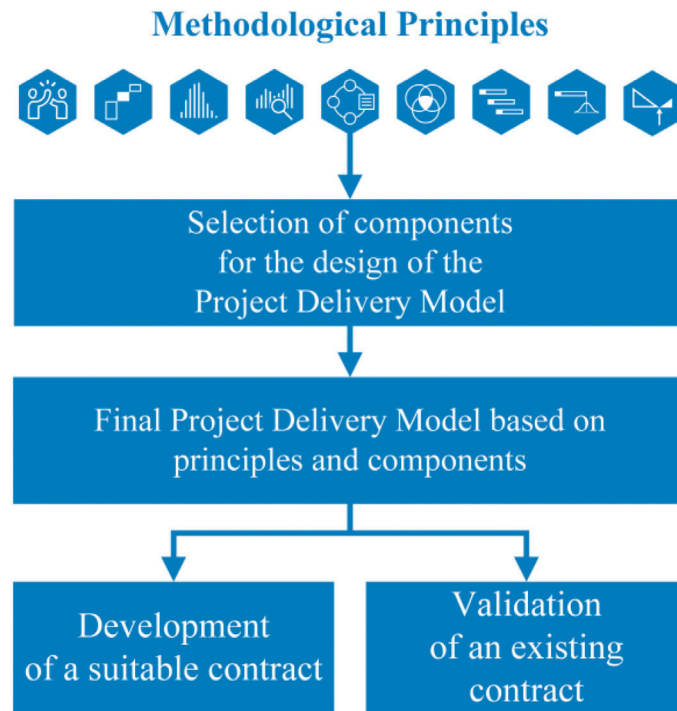


Figure 1. PPF approach.

3 METHODOLOGY OF THE PROGRESSIVE PARTNERSHIP FRAMEWORK

Before discussing practical implementation, it should be noted that not all stages of the PPF can be presented in full detail within this paper, as their full description exceeds the scope of this contribution. For illustration, the description of implementation focuses on Stage I (Principles) and Stage II (Selection of Modules), as these stages represent the methodological foundation and demonstrate the structured process of tailoring project delivery models to tunneling projects (Sander et al. 2025).

The PPF is structured as a sequence of four defined stages, see Figure 1. Each stage builds on the previous one, with the goal of systematically deriving a project delivery model that can be translated into a contract. This avoids the weaknesses of conventional contract-first approaches, where legal agreements are developed without sufficient technical or risk-based grounding.

The four stages are:

1. **Stage I – Methodological foundation:** Nine principles form the technical and procedural foundation of the PPF.
2. **Stage II – Selection of project-specific components:** With a structured process, components are selected from a pool of available options.
3. **Stage III – Creation of the project delivery model:** Based on the principles and the selected modules, a project-specific delivery model is developed, documented in a Project Delivery Report.
4. **Stage IV – Contract development or validation:** The project delivery model then serves as the basis for creating a suitable contract or validating an existing contract.

This sequence ensures that the contract reflects project-specific risks, objectives and delivery conditions, rather than generic formulations.

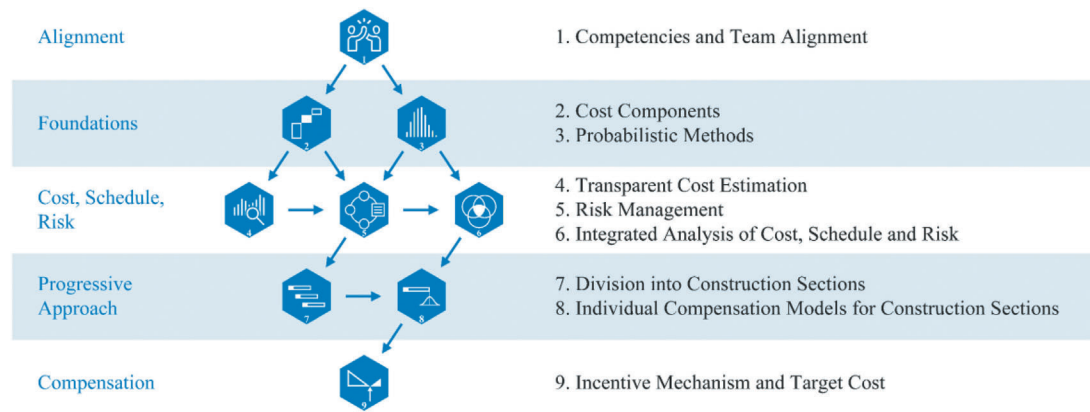


Figure 2. The nine core principles of the Progressive Partnership Framework.

3.1 Stage I – Methodological foundation

The methodological foundation of the PPF is defined by nine principles, see Fig. 2. They are sequential and interrelated, addressing both technical and organizational requirements:

1. **Competencies and Team Alignment** – ensuring the right skills and collaborative culture.
2. **Cost Components** – structuring costs into Base, Risk, Escalation, Overhead and Profit.
3. **Probabilistic Methods** – applying Monte Carlo simulations to quantify uncertainty.
4. **Transparent Cost Estimation** – using open-book methods for verifiable calculations.
5. **Risk Management** – systematic identification, assessment and monitoring of risks.
6. **Integrated Analysis of Cost, Schedule and Risk** – ensuring that the interdependencies between cost development, schedule performance and risk exposure are explicitly modeled.
7. **Division into Construction Sections** – segmenting projects by technical and risk profile.
8. **Individual Compensation Models for Sections** – applying different compensation schemes as appropriate.
9. **Incentive Mechanism and Target Cost** – aligning contractor profitability with project success.

Together, these principles create a framework that is transparent, technically rigorous and adaptable to complex underground conditions.

3.2 Stage II – selection of project-specific components

A project delivery model is composed of a variety of components. A central step is their structured selection of project-specific needs.

Figure 3 presents a systematic five-step process for deriving a suitable project delivery model. The project is first divided into meaningful sections, followed by the collection of objectives and boundary conditions, and an integrated analysis of cost, schedule, and risk. Based on these insights, appropriate and suitable model components - covering contractual, procedural, and organizational aspects - are selected, resulting in a tailored, risk-oriented project delivery framework.

The design of the compensation model is of utmost importance as it sets the stage for either a partnership based relationship or a more claim driven relationship (Friedinger, Stangl & Sander. 2025).

This process is carried out in moderated and interactive workshops that include the owner, contractors, designers and other stakeholders. The workshops use various methods such as posters or software support to visualize interdependencies between possible components, such as procurement procedure, compensation model and incentive mechanisms. This enables consistent choices and ensures that the chosen model components reflect the actual risks and priorities of the tunnel project.

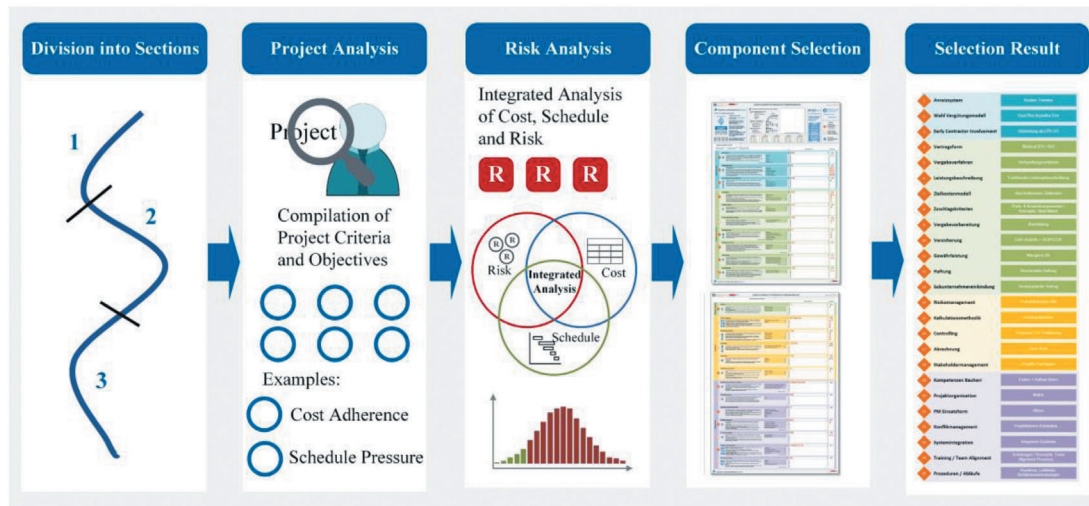


Figure 3. Selection of project delivery components through a structured and moderated process, tailored to project-specific needs.

3.3 Stage III – creation of the project delivery model

Based on the model components selected in *Stage II*, a consistent, project-specific project delivery model is developed by specifying contents and workflows. The selected options are sequenced along the project timeline and assigned to clearly defined tasks, responsibilities and processes. The output result is a project delivery report (PAR).

3.4 Stage IV – contract development or validation

The previously developed project delivery model is translated into a legally robust contract structure through the use of the PRA. Depending on the project, this either involves drafting a new contract fully based on the project delivery model or validating and, where necessary, adapting an existing contract to the requirements defined in *Stage III*. The result is a clearly structured, project-appropriate contract, developed in close coordination with legal counsel and jointly endorsed by all key project participants.

4 CASE APPLICATIONS

The PPF has been applied to major, as well as small scale, infrastructure projects in Germany. Two examples are shown below. These applications demonstrate how the methodology can be adapted to different project types and scales, while maintaining a consistent technical foundation. The examples are:

4.1 Amprion: Progressive Partnering Contract Civil Engineering

One application of the PPF is the Progressive Partnering Contract Civil (PPCC) with Amprion GmbH for the Corridor B (710 km) and Rhine-Main Link (589 km) transmission projects. Both projects include extensive underground sections and high technical complexity (Koch et al. 2024). Key features of the application are:

- Division of the project into construction lots for execution, each with its own contract and risk profile and compensation model.
- Use of differentiated compensation models, including Lump Sum, Cost Plus Incentive Fee (CPIF), and Cost Plus Fixed Fee (CPFF).
- Probabilistic risk modeling and Monte Carlo simulation to establish section-specific target costs.

- Incentive mechanisms aligned with jointly developed cost and risk baselines by implementing pain-and-gain mechanisms that are directly tied to the jointly agreed target cost ranges.

The PPCC received the ICPMA (International Construction Project Management Association) Award for Excellence in Construction Project Management in 2024, highlighting the international recognition of the approach.

4.2 *Bavarian State Ministry of Housing, Construction and Transport (StMB): IPD Compact*

A compact example of the PPF in practice is its application by StMB. The approach was developed for road construction projects and adapts the methodology to smaller-scale works. It preserves the core elements of the PPF such as probabilistic cost estimation, section-based delivery, and incentive mechanisms, while streamlining the initiation phase to reduce administrative effort.

This adaptation was necessary because the PPF was implemented after design had been completed but before the works were tendered. As a consequence, comprehensive early contractor involvement was no longer feasible, yet the project still aimed to apply the methods outlined above.

The resulting IPD Compact illustrates the flexibility of the PPF and its potential to scale from large, complex underground projects to more conventional infrastructure works.

4.3 *Implementation of PPF in underground projects*

Especially in complex tunnelling projects, the project delivery model should be developed before contract drafting and the procurement of construction works. Within the PPF, the implementation of the core principles in *Stage I* establishes the structural basis for a collaborative project delivery. In *Stage II*, the relevant model components are selected and subsequently elaborated in *Stage III* within a Project Delivery Report. In *Stage IV*, this report serves as the basis for drafting a new contract or for reviewing and adapting an existing contractual template. Once the PPF has been fully completed and a project-specific project delivery model and draft contract have been established, the procurement process can commence.

5 CONCLUSION AND OUTLOOK

As the PPF is a structured approach for developing project delivery models that meet project-specific requirements and not a project delivery model, it provides a structured and transparent methodology for managing the complexity and uncertainty inherent in underground construction. It does this by integrating probabilistic risk modelling, open-book cost structures, and combined cost–schedule–risk analysis. This integration establishes a verifiable basis for balanced, collaborative contracting.

The applications presented demonstrate that the PPF combines methodological rigour with practical applicability. Large-scale projects such as Amprion's Progressive Partnering Contract Civil show how complex works can be segmented into sections with tailored compensation and incentive schemes, while the IPD Compact confirms that the approach can be scaled to smaller projects. By establishing a shared, probabilistic risk baseline, the framework enables systematic alignment of owner and contractor objectives, creating the foundation for trust and for incentive mechanisms that are credible and enforceable.

The PPF pursues four central objectives:

- Establish a transparent, methodologically sound process reflecting project-specific criteria.
- Enable practical solutions applicable across varying project sizes and complexities.
- Create project-specific, transparent contracts linked to jointly developed cost and risk models.
- Foster a culture of cooperation, trust, and shared responsibility.

Future work should extend the application of the PPF across the construction sector, adapting its principles to building, industrial, and public projects. The goal is to generate simple, standardized, and easy-to-use delivery models that retain transparency and risk balance while minimizing administrative complexity. Developing digital tools and templates will support broader adoption and help embed the PPF as a scalable framework for efficient, collaborative, and outcome-oriented project delivery.

By promoting adaptable and scalable applications of the PPF across different project types and organizational contexts, the framework has the potential to contribute to a broader transformation of contracting culture - moving the construction industry toward more efficient, cooperative, and outcome-oriented project delivery.

ACKNOWLEDGEMENTS

This research paper of the research project DigiPeC - Digital Performance Contracting Competence Center is funded by dtec.bw – Digitalization and Technology Research Center of the Bundeswehr. dtec.bw is funded by the European Union – NextGenerationEU.

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