



Comparing Road Construction Projects Against an IPD Standard

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Introduction



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Research purpose

- Collaborative Project Delivery Methods (PDMs) presented as a potential solution to improving project performance
- Integrated Project Delivery has gained attention from the LC community in recent years
- Laws, regulations and internal restrictions limit a project's influence on its PDM

Research question

“How can projects use alternative organization and contract arrangements to achieve incentives which resemble the IPD arrangement?”





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Introduction

AIA's six IPD principles

- Continuous involvement of owner
- Key designers from early design through to project completion
- Shared risk and reward
- Joint project control
- Limited liability
- Multi-party agreement or equal interlocking agreements



Research Methods



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- Research approach
 - Literature study
 - Descriptive and adaptive starting point
 - Case study – 3 different projects
- Data collection method
 - Document studies
 - 24 semi-structured in-depth interviews
- Analyzing method
 - Qualitative content base analysis



Project Information and Data Sources



	Project 1 Rv. 3 Løten-Elverum	Project 2 E6 Ulsberg-Vindåsliene	Project 3 E6 Mandal East-City
Procurement procedure and PDM	Tender with negotiation, Public-Private Partnership	Best Value Procurement, Partnering and DB with target price	Best Value Procurement, Collaborative design and DB with fixed price
Current stage in the project life cycle	Late execution	Zoning plan	Early execution
Semi-structured interviews	5	8	11
Document study	Contract Procurement doc. Description of PDM	Contract Procurement doc. Description of PDM	Contract Procurement doc. Description of PDM



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Theoretical Background

- Lean tools to promote collaboration include:
 - Big Room
 - Last Planner System®
 - Cross-functional teams
 - Choosing by Advantages
 - Value Stream Mapping
 - Etc.
- To bridge theory and empirical evidence, we elaborate on the dimensions of the LC triangle



Case Studies – Project 1

Løten-Elverum



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AIA principles	Optimization phase	Execution phase
Continuous involvement of the owner	Yes, part of the negotiation process	Yes, in a distanced way. Involved in change of scope
Key designers, contractors from design through project completion	No, they were involved from detailed planning	Yes
Shared risk and reward	No	Yes, part of the discussion in the execution phase
Joint project control	No, client in control	No, contractor in control
Limited liability	No	Partly. Client pays for access to the road when delivered
Multi-party agreement or equal interlocking agreements	No	No, two-way agreement

Case Studies – Project 2

Ulsberg-Vindåsliene



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AIA principles	Optimization phase	Execution phase
Continuous involvement of the owner	Yes, in developing the target price	Not available, but intentional
Key designers, contractors from design through project completion	Yes, significant re-zoning	Not available, but intentional
Shared risk and reward	Yes, open book and target price	Not available, but intentional
Joint project control	Yes, but the engineering company in the lead	Not available, but intentional
Limited liability	No, but the agreement is believed to create strong bond between main actors	Not available, but not intentional
Multi-party agreement or equal interlocking agreements	No, designers hired by the contractor. No bonus for designers	Not available, but not intentional

Case Studies – Project 3

Mandal East-Mandal City



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AIA principles	Optimization phase	Execution phase
Continuous involvement of the owner	Yes, in developing the target price	No, DB with fixed price
Key designers, contractors from design through project completion	Yes, they were involved from zoning planning phase	Yes, in the detailed design
Shared risk and reward	Yes, open book and target price	No, DB with fixed price
Joint project control	Yes, but the engineering company in the lead	No, DB with fixed price
Limited liability	No, but they have a conflict management system denoted alliance group	No, DB with fixed price
Multi-party agreement or equal interlocking agreements	No, but the designers are eligible to get bonus from the contractor	No



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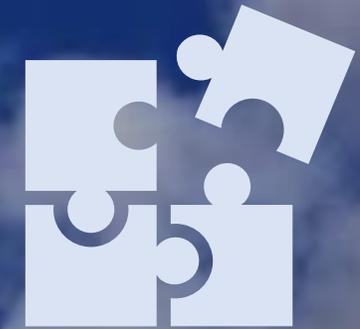
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Conclusion – Project 1

“How can projects use alternative organization and contract arrangements to achieve incentives which resemble the IPD arrangement?”

- Involved contractors early by conducting a comprehensive tendering process with three tenderers.
- PPP makes the contractor more accountable





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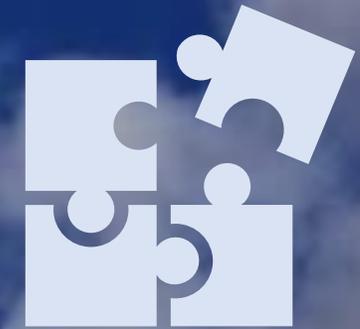
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Conclusion – Project 2

“How can projects use alternative organization and contract arrangements to achieve incentives which resemble the IPD arrangement?”

- Used BVP, which resulted in tight collaboration with a single contractor.
- The only project that actively tried to imitate an IPD approach





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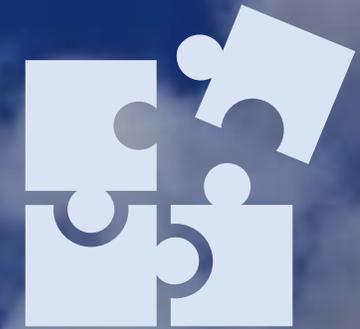
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Conclusion – Project 3

“How can projects use alternative organization and contract arrangements to achieve incentives which resemble the IPD arrangement?”

- Used BVP, which resulted in tight collaboration with a single contractor
- Many IPD principles during the optimization phase
- DB with fixed price in the execution phase, limits the potential for implementing IPD tools and principles



Conclusion



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“How can projects use alternative organization and contract arrangements to achieve incentives which resemble the IPD arrangement?”

- Many potential ways to implement IPD principles within the frames of laws, regulations and internal restrictions
- Different approaches resulted in a varying degree of impact on each IPD principle
- The choice of procurement procedure can affect further collaboration
- No project had a multi-party agreement or equal interlocking agreements



References



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- **Pikas, E., Koskela, L., Trelidal, N., Ballard, G., Liias, R. (2016).** "Collaboration in Design–Justification, Characteristics and Related Concepts." 24th Annual Conference of the International Group for Lean Construction, pp. 143-152.
- **Mesa, H. A., Molenaar, K. R., Alarcón, L. F. (2019).** "Comparative analysis between integrated project delivery and lean project delivery." *International Journal of Project Management*, 37(3), pp. 395-409.
- **Kalsaas, B.T. (2020).** "Lean Construction: A management model for interdependencies in detailed design". In, *Tzortzopoulos, P., Kagioglou, M. and Koskela, L. (Eds), Lean Construction. Core Concepts and New Frontiers*, (pp. 209-229). Huddersfield: Routledge.
- **Thomsen, C., Darrington, J., Dunne, D., Lichtig, W. (2009).** "Managing integrated project delivery." *Construction Management Association of America (CMAA)*, McLean, VA, 105, pp.

