NEW ZEALAND
INFRASTRUCTURE
COMMISSION
Te Waihanga

Insights for major project delivery

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New Zealand Infrastructure Commission / Te Waihanga

Te Waihanga seeks to transform infrastructure for all New Zealanders. By doing so our goal is to lift the economic performance of Aotearoa and improve the wellbeing of all New Zealanders.

We are an autonomous Crown entity, listed under the Crown Entities Act 2004, with an independent board. We were established by the New Zealand Infrastructure Commission/Te Waihanga Act 2019 on 25 September 2019.

Information on the Commission is available at www.tewaihanga.govt.nz/

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Foreword

Infrastructure is the foundation upon which our economy, communities and way of life are built. As a nation we face unprecedented infrastructure challenges – from adapting to climate change to addressing regional growth pressures to renewing the aging assets beneath our streets. The scale of investment required to meet these challenges is substantial, even with the billions of dollars already committed to transportation networks, water systems, hospitals, schools and other critical infrastructure.

How well we deliver these infrastructure projects matters. When projects succeed, they create lasting value, strengthen communities and enhance our economic performance. When they falter, the consequences extend far beyond cost overruns and delays – they include missed opportunities, erosion of public trust and constraints on future capacity to invest.

As General Manager of Infrastructure Investment at Te Waihanga, I have experienced both the transformative power of well-delivered projects and the challenges that arise when delivery falls short of expectations.

This report, *Insights for major project delivery*, represents a critical milestone in our journey to transform how New Zealand plans and delivers the infrastructure that will shape our nation for generations to come. Inspired by the research of Dr Juliano Denicol from University College London, including the 2020 study *What are the causes and cures of poor megaproject performance?,* we have applied this leading research alongside global best practice and lessons from local major projects to develop actionable findings designed specifically for New Zealand's context.

The insights in this report matter because they offer a pathway to more consistent, successful delivery outcomes – ensuring that New Zealand's significant infrastructure investments translate into tangible benefits for all New Zealanders.

Our report is intended for everyone involved in the infrastructure delivery ecosystem: from government ministers and officials making investment decisions to the project sponsors and governance boards overseeing delivery and the project directors and their teams managing day-to-day implementation alongside those contractors, consultants, and suppliers that bring these projects to life. It is equally valuable for central government agencies, local authorities and Crown entities as they navigate the complexities of infrastructure delivery.

Our insights are particularly relevant for those responsible for complex, large-scale projects where the stakes are highest, the risks most pronounced and the potential for transformative outcomes greatest.

I encourage you to:

- use the six themes as a framework for assessing current projects and planning future ones
- incorporate the best practice insights into project business cases, governance charters and delivery strategies
- apply the cross-cutting principles to foster a project culture that embraces adaptability, trust, and continuous improvement
- share insights with your teams and create opportunities for discussion about how these practices can be applied in your specific context.

Most importantly, I urge you to view our findings not as isolated interventions but as an integrated system of practices that reinforce each other. The greatest value will come from implementing them holistically, recognising the interconnections between decision-making, governance, risk management, stakeholder engagement, leadership and supply chain integration.

The path to better infrastructure delivery is neither simple nor short, but the insights in this report provide a solid foundation for the journey. I encourage you to embrace these insights, adapt them to your context and join us in building a better New Zealand through infrastructure that truly transforms lives.

Andy Hagan
General Manager, Investment
New Zealand Infrastructure Commission, Te Waihanga

Executive summary

Megaprojects have the power to transform economies, strengthen communities and shape the way we live for generations. Their scale and complexity demand careful planning, disciplined execution, and the flexibility to adapt to evolving challenges. Success is not guaranteed – it requires sound decision-making, strong leadership and well-structured governance and delivery models.

This report distils global best practices and research in megaproject delivery, offering strategic insights for ensuring that New Zealand's infrastructure investments deliver lasting value.

Our analysis and findings are structured around six themes – decision-making, governance, risk, leadership, stakeholder engagement and supply chain integration – adapted from Dr. Juliano Denicol et al's 2020 study, *What Are the Causes and Cures of Poor Megaproject Performance*. By applying these insights, we can deliver projects that are not only on time and on budget but also set new benchmarks for innovation, resilience and long-term value.

1. Decision-Making Behaviour

Great projects start with great decisions, and great decisions guide projects from inception to completion. The strongest megaprojects are built on data-driven planning, disciplined financial oversight and the ability to adapt without losing sight of strategic goals.

- **Great decision-making is grounded in data**: Use reference-class forecasting and historical cost benchmarks to ensure estimates reflect reality, not best-case scenarios.
- **Great decision-making remains adaptable**: Embed descoping and deferral mechanisms in business cases to enable scope adjustments as conditions evolve.
- **Great decision-making is rigorously tested**: Utilise gateway reviews as strategic checkpoints to regularly reassess projects against cost, risk and deliverability before making major commitments.

Adopt these practices to enable more realistic budgets and fewer project overruns.

2. Strategy, Governance & Procurement

Static governance structures don't serve dynamic projects. Procurement models that prioritise short-term cost savings over long-term value don't drive great outcomes. The most successful infrastructure projects demonstrate clear accountability, adaptive governance and procurement models that empower project delivery teams.

- **Great governance ensures clarity:** Clearly define roles and responsibilities among sponsors, funders, and delivery teams to minimise misalignment and delays.
- **Great governance adapts dynamically:** Oversight should evolve with project phases, embedding appropriate expertise at each stage. Governance groups should comprise a complementary mix of financial, technical and commercial skills, with independent members challenging assumptions and enhancing decision-making.
- **Great governance balances oversight with autonomy:** Governance structures should adjust to reflect the demonstrated capability of delivery teams, ensuring sponsors maintain strategic oversight without creating bottlenecks.
- **Great procurement fosters collaborative partnerships:** Implement collaborative procurement strategies, including early contractor engagement, to align objectives, promote joint problem-solving and enhance delivery certainty.

Adopt these governance and procurement practices to foster transparency, improve adaptability and increase overall project success.

3. Risk & Uncertainty

Uncertainty is inevitable, but unpreparedness is not. The most successful megaprojects don't just react to uncertainty – they plan for it, adapt to it and stay ahead of it.

- **Great risk management starts early and is grounded in reality:** Projects must proactively identify and manage risks early and upfront, using scenario planning and benchmarking to anticipate external pressures such as market fluctuations, regulatory changes and supply chain disruptions.
- **Great risk management evolves with the project:** Static risk frameworks are ineffective in dynamic environments. Continuous reassessment, structured decision points and flexible contingency planning enable adaptive responses while maintaining cost and schedule control.
- **Great risk management drives continuous learning:** Capture and apply lessons learned in real time to continually refine and improve risk strategies throughout the project lifecycle.

Embed these risk management practices to create greater resilience, fewer surprises, and sustained project performance.

5. Stakeholder Engagement & Management

The most successful projects create alignment, trust and shared accountability through effective engagement. From government agencies and delivery partners to iwi, businesses and communities, engagement must be structured, transparent and continuous to ensure projects stay on track.

- **Great engagement is structured:** Clear frameworks define roles, timing and methods of engagement, ensuring coordination and accountability across agencies, regulators and project teams.
- **Great engagement is proactive:** Stakeholders should be engaged early and continuously, to secure alignment well before key decisions are made.
- **Great engagement is transparent:** Open communication with the public on project milestones, trade-offs, and risks builds trust, prevents misinformation, and reduces regulatory and political friction.

Adopt these effective engagement strategies to build confidence in the project and increase overall project success.

5. Leadership and Capable Teams

Megaprojects demand high-performing teams, equipped to handle complexity and drive delivery. The right skills, leadership, and culture can make the difference between a project that thrives and one that struggles:

- **Great leadership aligns teams:** Strong leaders bridge the gap between policy and execution, ensuring sponsors, delivery partners and contractors share a common vision and work toward shared objectives.
- **Great teams combine expertise from both sides:** Projects benefit when sponsors and delivery teams include team members with direct experience across different project roles, improving risk identification and decision-making.

- **Great capability is actively invested in:** Structured training, leadership programs and clear development pathways ensure that major projects are led by people with the strategic, technical and adaptive skills required to manage risk and deliver results.

Invest in developing leadership and team capability to build organisational resilience, drive better outcomes and position projects for sustained success.

6. Supply Chain Integration & Coordination

Procurement models shape project outcomes. Aligning incentives, improving coordination and tailoring procurement approaches help reduce inefficiencies, manage risk and drive long-term value:

- **Great projects align procurement models with project complexity:** Choosing the right procurement and contracting approach ensures an optimal balance of competition and collaboration, reducing misalignment and improving efficiency.
- **Great supply chain integration enables long-term alignment:** Long-term contracting strategies help create stability, encourage innovation and enhance supplier accountability for project outcomes.
- **Great supply chain integration utilises ECI thoughtfully, where appropriate:** Early contractor involvement (ECI), when carefully structured, brings key suppliers into the planning phase, reducing risk, assessing buildability and aligning supply chain capacity with project timelines.
- **Great projects break down complexity, where appropriate:** Structuring projects into modular, well-coordinated components enhances efficiency, reduces risk and allows for smarter sequencing of work.

Adopt integrated, coordinated and modular approaches to supply chain management to improve delivery certainty, reduce complexity and enhance project performance.

Cross-Cutting Principles for Thriving Projects

While strong governance, risk management and procurement strategies provide the structure for success, high-performing megaprojects are also defined by the culture, leadership and values that underpin them. These factors are rarely captured in evidential or technical reports. However, as we prepared this report, six cross cutting principles emerged as, in our opinion, distinguishing features between projects that merely function and those that thrive.

Consider these six cross-cutting principles as an essential foundation upon which successful megaprojects can deliver outstanding outcomes:

- **A clear and intentional project culture is critical:** When teams share a clear purpose, operate with mutual respect, and have the autonomy to make informed decisions, they are more engaged, proactive, and invested in delivering quality outcomes.

- **Equally important is recognising that culture is not one-size-fits-all:** Every project has a unique mix of people, challenges, and working environments, and leaders should feel empowered to shape culture in ways that work best for their circumstances.

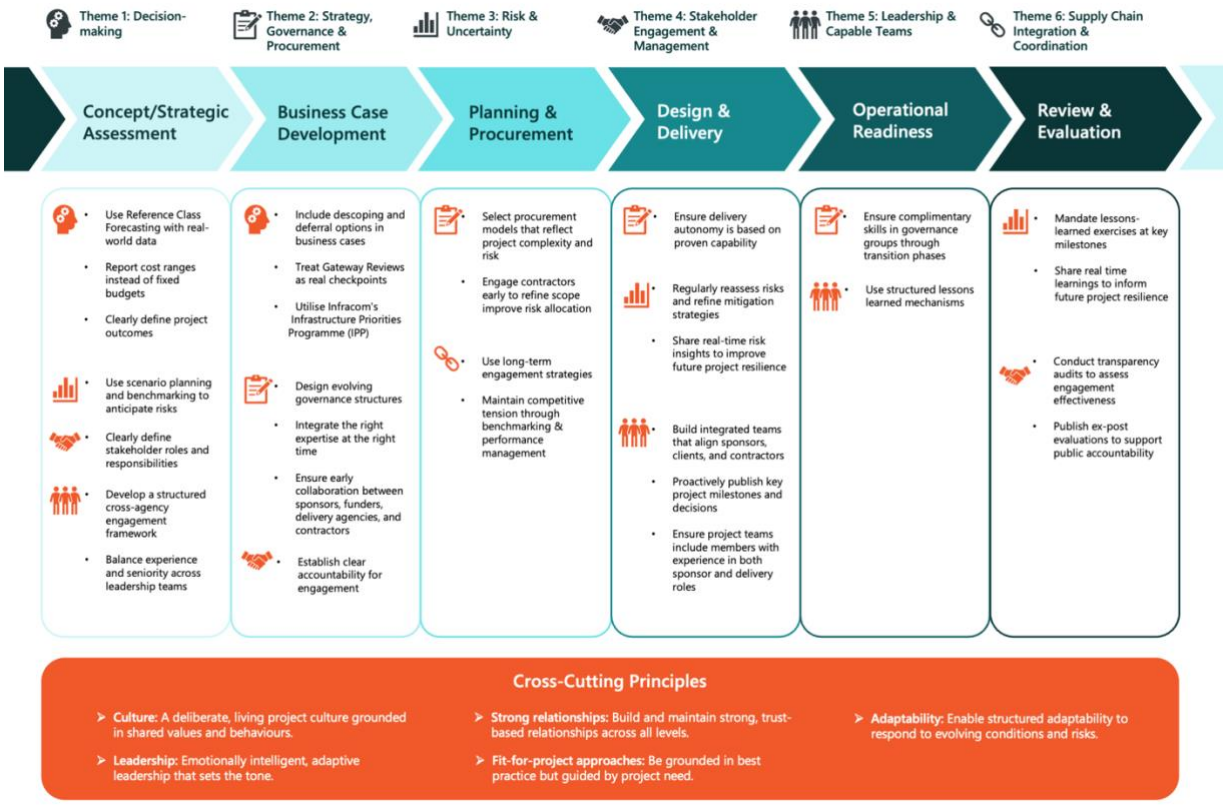
- **Emotional intelligence is fundamental to team performance under pressure:** A strong feedback culture, supported and enabled by emotional intelligence, allows teams to challenge assumptions, adjust course before small issues escalate and ultimately reduce risk in a meaningful way.

- **At the heart of every megaproject is the ability to bring people together:** While infrastructure is measured in steel and concrete, successful delivery relies on human relationships – between agencies, contractors, consultants and communities. Projects succeed when leaders actively invest in these relationships and recognise the human dynamics that influence every decision.

- **Success requires applying best practice flexibly, tailoring it precisely to each project's unique demands:** High-performing projects draw on established best practice but remain attuned to the specific needs, constraints, and risks of their project.

- **Adaptability distinguishes resilient megaprojects from those that falter under pressure:** Successful teams find the balance between structure and agility through features like dynamic governance frameworks, live risk registers and contingency planning that includes descoping or resequencing options.

Consider where you can action our insights across the project management lifecycle



1. Theme 1: Decision-Making Behaviour

Infrastructure projects are inherently complex, requiring decision-making under conditions of uncertainty. While technical complexity poses challenges, poor decision-making processes – shaped by uncertainties and institutional dynamics – often contribute to cost overruns, delays and performance issues.

Denicol et al's (2020) study identified three behavioural and institutional factors underlying poor decision making – optimism bias, strategic misrepresentation and escalating commitment. Seen as critical drivers of poor project outcomes, these dynamics are frequently compounded by inconsistent financial oversight, limiting the ability to control costs effectively.[1]

1.1. What challenges are we observing?

1.1.1. Pressure to secure funding can distort estimates

Government infrastructure funding is highly competitive, and project sponsors must demonstrate financial viability and public benefit to secure support. However, political and institutional pressures can create incentives to announce solutions before full due diligence is complete. Rather than deliberate misrepresentation, this reflects a 'think slow, act fast' challenge – where early commitments are made before risks are fully understood.

Premature commitments can have lasting financial consequences. Research from the Grattan Institute found that 79% of cost overruns on major Australian infrastructure projects occurred in the 35% of projects that were announced before a business case was completed. In 2023, the Commission's Annual Report disclosed that 50% of budget bids reviewed by Treasury's Capital Panel were submitted without a complete business case. When projects are locked in too early, they frequently become significantly more expensive, highlighting the dangers of selective forecasting and overly optimistic assumptions.

1.1.2. Overconfidence can lead to unrealistic budgets

While some cost underestimation is strategic, decision-makers at multiple levels may also genuinely believe their projects will cost less and finish faster than is realistic. Early forecasts often reflect best-case scenarios rather than realistic assessments of risk and uncertainty. Decision-makers regularly assume a level of certainty that does not align with the complexity of large-scale projects, resulting in budgets that fail to adequately account for scope changes, market volatility, or unforeseen technical challenges.

The Transmission Gully roading project illustrates these risks. The Commission's Post-Construction Review found that "*because of the low Affordability Threshold (AT) set during the procurement phase, the TG Project was effectively always under-priced given the complex risks involved. As a result, it was inevitable the project's costs would change during the construction phase*".[2] The Review highlighted several key risks that impacted costs and delivery, including geotechnical complexities, consenting challenges and external shocks such as the Kaikōura Earthquake and COVID-19 pandemic.[3]

[1] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance? A systematic literature review and research agenda. School of Construction and Project Management, University College London.
[2] New Zealand Infrastructure Commission | Te Waihanga. (2024). Transmission Gully Post-Construction Review – Executive Summary & Insights for the Future. Retrieved from https://tewaihanga.govt.nz.
[3] New Zealand Infrastructure Commission | Te Waihanga. (2024). Transmission Gully Post-Construction Review – Executive Summary & Insights for the Future. Retrieved from https://tewaihanga.govt.nz.

1.1.3. Sticking with a failing plan can lock in poor outcomes

Once projects are approved, it becomes difficult to reassess their feasibility, even as costs escalate. The 'too big to fail' mindset means sunk costs and reputational concerns drive continued investment, even when rescoping or cancellation would be the more prudent financial decision.

The New Dunedin Hospital (NDH) project highlights the importance of early intervention in managing scope and financial pressures. The Independent Expert Readiness Review[4] found that cost constraints led to scope reductions before construction, including removal of pathology services, reductions in inpatient beds and fewer operating theatres (p. 21). These changes were made to align the project with available funding, although the review cautioned that such reductions should be managed carefully to avoid long-term service delivery impacts (p. 24).

1.1.4. Weak cost assurance limits adaptability

The challenges of misrepresentation, optimism bias and escalating commitment can be exacerbated by inconsistent financial oversight frameworks and fragmented governance. Many large-scale projects lack robust mechanisms for tracking costs and adjusting estimates as new risks emerge. Key contributing factors include:

- **Inadequate cost estimation frameworks:** Initial estimates often fail to evolve as new information emerges.
- **Fragmented financial governance:** Multiple agencies overseeing cost approvals can create delays and inefficiencies.
- **Limited use of historical cost data and benchmarking:** Cost assumptions frequently lack strong evidence, leading to unrealistic projections.

International research, including Denicol et al's (2020) study, identifies poor decision-making during project initiation as a major cause of megaproject performance failures.[5] Addressing these risks requires stronger financial discipline, better forecasting and structured decision-making frameworks.

1.2. What can we learn from international best practice?

1.2.1. Ground cost estimation in data and evidence

Accurate cost estimation is essential for keeping infrastructure projects on track. International best practice highlights structured cost frameworks, evidence-based forecasting and risk-adjusted budgets as critical tools to manage uncertainty.

Nationally Standardised Cost Structures

Cost classification involves systematically grouping project costs into predefined categories. A consistent national approach to cost classification is essential for improving infrastructure planning and delivery. When agencies use different cost categories and definitions, data becomes fragmented, benchmarking is difficult and transparency suffers.

Countries with structured cost frameworks have realised major benefits. The UK's national cost framework, for instance, uses consistent categories and mandatory reviews to improve oversight and comparability across projects[6].

[4] New Zealand Infrastructure Commission – Te Waihanga. (2023). *New Dunedin Hospital Expert Review*. Retrieved from https://tewaihanga.govt.nz/our-work/reviews/dunedin-hospital-independent-review.
[5] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?
[6] UK Infrastructure and Projects Authority, 2021

New Zealand has made progress in some sectors. Waka Kotahi's *Cost estimation manual (SMO14)*[7] for transport projects and Te Whatu Ora's *Cost Estimating guideline*[8] *For Public Sector Health Capital Projects* are positive steps. However, these frameworks are not aligned – terminology, structure and methodology vary between agencies, limiting visibility and making it harder to track spending across the investment system.

While coordination across sectors is challenging, a nationally-standardised cost framework would unlock major gains in transparency, forecasting and data-driven decision making. It would also provide the backbone needed to support more advanced forecasting tools such as Reference Class Forecasting.

Reference Class Forecasting and Benchmarking

Reference Class Forecasting (RCF) compares new project estimates against real-world data from similar completed projects. It counters optimism bias by grounding forecasts in historical reality – reducing the chance that projects are green-lit on unrealistic expectations.

> *"If you imagine that your project is so different from other projects that you have nothing to learn from them, you will overlook risks that you would catch and mitigate if you instead switched to the outside view."*
>
> *Bent Flyvberg*

RCF is already used internationally with measurable results:

- Hong Kong applied early-stage RCF to 25 major road projects, resulting in 44% cost uplifts – improving forecasting accuracy[9]
- Denmark, Norway, Sweden, and the Netherlands use RCF to align cost estimates with real-world project trends[10]
- RCF has reduced cost overruns in the UK from 38% to 5% in transport projects.[11]

New Zealand has yet to apply RCF systematically. While some agencies use benchmarking tools, the lack of consistent data makes comprehensive forecasting difficult. A first step is to improve data collection and implement a standard cost classification system across sectors (Infrastructure Strategy Recommendation 46). The Commission is working on developing a National Infrastructure Pipeline that can in turn be used for understanding unit costs by asset class - a prerequisite to a RCF forecasting tool.

RCF is most effective when used early – at the business case and pre-implementation stage, where it can shape realistic expectations and influence scope. It should complement, not replace, risk analysis later in the project lifecycle.

Apply Cost Ranges Instead of Fixed Budgets

Fixed budgets create the illusion of certainty where little exists. When cost-estimates are locked in too early, projects can be forced to manage around unrealistic constraints – leading to shortfalls, change requests and cost overruns.

[7] https://www.nzta.govt.nz/resources/cost-estimation-manual/
[8] https://www.tewhatuora.govt.nz/publications/cost-estimating-guideline-for-public-sector-health-capital-projects
[9] Flyvbjerg, B., Hon, C.-K., & Fok, W. H. (2016). Reference class forecasting for Hong Kong's major roadworks projects. Proceedings of the Institution of Civil Engineers, 169(CE6), 17-24. https://doi.org/10.1680/jcien.15.00075
[10] Park, J. E. (2021). Curbing cost overruns in infrastructure investment: Has reference class forecasting delivered its promised success? European Journal of Transport and Infrastructure Research, 21(2), 120–136. https://doi.org/10.18757/ejtir.2021.21.2.5504
[11] Baerenbold, R. (2023). Reducing risks in megaprojects: The potential of reference class forecasting. Project Leadership and Society, 4, 100103. https://doi.org/10.1016/j.plas.2023.100103

Leading practice internationally now favours cost ranges over fixed budgets. This approach reflects uncertainty upfront, improves contingency planning and encourages more informed investment decisions:

- **US Government Accountability Office (GAO):** Recommends probabilistic forecasting, including three-point estimates (minimum, most likely and maximum), and risk driver modelling.[12]
- **UK Treasury's Green Book:** Requires ranges rather than point estimates to reflect the range of possible outcomes, ensuring budgets account for uncertainty.[13]

By requiring cost ranges in infrastructure planning, New Zealand delivery agencies can better plan for uncertainties rather than react to cost blowouts. This allows for better contingency planning, more informed decision-making and a likely consequential reduction in significant budget overruns. This approach also allows better portfolio management of capital investment across asset classes. One consequence of project cost overruns is that other priorities are crowded out. By improving cost information at the outset, decision-makers are better able to understand adequate investment across all infrastructure needs.

1.2.2. Embed descoping and deferral mechanisms in business cases

Better forecasting alone is not enough to achieve delivery success — projects also need flexible delivery pathways. Too often, rigid scope and funding commitments are locked in before risks, affordability and deliverability are fully understood. When this happens, projects are forced to absorb shocks instead of responding to them. To avoid this, business cases should be designed with built-in descoping and deferral mechanisms, allowing decision-makers to prioritise essential elements and postpone or adjust non-critical components if conditions change. This should be complemented by a clear understanding of project outcomes, including what is needed in scope at a minimum to operate effectively.

By applying these mechanisms in early project planning, agencies can strengthen investment discipline, improve delivery adaptability and reduce pressure when projects encounter challenges.

Business cases should:

- define core outcomes clearly and early to serve as a reference point for scope and feasibility decisions
- embed structured mechanisms to defer or descale components while maintaining alignment with core project objectives.

1.2.3. Maximising the value of gateway reviews

Independent gateway reviews serve as critical checkpoints to test whether projects are on track before major financial commitments are made. They help validate cost estimates, risk assumptions and overall deliverability, reducing the risk of projects proceeding based on unrealistic expectations.[14] New Zealand currently mandates Gateway Reviews for all high-risk projects, ensuring independent assessments at key decision points.[15] However, to be truly effective, these reviews must be seen as opportunities for improvement–not just compliance exercises.

[12] GAO. (2020). GAO Cost Estimating and Assessment Guide: Best Practices for Developing and Managing Program Costs. Retrieved from https://www.gao.gov/products/gao-20-195g

[13] HM Treasury. (2020). The Green Book: Appraisal and Evaluation in Central Government. Retrieved from https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-government/the-green-book-2020

[14] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?

[15] New Zealand Treasury (2024) – Gateway Reviews. Available at: https://www.treasury.govt.nz/information-and-services/state-sector-leadership/investment-management/gateway-reviews

To fully leverage their value, Senior Responsible Owners (SROs) and delivery agencies should treat Gateway Reviews as natural control gates – moments to step back, assess progress objectively and make informed adjustments.

When used with discipline, Gateway Reviews can improve investment decision-making, enhance risk management, and drive better project outcomes.[16]

Beyond Gateway Reviews, Te Waihanga's Infrastructure Priorities Programme (IPP) provides independent pre-funding assessments of proposals, evaluating their strategic alignment with New Zealand's infrastructure objectives, value for money and deliverability.[17]

Together, Gateway Reviews and IPP assessments provide a dual-lens approach to project assurance. Used consistently, they can help ensure that only well-structured, viable and strategically-aligned projects proceed. Key actions to strengthen assurance:

- **Proactive engagement:** Treat Gateway Reviews as strategic performance checkpoints, not just compliance checks.[18]
- **Integrate assurance:** Combine IPP assessments and Gateway Review findings to strengthen investment decision-making and project delivery.

DECISION MAKING BEHAVIOUR: KEY INSIGHTS

Improve Cost Estimation:

- Implement nationally-standardised cost structures across all infrastructure agencies to enable consistent, reliable forecasting.
- Embed Reference Class Forecasting as a standard practice to ground cost estimates in real world data and reduce optimism bias.
- Adopt cost ranges rather than fixed budgets to actively manage uncertainty and reduce the risk of significant overruns.

Build Flexibility into Business Cases:

- Embed clearly defined descoping and deferral options within business cases to proactively manage scope when risks or cost pressures emerge.
- Define core project outcomes at an early stage to guide feasibility assessments, inform funding decisions and ensure critical objectives are met.

Maximise Value from Gateway Reviews:

- Use Gateway Reviews as strategic performance checkpoints to objectively reassess progress and inform course corrections.
- Leverage insights from Te Waihanga's Infrastructure Priorities Programme to rigorously evaluate projects prior to funding approval.

[16] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?
[17] Te Waihanga – New Zealand Infrastructure Commission (2024) – Infrastructure Priorities Programme (IPP) – Assessment Criteria. Available at: https://www.tewaihanga.govt.nz/our-work/infrastructure-priorities-programme/assessment-criteria
[18] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?

2. Theme 2: Strategy, Governance & Procurement

Delivering large-scale infrastructure depends on strong governance, clear oversight and procurement models that support high-performance delivery. When the design of these structures is suboptimal, projects can suffer from slow decision-making, misaligned priorities and contractual disputes that delay progress and increase costs.[19]

Denicol et al's (2020) research highlights how rigid governance, adversarial procurement and unclear accountability contribute to inefficiencies and delivery failures.[20] This section explores how these issues have manifested in New Zealand and, building on Denicol et al's (2020) recommendations, identifies opportunities to strengthen governance and procurement for future projects.

2.1. What challenges are we observing?

2.1.1. Fragmented oversight slows decision-making and increases risk

Infrastructure projects can involve multiple agencies, government departments and other stakeholders, often with overlapping responsibilities. While oversight is essential, too many layers of governance and unclear role definitions can slow down decision-making and cause duplication.[21] This fragmentation can lead to conflicting priorities, difficulty in escalating issues and delays in resolving project challenges. Without a single accountable entity overseeing the entire programme, critical programme dependencies can be missed, affecting the success of the overall project.[22]

The City Rail Link (CRL) project illustrates these challenges. While City Rail Link Limited was responsible for delivering core infrastructure, key supporting components – such as new trains, network upgrades and level crossing removals – were managed by separate entities without an integrated governance framework. This fragmented oversight created delays, increased costs and led to misalignment between delivery partners, affecting the project's overall readiness.[23]

2.1.2. Governance structures do not adapt as projects evolve

Megaprojects unfold over many years. Priorities shift, risks emerge and costs change. Yet governance structures are often static and too rigid to accommodate these changes, leading to inefficiencies. When governance does not evolve, decisions stall, constraining the ability for project teams to align delivery with changing requirements.[24]

The New Dunedin Hospital (NDH) project exemplifies governance structures that were slow to adapt, leading to challenges in operational readiness and cost control. The Commission's independent review

[19] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?
[20] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?
[21] UK National Audit Office (2024). Governance and decision making on mega projects. Retrieved from: Governance and decision-making on mega-projects - NAO insight
[22] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?
[23] New Zealand Infrastructure Commission – Te Waihanga. (2024). City Rail Link Interim Review: Phase 1 – Preliminary Lessons Learnt Findings. Retrieved from https://tewaihanga.govt.nz/our-work/reviews/city-rail-link-lessons-learnt. It is acknowledged since the completion of this Review changes in governance arrangements have been implemented to address these challenges. In particular the CRL One Client Governance Group was established comprising the Chairs and Chief Executives of CRLL, KiwiRail, and Auckland Transport and the Chief Executive of Auckland One Rail. The Group's aim is ensuring integration between the entities is prioritised. There is regular reporting through the One Client Governance Group on the full programme of work across all entities needed to support day 1 operations.
[24] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?

found that while governance mechanisms were in place, they did not adapt to align decision-making with the evolving scope and financial realities of the project.[25]

2.1.3. Adversarial procurement models can create misaligned incentives

Procurement models shape how risk is allocated and how teams work together, with some models entrenching adversarial dynamics rather than fostering collaborative problem-solving. Poorly designed models that do not align with a project's delivery complexity can transfer excessive risk to contractors. This often results in contractual disputes, delays and increased project costs.[26]

Transmission Gully (TG) demonstrates the risks associated with suboptimal procurement models. As New Zealand's first roading Public-Private Partnership (PPP), the project was intended to drive efficiency and innovation by transferring delivery risks to the private sector. However, the fixed-price contract did not fully account for the project's geotechnical complexities, consenting challenges or external disruptions such as COVID-19. When these risks materialised, the rigid contractual structure left limited room for negotiation or collaborative problem-solving.[27]

2.2. What can we learn from international best practice?

Building on the recommendations from Denicol et al's (2020) research, we can also examine how leading jurisdictions and projects have addressed governance and procurement challenges, leveraging best practices to drive better project outcomes. By learning from these approaches, we can identify practical strategies to strengthen oversight, improve decision-making and enhance procurement effectiveness in New Zealand.

2.2.1. Build strong collaborative relationships from the outset

Successful infrastructure projects often begin with early and genuine collaboration among responsible stakeholders – sponsors, funders, delivery agencies and contractors – ensuring that priorities and long-term project outcomes are agreed and well understood.[28] Critically, governance and procurement models should be structured to support rather than hinder ongoing collaboration. Beyond structural mechanisms, project leaders should foster collaboration through deliberate efforts to establish shared principles, goals, and expectations from the outset, ensuring alignment is maintained throughout delivery.

SWEDEN

Case study: Road 252 Hallstahammar-Surahammar

Overview: The reconstruction of Road 252 in Sweden exemplifies how collaborative practices and robust relationships can lead to successful infrastructure project outcomes.

Outcome: Delivered on time with efficient decision-making.

Success factors:

- Joint project office
- Collaborative risk management
- Regular collaboration meetings.

[25] New Zealand Infrastructure Commission – Te Waihanga. (2023). New Dunedin Hospital Expert Review. Retrieved from https://tewaihanga.govt.nz/our-work/reviews/dunedin-hospital-independent-review.
[26] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?
[27] New Zealand Infrastructure Commission | Te Waihanga. (2024). Transmission Gully Post-Construction Review – Executive Summary & Insights for the Future. Retrieved from https://tewaihanga.govt.nz.
[28] Miller, D., & Oliver, M. (n.d.). Engaging Stakeholders for Project Success. Project Management Institute. Retrieved from https://www.pmi.org/learning/library/engaging-stakeholders-project-success-11199.

Establishing a culture of trust and shared accountability early in a project creates a foundation for faster decision-making, stronger risk management and earlier resolution of issues as they arise. Without a foundation of trust, misaligned incentives and fragmented communication can quickly escalate into costly delays and disputes.

Several of Sweden's infrastructure projects illustrate how embedding collaboration as a guiding principle can enhance project outcomes. For example, the Road 252 Hallstahammar-Surahammar project established a partnering charter, outlining shared values and expectations for all participants – from senior management to on-site workers. This framework promoted open communication and joint problem-solving and outlined key words and phrases that reflected the desired culture. Regular collaboration meetings ensured that workers at all levels contributed their expertise, fostering a culture where responsibility for project success was widely shared.[29]

A culture of collaboration should also extend to iterative learning and continuous improvement throughout the project lifecycle. Lessons-learned exercises should be formerly required by project governance bodies – not just conducted retrospectively at project completion.[30] Formal and informal processes should support structured reflection, with leaders championing a culture of sharing insights across teams and between projects. Internationally, the Crossrail Learning Legacy[31] demonstrates the benefits of actively capturing and sharing project insights throughout delivery. By systematically recording best practices, challenges and solutions, Crossrail strengthened internal decision-making and provided a valuable knowledge base for industry-wide improvement.

2.2.2. Introduce dynamic governance models that evolve with project needs

Effective governance structures should facilitate collaboration and enable the timely integration of specialised expertise as project needs evolve. This requires a governance model that is structured for adaptability, ensuring that decision-making remains clear and agile throughout the project lifecycle.

Large infrastructure projects span years, if not decades, and require governance arrangements that can adapt to shifting priorities, emerging risks and leadership transitions. However, many projects operate with static governance models, leading to inefficiencies, slow decision-making and misalignment between stakeholders.[32] To avoid these challenges, governance must be designed with built-in flexibility, allowing structures to evolve as the project moves through different phases. The UK's National Audit Office reinforces this point, noting that megaprojects require governance cultures that are adaptive and responsive, with the right skills and behaviours evolving across each phase of delivery.[33]

From the outset, project directors should anticipate inflection points – key milestones where governance must be refined to reflect the project's increasing complexity.[34]

Crucially, this includes ensuring that governance structures integrate the right expertise at the right time. The skills required in the early phases of a project – such as investment analysis, regulatory compliance and strategic planning – differ significantly from those needed during delivery, including engineering, risk management and operational systems integration. A phased, expertise-driven approach ensures that governance structures remain fit for purpose throughout the project lifecycle, preventing misalignment between early-stage decisions and the realities of execution. Transitions between project phases must

[29] International Transport Forum. (2021). Collaborative Infrastructure Procurement: A Review of International Practices and Future Opportunities in Sweden and the Netherlands. OECD Publishing. Retrieved from https://www.itf-oecd.org/sites/default/files/docs/collaborative-infrastructure-procurement-sweden-netherlands.pdf.
[30] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?
[31] For more on the Crossrail project refer to the pop-out box on page 26
[32] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?
[33] UK National Audit Office (2024). Governance and decision making on mega projects. Retrieved from: Governance and decision-making on mega-projects - NAO insight
[34] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?

be formally planned and actively managed to ensure continuity, maintain accountability and protect institutional knowledge as leadership and priorities shift.

This phased approach should be underpinned by the principle that governance groups should have a complementary skill set, ensuring diverse expertise across financial, technical, commercial, and operational domains. Governance teams must also include the ability to manage upwards – to sponsors, Ministers or the public – as well as the technical capability to manage delivery partners and contractors.[35] Additionally, at least one independent member should be included to provide external oversight, challenge internal assumptions and mitigate the risk of organisational groupthink.

The Crossrail[36] project in the UK demonstrates the importance of proactively adapting governance structures in response to project realities.[37] Initially, Crossrail operated with limited sponsor oversight – which contributed to cost overruns and delays. However, in 2018, governance arrangements were restructured to improve decision-making and expertise alignment. This included appointing a CEO with expertise in complex systems integration. Sponsors took a more active role, a strengthened project board was introduced and independent assurance mechanisms were refined, ensuring that certain risks, such as systems integration, were addressed before they derailed project delivery. These changes were critical in bringing Crossrail back on track, illustrating that governance must evolve ahead of critical project milestones, not react after issues arise.

These examples reinforce the principle that governance should not be static; it must be an active enabler of project success, ensuring that expertise, decision-making agility and accountability remain aligned throughout delivery.

2.2.3. Ensure a balance between sponsor oversight with earned autonomy for delivery teams

International best practice suggests that effective project governance requires a deliberate balance between sponsor oversight and delivery team autonomy.[38] Sponsors must retain strategic oversight and accountability, ensuring the project remains aligned with broader policy and investment objectives. But excessive control can slow decisions, disempower delivery teams, and reduce their ability to manage risk and respond to emerging challenges.

As projects move from early planning to delivery, oversight should evolve in line with the delivery organisation's capability and performance. While the sponsor should always retain oversight, it should also progressively

UNITED KINGDOM

Case study: Thames Tideway Tunnel

Overview: A 25 km underground 'super sewer' to modernize London's aging wastewater system and prevent raw sewage from entering the River Thames.

Key outcomes: On schedule for full completion.

Success factors:

- Progressive delivery autonomy
- Structured sponsor oversight with preserved intervention rights.

[35] UK National Audit Office (2024). Governance and decision making on mega projects. Retrieved from: Governance and decision-making on mega-projects - NAO insight

[36] For more on the Crossrail project refer to the pop-out box on page 26

[37] Denicol, J., Davies, A., & Krystallis, I. (2020)., UK Department for Transport. (2024). Crossrail Lessons Learned Report. UK Government. Retrieved from https://assets.publishing.service.gov.uk/media/664b0afebd01f5ed32793e3e/crossrail-lessons-learned-report.pdf.

[38] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance? Denicol, J., Davies, A., & Pryke, S. (2021). The organisational architecture of megaprojects. International Journal of Project Management 39(4), 339–350.

grant delivery teams the freedom to deliver. Autonomy should not be the default, rather it should be earned against clear criteria and continue to sit alongside sponsor assurance.

During early stages, sponsors play an active role in establishing project direction, securing investment approvals and shaping governance structures. As the project moves into detailed design and delivery, autonomy should be earned progressively, based on demonstrated capability, with sponsors shifting from active management to a challenge-and-assurance role.[39] This transition is critical – too little autonomy can disempower the delivery team, while too much too soon can create governance gaps and accountability risks.

International experience underscores the importance of this balance. The Thames Tideway Tunnel project in the UK exemplifies a governance model where delivery autonomy was progressively earned while maintaining robust sponsor oversight.[40] This was achieved through clearly defined review points, structured delegation of authority, and retained governance powers that allowed intervention when necessary. In contrast, Crossrail's experience highlights the risks of granting too much autonomy too early, reinforcing the need for sponsors to retain a structured challenge function to ensure delivery performance remains on track.[41]

AUSTRALIA

Case Study: Major Road Projects Victoria

Overview: Major Road Projects Victoria (MRPV) oversees the delivery of major road upgrades across the state.

Key outcomes: Improved cost predictability, enhanced risk management and stronger collaboration.

Success factors:

- KPI-linked contractor payments
- Early contractor involvement (ECI)
- Balanced risk sharing

2.2.4. Apply collaborative procurement principles to improve project resilience

The appropriate procurement model will depend on a project's complexity, risk profile and market conditions.[42] While not every project requires a fully collaborative model, key principles from approaches like alliancing can strengthen alignment, accountability and delivery outcomes.

Traditional procurement approaches often emphasise rigid contracts and aggressive risk transfer, which can lead to adversarial relationships, disputes and inefficiencies. Conversely, procurement models that integrate collaborative elements – such as early contractor engagement, risk-sharing mechanisms and incentive structures – have demonstrated greater resilience, adaptability and efficiency in managing large, complex projects.[43]

An example of this approach is Major Road Projects Victoria's (MRPV) Program Delivery Approach (PDA), which integrates collaborative procurement principles within a structured contract framework.[44] MRPV employs an Incentivised Target Cost contract, which links contractor payments to key performance

[39] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?
[40] Denicol, J., Davies, A., & Krystallis, I. (2020)., Global Infrastructure Hub. (2021). Thames Tideway Tunnel. Retrieved from https://infrastructuredeliverymodels.gihub.org/case-studies/thames-tideway-tunnel/.
[41] Denicol, J., Davies, A., & Krystallis, I. (2020)., UK Department for Transport. (2024).
[42] Eriksson, P. E., Volker, L., Kadefors, A., Lingegård, S., Larsson, J., & Rosander, L. (2019). Collaborative Procurement Strategies for Infrastructure Projects: A Multiple Case Study. Proceedings of the Institution of Civil Engineers - Management, Procurement and Law, 172(5), 197–205. https://doi.org/10.1680/jmapl.19.00016
[43] Eriksson, P. E., Volker, L., Kadefors, A., Lingegård, S., Larsson, J., & Rosander, L. (2019).
[44] Melbourne Law School (2023). Major Road Projects Victoria and its Project Delivery Approach. The University of Melbourne. Available at: https://law.unimelb.edu.au/__data/assets/pdf_file/0004/4759672/MRPV-and-its-Project-Delivery-Approach-September-2023.pdf

indicators rather than relying solely on traditional penalty mechanisms. This model aligns contractor incentives directly with delivery outcomes – tying cost efficiency, timelines, safety and quality to financial rewards. It encourages collaborative behaviours and early problem solving. By aligning contractor incentives with project objectives, MRPV's PDA has resulted in greater cost predictability, improved risk management and stronger collaboration.

While no single procurement model is universally applicable, projects can benefit from embedding key collaborative principles regardless of the chosen structure. These include:

- **Early engagement with delivery partners:** Engaging contractors, suppliers and delivery teams early helps refine project scope, cost estimates and risk allocation before contracts are finalised.
- **Balanced risk allocation:** Risks should be distributed to the parties best equipped to manage them, rather than defaulting to transferring all risks to contractors, which can drive up costs and fuel disputes.
- **Performance-based incentives:** Contract structures should encourage proactive problem-solving and efficiency, rather than relying solely on penalties that discourage collaboration.

STRATEGY, GOVERNANCE & PROCUREMENT: KEY INSIGHTS

Build strong collaborative relationships from the outset:

- Ensure early collaboration between sponsors, funders, delivery agencies and contractors to align priorities and long-term project outcomes.
- Foster a culture of trust and shared accountability through structured engagement mechanisms.

Introduce dynamic governance models:

- Design governance structures to adapt as projects progress, ensuring decision-making remains clear and agile.
- Integrate the right expertise at the right time, with a complimentary mix of skillsets.
- Formalise governance transitions between project phases to maintain continuity, knowledge transfer and accountability.

Ensure a Balance Between Sponsor Oversight and Earned Autonomy:

- Establish clear thresholds for delivery autonomy, ensuring responsibility is progressively earned based on demonstrated capability.
- Retain a sponsor challenge-and-assurance role to monitor performance while allowing delivery teams to operate effectively.

Apply Collaborative Procurement Principles:

- Select procurement models that reflect project complexity and risk.
- Engage contractors early to refine scope, improve risk allocation and strengthen cost certainty.
- Incorporate performance-based incentives to align contractor behaviours with project success.

3. Theme 3: Risk & Uncertainty

Megaprojects are inherently uncertain, yet many can suffer from poor early risk identification and rigid risk management frameworks, leading to cost overruns and delays. Denicol et al's (2020) research highlights that risk assessments often overlook market volatility, regulatory shifts, and supply chain disruptions, while static management approaches fail to adapt as conditions change.[45] To improve delivery certainty, Denicol et al (2020) suggests that projects should adopt proactive risk management, integrating scenario planning, adaptive strategies, and continuous monitoring to stay ahead of emerging challenges.

3.1. What challenges are we observing?

3.1.1. Poor early risk identification undermines project stability

Megaprojects often struggle to sufficiently identify and assess risks early in the project lifecycle, leading to cost escalations, scheduling disruptions, and increased complexity. Denicol et al's (2020) research highlights that megaprojects frequently rely on overly optimistic assumptions that fail to account for external volatility, such as regulatory hurdles, supply chain disruptions, and inflationary pressures.[46] When early-stage risk assessments are incomplete or inadequate, projects become vulnerable to unforeseen challenges that materialise as delivery progresses.

The New Dunedin Hospital project illustrates this issue.[47] Delayed property acquisitions and suboptimal early risk assessments led to cost increases and uncertainty around delivery timeframes.[48] The business case did not fully anticipate rising material costs and labour shortages or evolving clinical service requirements, which later necessitated revisions. This reflects a broader challenge in infrastructure delivery, where failure to conduct comprehensive early-stage risk assessments results in costly mid-project adjustments and prolonged timelines.

3.1.2. Static risk frameworks leave projects exposed to emerging challenges

Megaprojects operate in complex, high-risk environments where unforeseen challenges, such as market shifts, regulatory changes and technical uncertainties can emerge throughout delivery. While risk management frameworks are a standard feature of megaproject planning, they are often too rigid, failing to evolve alongside project realities. When risk strategies are not periodically reassessed and adjusted, projects struggle to proactively address emerging threats.

Denicol et al's (2020) research highlights that a key weakness in megaproject delivery is the lack of structured, ongoing risk reassessment mechanisms.[49] Many projects establish risk registers and mitigation strategies at the outset, but these frameworks are not always revisited with sufficient frequency or depth as projects evolve. Without a dynamic approach to risk management, project teams can be caught off guard by shifting conditions, leading to reactive rather than proactive decision-making. This rigidity is often cultural as much as structural – without a culture that supports transparency, teams may avoid raising concerns or miss opportunities to adjust before issues escalate.

[45] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?
[46] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?
[47] New Zealand Infrastructure Commission – Te Waihanga. (2023). New Dunedin Hospital Expert Review. Retrieved from https://tewaihanga.govt.nz/our-work/reviews/dunedin-hospital-independent-review.
[48] New Zealand Infrastructure Commission – Te Waihanga. (2023). New Dunedin Hospital Expert Review. Retrieved from https://tewaihanga.govt.nz/our-work/reviews/dunedin-hospital-independent-review.
[49] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?

3.2. What can we learn from international best practice?

3.2.1. Leverage scenario planning and real-world data to anticipate risks

International best practice highlights the importance of structured scenario planning and benchmarking frameworks to improve early-stage risk identification, enhance decision-making and reduce reliance on speculative forecasting.[50]

Scenario planning enables project teams to anticipate a range of potential risks, including market fluctuations, regulatory changes and logistical constraints. By simulating different delivery scenarios, teams can test mitigation strategies before risks materialise, ensuring that project plans remain resilient in dynamic environments. This approach shifts project risk management from a reactive process to a proactive, evidence-based practice.

The HS2 project, a high-speed railway linking London to major cities in the UK, exemplifies effective scenario planning.[51] HS2 Ltd implemented a comprehensive Risk Management Policy, integrating scenario planning to refine risk allocation and cost forecasts as the project evolved. This structured approach allowed the team to proactively address potential challenges, such as environmental concerns and stakeholder engagement, thereby enhancing decision-making and project resilience.

Benchmarking, on the other hand, ensures that cost estimates, delivery schedules and risk profiles are informed by data from comparable projects rather than speculative assumptions. Robust benchmarking frameworks allow project teams to assess efficiency, identify best practices and set realistic performance targets, ultimately improving decision-making at every stage of project delivery.

Crossrail, now known as the Elizabeth Line, serves as a notable example of leveraging benchmarking. [52] The project developed a comprehensive 'learning legacy' through benchmarking, enabling future projects to utilise real-world data for more accurate forecasting and risk assessment. This approach facilitated the identification of best practices and lessons learned, contributing to improved efficiency and effectiveness in project delivery. Beyond the UK, the Fehmarnbelt Tunnel (Denmark-Germany) applied benchmarking against similar tunnel

Benchmarking in Infrastructure Delivery

What is benchmarking?

Benchmarking is the process of systematically comparing infrastructure project unit costs, delivery performance and efficiency across different countries, regions, or sectors. By using real-world unit cost data, benchmarking helps identify where unit costs are higher than expected, what's driving these differences and what can be improved.

Why does benchmarking matter?

Large infrastructure projects involve significant public investment, and without clear unit cost comparisons it can be difficult to know whether projects are delivering value for money. Benchmarking provides a data-driven basis for improving cost estimation, procurement models and risk management.

In New Zealand, Te Waihanga's research has shown that some types of infrastructure – such as urban motorways, road tunnels and underground rail – tend to be more expensive compared to international counterparts.

The Lay of the Land: Benchmarking New Zealand's Infrastructure Delivery Costs, Te Waihanga (2022)

[50] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?
[51] High Speed Two (HS2) Limited. (2022). Risk Management Policy. Retrieved from https://www.hs2.org.uk/about-us/our-documents/risk-management-policy/
[52] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?

projects worldwide, enabling the project team to refine cost estimates, risk management and construction methodologies based on global best practice.[53]

Systematically embedding these practices within New Zealand's infrastructure delivery ecosystem could support more realistic risk assessments, reduce cost overruns and create a stronger evidence base for investment decisions.

3.2.2. Embed flexibility in project plans to manage evolving risks

Megaprojects operate in complex environments where risks and challenges evolve throughout the project lifecycle. However, rigid project planning frameworks often limit the ability to adjust when conditions change, leading to cost overruns, schedule delays and inefficiencies. Embedding structured flexibility into project planning ensures that risk mitigation strategies evolve alongside emerging challenges, allowing for mid-course corrections that maintain control over budgets and timelines.

Recent research highlights that project plans should integrate mechanisms that allow for iterative adjustments based on evolving project conditions.[54] This involves continuous risk reassessment, enabling teams to refine mitigation strategies as new intelligence becomes available.[55] Phased decision-making enhances project adaptability by incorporating predefined decision points that allow teams to reassess risks and adjust scope, procurement and resource allocation without triggering cascading disruptions.[56] Additionally, safeguarding contingency reserves is critical, with probabilistic risk assessments used to inform how financial buffers are allocated to prevent premature depletion.[57]

International best practice demonstrates the value of these approaches. Crossrail (UK) adopted an iterative risk review system, ensuring risk mitigation strategies evolved throughout the project lifecycle, preventing rigid adherence to outdated assumptions.[58]

By integrating continuous risk reassessment mechanisms, strategic allocation of contingency funds and structured governance processes that allow for iterative adjustments, projects can improve resilience and proactively manage emerging risks while maintaining cost and schedule control.

3.2.3. Capture and apply 'lessons learned' to improve future decision-making

Without systematic knowledge-capture, projects risk repeating past mistakes and failing to refine risk identification and mitigation techniques over time. Embedding structured learning into projects' delivery frameworks can help ensure that insights from past and ongoing projects actively inform future decision-making.[59]

Complex project management requires distributed learning processes, where knowledge creation does not happen in isolation but through continuous, iterative learning. Lessons-learned exercises should be a core requirement of project governance bodies, mandated throughout project delivery – not just at completion.[60] These activities should be supported by both formal and informal processes, ensuring that

[53] Risk Decisions. (n.d.). Fehmarnbelt Case Study. Retrieved from https://www.riskdecisions.com/risk-management-case-studies/fehmarnbelt-case-study/.
[54] Osipova, E., & Eriksson, P. E. (2013). Balancing control and flexibility in joint risk management: Lessons learned from two construction projects. International Journal of Project Management, 31(3), 391-399.
[55] Love, P. E. D., Wang, X., Sing, C. P., & Tiong, R. L. K. (2016). Determining the probability of project cost overruns. Journal of Construction Engineering and Management, 142(1)
[56] Ahern, T., Leavy, B., & Byrne, P. J. (2014). Complex project management as complex problem solving: A distributed knowledge management perspective. International Journal of Project Management, 32(8), 1371-1381
[57] Love, P. E. D., Wang, X., Sing, C. P., & Tiong, R. L. K. (2016)
[58] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?
[59] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?
[60] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?

leaders champion a culture of shared learning and iterative improvement rather than viewing lessons-learned as a compliance exercise.[61]

To enable effective learning, formalised mechanisms should include:

- structured post-mortem analyses at key milestones to capture insights while they are still relevant
- real-time documentation of risk mitigation effectiveness to ensure adjustments happen dynamically
- integrated feedback loops that allow teams to refine risk strategies in practice, rather than relying on retrospective reviews.[62]

International best practice demonstrates the benefits of structured learning mechanisms. Crossrail (UK) developed the Learning Legacy initiative, systematically documenting project challenges and lessons learned across its delivery phases.[63] This ensured that lessons in procurement, risk management and governance were available for future infrastructure projects, reducing knowledge fragmentation and enhancing industry-wide capability. Structured knowledge transfer mechanisms prevent organisations from relying solely on individual's experience, instead embedding institutional learning that strengthens long-term project resilience[64].

There is benefit from a more structured approach to knowledge management, ensuring that risk mitigation strategies are not only designed but also tested, documented and refined over time. By integrating structured learning mechanisms within project delivery frameworks agencies can strengthen their ability to navigate complexity, reduce cost overruns and improve project outcomes. This should be supported by strong project culture, where open communication is encouraged, risks are surfaced early and learning is embedded into daily practices.

UNITED KINGDOM

Case Study: Crossrail

Overview: Crossrail, now known as the Elizabeth Line, is one of Europe's largest infrastructure projects. It aims to enhance London's rail capacity by 10% through a new east-west route.

Key outcomes:
Extensive knowledge repository: over 800 documents, technical papers and templates made publicly available.
Dedicated learning events to facilitate direct knowledge transfer.

Success factors:

- Proactive knowledge sharing.
- Structured documentation.
- Strategic partnerships e.g. Association for Project

[61] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?
[62] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?
[63] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?
[64] Osipova, E., & Eriksson, P. E. (2013).

RISK & UNCERTAINTY: KEY INSIGHTS

Improve Early Risk Identification:

- Use scenario planning and benchmarking to anticipate risks.

Make Risk Management Adaptive, Not Static:

- Regularly reassess risks and refine mitigation strategies.
- Design projects plans to allow for iterative adjustments as risks emerge.

Capture and Apply Lessons Learned:

- Mandate formalised lessons-learned exercises at key milestones, not just at completion.
- Share real-time risk insights to improve future project resilience.

4. Theme 4: Stakeholder engagement & management

Stakeholders in megaprojects are diverse and complex, with competing priorities, power dynamics and expectations. Effective engagement with stakeholders can be the key to minimising delays, managing risks and ensuring public and political support. Without clear engagement, projects can face legal challenges, scope changes, project opposition and misalignment between government, industry and communities. Stakeholders can be generally categorised into three primary groups:[65]

- **Institutional stakeholders:** Government agencies, regulators and funders responsible for policy, oversight and financial approvals.
- **Delivery stakeholders:** Project partners, contractors and infrastructure providers tasked with designing, constructing and managing the project.
- **Public stakeholders**: Communities, businesses, iwi and advocacy groups who are directly or indirectly affected by the project.

Denicol et al (2020) identifies three major challenges in managing and engaging with stakeholders: institutional complexity, stakeholder fragmentation and poor community engagement.[66] To address these, Denicol et al (2020) emphasises structured engagement frameworks, transparent milestone communication and governance mechanisms that embed transparency.[67]

4.1. What challenges are we observing?

4.1.1. Institutional complexity drives delays

Megaprojects must navigate numerous and overlapping regulations, complex decision-making structures and political influences. Institutional complexity also extends to the need to interact across multiple organisations, each with its own governance structures, priorities and constraints. Denicol et al (2020) highlight that project leaders and clients often struggle to navigate this broader landscape, including the roles, responsibilities and power dynamics between agencies, regulators and stakeholders. [68] This lack of clarity leads to inefficiencies, approval delays and misaligned decision-making, ultimately impacting project timelines.[69]

This challenge is evident in New Zealand infrastructure projects, where multiple approvals from central and local government agencies can result in delays and uncertainty due to inconsistent regulatory interpretations and fragmented governance structures.[70] Our 2023 transparency report (*Transparency within large publicly funded New Zealand infrastructure projects*) highlights that local authorities may lack the capacity to manage the governance requirements of large-scale projects, contributing to approval bottlenecks and inefficiencies.[71] At the same time, some central government reforms and planning

[65] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?
[66] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?
[67] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?
[68] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?
[69] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?
[70] New Zealand Infrastructure Commission – Te Waihanga. (2023). Transparency within large publicly funded New Zealand infrastructure projects. Retrieved from https://tewaihanga.govt.nz/our-work/research-insights/transparency-within-large-publicly-funded-new-zealand-infrastructure-projects.
[71] New Zealand Infrastructure Commission – Te Waihanga. (2023). Transparency within large publicly funded New Zealand infrastructure projects.

processes have historically added further uncertainty, with inconsistencies in approval pathways and regulatory frameworks contributing to complexity at the national level.[72]

4.1.2. Stakeholder fragmentation limits transparency and meaningful input

Stakeholder fragmentation occurs when megaprojects must coordinate and align multiple external stakeholders – each with different priorities, interests, and levels of influence – without a structured process to reconcile competing objectives. Denicol et al (2020) highlight that stakeholder misalignment leads to funding uncertainty, project scope disputes and regulatory bottlenecks, slowing project delivery.[73]

Our transparency report found that some agencies engage stakeholders proactively, while others delay sharing key information until after major decisions are made, inadvertently limiting meaningful input.[74] Further, while some agencies follow Treasury's Better Business Case (BBC) framework, others do not, contributing to uneven transparency and accountability across projects.[75] This inconsistency can also blur responsibilities for stakeholder engagement, making it unclear who should communicate what and when. For example, communities, iwi and businesses may receive inconsistent or contradicting updates on project impacts, eroding trust and fuelling opposition.

4.1.3. Poor community engagement fuels opposition

Limited communication, poor transparency and reactive engagement strategies frequently fuel public opposition and political intervention. This lack of transparency can reinforce public scepticism, fuel misinformation and intensify opposition, particularly when major decisions – such as route selection, environmental approvals, and project funding – are not openly communicated. When communities feel excluded from decision-making, they can mobilise against projects, leveraging media and political pressure to delay or block delivery.[76]

In New Zealand, gaps in transparency and the accessibility of project information have the potential to erode public trust. Our Transparency Report found that more than half of all business case and assurance case documents for major projects are inaccessible, preventing meaningful public scrutiny.[77] It found that 55.5% of business cases were unavailable, limiting the public's ability to evaluate project decision-making, while 100% of ex-post evaluations were not made public, meaning New Zealanders have no way to assess whether projects delivered on their intended benefits.[78] Regularly publishing ex-post evaluations would allow communities to gauge whether projects have delivered as promised, improving transparency and helping refine future project planning.

4.2. What can we learn from international best practice?

4.2.1. Standardise engagement frameworks with appropriate adaptability

Denicol et al (2020) advocates for a structured, proactive approach to stakeholder engagement in megaprojects, emphasising clear roles, continuous engagement and formalised processes for resolving

[72] New Zealand Infrastructure Commission – Te Waihanga. (2023). Transparency within large publicly funded New Zealand infrastructure projects.
[73] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?
[74] New Zealand Infrastructure Commission – Te Waihanga. (2023). Transparency within large publicly funded New Zealand infrastructure projects
[75] New Zealand Infrastructure Commission – Te Waihanga. (2023). Transparency within large publicly funded New Zealand infrastructure projects
[76] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?
[77] New Zealand Infrastructure Commission – Te Waihanga. (2023). Transparency within large publicly funded New Zealand infrastructure projects
[78] New Zealand Infrastructure Commission – Te Waihanga. (2023). Transparency within large publicly funded New Zealand infrastructure projects

tensions. A standardised, cross-agency, stakeholder engagement framework for New Zealand could embed these principles into practice, ensuring consistency across projects while remaining adaptable to project-specific needs. A structured framework can help mitigate institutional complexity by clarifying responsibilities, ensuring inter-agency coordination and providing a unified approach to stakeholder communication.

Some international projects highlight the benefits of structured engagement over ad hoc approaches. Crossrail (UK) developed a Stakeholder Engagement Strategy with clear milestones, regular updates and centralised communication through an online hub.[79] Thames Tideway Tunnel (UK) established a Stakeholder Advisory Group, aligning diverse interests through formal engagement structures.[80] The Australian Department of Health's Stakeholder Engagement Framework provides a potential model for standardisation, offering a structured yet flexible approach.[81]

Australian Department of Health Stakeholder Engagement Framework

The Australian Department of Health's Stakeholder Engagement Framework provides a structured yet flexible model for meaningful stakeholder participation. Key features include:

Guiding Principles: Engagement is driven by five core principles – purposeful, inclusive, timely, transparent and respectful – to ensure that all stakeholders can contribute effectively.

Five-Step Model: A clear process – Think, Plan, Prepare, Engage, Evaluate – guides engagement activities from design through review, supporting continuous improvement and accountability.

Levels of Engagement Matrix: This tool ensures stakeholders are involved appropriately, based on their influence and interest, which helps tailor communication and decision-making processes.

Risk Management and Inclusivity: The framework addresses common challenges, including engaging culturally diverse groups and ensuring accessibility for all, thereby mitigating risks related to stakeholder disengagement.

A standardised, cross-agency, stakeholder engagement framework for New Zealand megaprojects could help ensure clear, structured, and ongoing engagement throughout the lifecycle of megaprojects. Drawing from Denicol et al's (2020) findings, international best practice and structured engagement models, the framework should include guidance on:

- **Stakeholder Identification & Analysis:** Clearly define stakeholders, including their interests, power, influence and expectations, while identifying potential conflicts.
- **Core Engagement Principles:** Engagement should be timely, transparent, respectful, inclusive and continuous to prevent stakeholder disengagement mid-project.
- **Roles & Responsibilities:** Clearly define who is responsible for engaging with whom, ensuring consistent and accountable engagement across government agencies, delivery partners, iwi and communities.
- **Structured Engagement Processes:** Define when and how stakeholders should be engaged across all project phases, embedding engagement into procurement and governance to make it integral to decision-making.
- **Dispute Resolution & Risk Mitigation:** Provide clear mechanisms for resolving stakeholder conflicts, including escalation pathways and political sensitivity guidance to prevent engagement failures from delaying projects.

[79] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?
[80] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?
[81] Australian Government Department of Health. (2020). Stakeholder Engagement Framework. Retrieved from https://www.health.gov.au/sites/default/files/stakeholder-engagement-framework.pdf.

4.2.2. Communicate project milestones and decision-making processes openly with the public

Opaque decision-making and inconsistent communication often undermine public trust in megaprojects, leading to stakeholder disengagement, public scepticism and regulatory delays.[82] Transparency reduces 'noise'. By openly sharing key project milestones and decision rationales, agencies can prevent misinformation, maintain social license and build long-term public confidence.[83]

NEW ZEALAND

Case Study: SH25A Taparahi Bridge

Overview: Critical infrastructure recovery initiative led by NZTA, to restore State Highway 25A after the significant weather events of January 2023.
Key outcomes: Completed in less than 12 months, reopening in December 2023 - three months ahead of schedule and $7 million under budget.
Success factors:

- Effective communication and engagement through regular 'town hall' meetings, newsletters and online updates. This fostered high public interest and support, contributing to a delivery-focused culture across the team.

Best practice projects demonstrate the benefits of proactive transparency in communication with communities. Sydney Metro West developed comprehensive community communication strategies, including real-time project dashboards and regular public updates, ensuring that the community remained informed of construction progress, changes and important decisions. This approach fostered public trust and facilitated smoother project delivery.[84]

To build trust and prevent misinformation, a structured approach to public transparency should include:

- proactive publication of key project milestones and decisions, ensuring the public understands what is happening and why
- clear, structured transparency measures, including business case disclosures, risk assessments, and ex-post evaluations, so that the public can scrutinise decisions and hold agencies accountable.[85]

4.2.3. Embed transparency practices into governance structures

Embedding transparency into project governance structures means ensuring that transparency is not just a principle but a practice that actively shapes decision-making, stakeholder engagement and project oversight. Transparency should go beyond publishing documents – it requires structured governance mechanisms that ensure engagement goes beyond compliance and is continuous, and accountable. Without mechanisms to track and audit transparency, projects risk engagement efforts becoming a tick-box exercise rather than a genuine process.

Our *Transparency within large publicly funded infrastructure projects* report emphasises that transparency requires structured processes that explicitly outline who does what, and who is responsible for ensuring transparency is upheld. The report also stresses that transparency is meaningful when public institutions are answerable. That is, when they can be questioned and held to account by the public, oversight

[82] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?
[83] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?
[84] Sydney Metro. (2022). Sydney Metro West: Overarching Community Consultation Strategy. Transport for NSW. Retrieved from https://www.sydneymetro.info/sites/default/files/2022-08/West-OCCS.pdf.
[85] New Zealand Infrastructure Commission – Te Waihanga. (2023). Transparency within large publicly funded New Zealand infrastructure projects

bodies or other stakeholders. To enable this, transparency should not be treated as a compliance exercise but proactively embedded in decision-making processes and project governance.[86]

Best practice demonstrates how embedding transparency into governance structures safeguards long-term accountability. The Netherlands' Multi-Year Programme for Infrastructure, Spatial Planning and Transport (MIRT) integrates real-time project tracking, structured reporting and independent audits, to ensure transparency remains central throughout project lifecycles. Under MIRT, the Ministry of Infrastructure and Water Management (MIWM) actively monitors all projects, publishing updates in real-time on the MIRT platform and in an annual MIRT Overview document. This structured, transparent, and consultative approach has streamlined project preparation and execution in the Netherlands.[87]

To ensure governance structures actively support transparency in stakeholder engagement, projects should incorporate:

- define clear accountability for transparency at every stage of a project, with designated roles and responsibilities.
- do periodic transparency audits, not only assessing compliance but also the quality and effectiveness of stakeholder engagement.[88]

STAKEHOLDER ENGAGEMENT & MANAGEMENT: KEY INSIGHTS

Standardise Stakeholder Engagement Frameworks to Address Institutional Complexity:

- Develop a structured, cross-agency engagement framework to improve coordination across agencies, funders, and regulators.
- Clearly define stakeholder roles, responsibilities, and engagement processes to reduce misalignment and regulatory delays.

Improve Transparency to Build Trust and Reduce Opposition:

- Proactively publish key project milestones and decisions to ensure the public understands what is happening and why.
- Implement structured transparency measures such as business case disclosures and ex-post evaluations to improve public accountability and prevent misinformation.

Embed Transparency into Governance Structures:

- Establish clear accountability for stakeholder engagement at every stage of a project.
- Implement periodic transparency audits to assess the quality and effectiveness of engagement efforts.

[86] New Zealand Infrastructure Commission – Te Waihanga. (2023). Transparency within large publicly funded New Zealand infrastructure projects

[87] Global Infrastructure Hub. (2018). The Netherlands: Procurement strategies for major infrastructure projects. Retrieved from https://cdn.gihub.org/umbraco/media/2343/gih_procurement-report_case-study_netherlands_final_web.pdf.

[88] New Zealand Infrastructure Commission – Te Waihanga. (2023). Transparency within large publicly funded New Zealand infrastructure projects

5. Theme 5: Leadership & Capable Teams

Strong leadership capabilities and accountability among project leaders and teams with the right skillsets ensure that teams can navigate challenges with agility, improving efficiency and driving long-term value. When leadership roles are well-defined and project teams are equipped with the right skills, projects are more likely to stay on track and deliver intended outcomes. Denicol et al (2020) identifies three key areas where gaps in project leadership and capability undermine project success:[89]

- deficient project leadership
- competency gaps in teams
- organisational capability weaknesses.

5.1. What challenges are we observing?

5.1.1. Project leadership deficiencies create silos and undermine effective decision-making

Strong leadership is essential for megaproject success, requiring both capable individuals and clear governance structures that empower them. Denicol et al (2020) highlights that leadership deficiencies arise when projects lack dedicated, accountable leaders and when leadership structures fail to provide clear authority and coordination.[90] Without both, project teams can become siloed and misaligned, decision-making can be inconsistent, and governance gaps may emerge, increasing risks and inefficiencies.

New Zealand's Transmission Gully project illustrates these challenges. The Post-Construction Review found that early governance structures failed to support effective decision-making, forcing teams to rely on individual perseverance rather than a structured leadership framework.[91] Additionally, our 2024 *How is Our Infrastructure Tracking?* report notes that New Zealand lacks a formal development pathway for major project leaders, limiting the public sector's ability to manage complex infrastructure projects.[92]

5.1.2. Competency gaps and high staff turnover undermine team stability

Frequent staff turnover disrupts institutional knowledge and continuity, particularly in large, complex projects. Without a structured approach to recruit, train and retain professionals with specialised megaproject experience, project teams can struggle to maintain momentum, increasing delivery risks. Denicol et al (2020) highlight that poorly-defined skill requirements often result in project teams lacking the necessary expertise, weakening efficiency and project success.[93] A shortage of experienced professionals creates a self-reinforcing cycle, where gaps in capability lead to higher project risks, governance challenges and delivery failures[94].

The City Rail Link (CRL) Phase 1 Preliminary Lessons Learnt Report illustrates these challenges. The report found that governance structures were not well-equipped to manage the complexity of a megaproject,

[89] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?
[90] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?
[91] New Zealand Infrastructure Commission | Te Waihanga. (2024). Transmission Gully Post-Construction Review – Executive Summary & Insights for the Future. Retrieved from https://tewaihanga.govt.nz.
[92] New Zealand Infrastructure Commission | Te Waihanga (2024). How is our infrastructure tracking? Monitoring progress against New Zealand's first Infrastructure Strategy. Retrieved from https://tewaihanga.govt.nz.
[93] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?
[94] Denicol, J., & Davies, A. (2022). The Megaproject-based Firm: Building programme management capabilities to deliver megaprojects. International Journal of Project Management 40(5), 505–516.

partly due to key decision-makers lacking megaproject delivery experience.[95] While the Sponsors' Representative played a critical governance role, interviewees noted that many individuals in this position had policy backgrounds rather than megaproject expertise, leading to misalignment and governance difficulties[96]. The New Dunedin Hospital (NDH) Expert Review found that changes in key roles, including senior responsible owner (SRO), have contributed to project uncertainty, reinforcing the risks associated with high staff turnover and continuity gaps in complex infrastructure projects.[97]

5.1.3. Capability gaps leave clients unprepared to navigate megaproject complexities

When organisations lack the internal capability to manage complex procurement, political and operational demands, they struggle to coordinate project stages and stakeholder expectations.[98] Inconsistent standards across government agencies further compound these challenges. Denicol et al (2020) highlight that many delivery organisations lack the necessary expertise to manage different project phases effectively, particularly in transitioning between them.[99] Poor handovers between project phases create gaps in institutional knowledge, weakening project oversight and increasing delivery risks[100].

The Transmission Gully Post-Construction Review underscores the importance of having "*the right teams of people with the necessary capability across all stages of the project from initial planning to procurement and delivery*."[101] In this case, insufficient assessment of whether the procuring entity had the necessary skills, resources and experience resulted in difficulties managing supplier relationships and contractual arrangements. Similarly, the New Zealand Infrastructure Strategy highlights the need for consistent standards and processes across projects, sectors and agencies to strengthen the government's ability to act as a "sophisticated client." [102] Without this alignment, capability gaps persist, limiting the public sector's ability to effectively oversee and deliver complex infrastructure projects.

5.2. What can we learn from international best practice?

5.2.1. Invest in leadership development to enhance strategic and operational capabilities

Strong leadership goes beyond technical oversight: it shapes culture, manages risk and ensures that policy and delivery remain connected. Governments that prioritise leadership development seek to ensure these skills are embedded across sponsors, client agencies and delivery teams. Government agencies should act as sophisticated clients – making informed investment decisions, providing clear

[95] New Zealand Infrastructure Commission – Te Waihanga. (2024). City Rail Link Interim Review: Phase 1 – Preliminary Lessons Learnt Findings. Retrieved from https://tewaihanga.govt.nz/our-work/reviews/city-rail-link-lessons-learnt.
[96] It is acknowledged that the CRL Sponsors representatives do not share this view and have, subsequent to the Review report, appointed assurance managers to mitigate risk.
[97] New Dunedin Hospital Expert Review. Retrieved from https://tewaihanga.govt.nz/our-work/reviews/dunedin-hospital-independent-review.
[98] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance? Denicol, J., & Davies, A. (2022). The Megaproject-based Firm: Building programme management capabilities to deliver megaprojects. International Journal of Project Management 40(5), 505–516.
[99] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance? Zani, C., Denicol, J., & Broyd, T. (2024). Organisation design in megaprojects: a systematic literature review and research agenda. International Journal of Project Management 42(6), 102634. Zani, C., Denicol, J., & Broyd, T. (2024). The four coordination roles of clients when designing megaproject organizations. Project Management Journal 55(5), 558–579.
[100] Zhang, X., Denicol, J., Chan, P.W., & Le, Y. (2024). Designing the transition to operations in large inter-organisational projects: Strategy, structure, process, and people. Journal of Operations Management 70(1), 107-136.
[101] New Zealand Infrastructure Commission | Te Waihanga. (2024). Transmission Gully Post-Construction Review – Executive Summary & Insights for the Future. Retrieved from https://tewaihanga.govt.nz.
[102] New Zealand Infrastructure Commission | Te Waihanga (2022). Rautaki Hanganga o Aotearoa: New Zealand Infrastructure Strategy 2022-2052. Retrieved from https://tewaihanga.govt.nz.

governance and ensuring alignment between policy, funding, and delivery. Leading infrastructure jurisdictions have embedded targeted programs to cultivate these capabilities, ensuring that sponsors can effectively govern projects, project directors can manage complexity, and delivery teams can operate with strategic clarity.

Leadership development should be intentional, structured, and continuous, rather than left to individual career progression. Project sponsors should have the capability to provide clear direction, act as informed decision-makers, and manage trade-offs effectively. Project directors require the capability to integrate strategic objectives with operational realities, balancing risk management with execution. This requires explicit investment in leadership skills, particularly in areas such as communication, emotional intelligence (EQ), and collaborative decision-making.

Leadership frameworks in leading infrastructure markets integrate clear competency expectations, progression pathways and tailored training programs that reflect the complexity of major projects. A core principle in these frameworks is the recognition that effective leadership is a form of risk management, ensuring that decisions are made with confidence, coordination is maintained across disciplines, and project objectives remain on track despite external disruptions. The Victoria Major Transport Infrastructure Authority (MTIA) has invested in leadership development initiatives, such as the Australian Major Projects Leadership Academy (AMPLA), to build leadership capability in the transport sector.[103] The UK's Infrastructure and Projects Authority (IPA) has developed capability frameworks that set clear expectations for both project sponsors and project directors, ensuring alignment between policy, funding and execution.[104]

In New Zealand, the Infrastructure Strategy recommended the establishment of a Major Projects Leadership Academy. While the Government responded positively and the idea was

International Infrastructure Leadership Training

Many leading infrastructure jurisdictions have recognised the critical role of leadership in major project delivery and have implemented training programs to build capability across government agencies and delivery teams.

Australia
- Australian Major Projects Leadership Academy (AMPLA)
- Women in Transport (WiT) Leadership Development Scholarship Program

United Kingdom
- Major Projects Leadership Academy (University of Oxford)
- Major Infrastructure Delivery MBA (University College London)

Canada
- Institute for Public Infrastructure Leadership (IPIL)

AUSTRALIA

Case Study: Australian Major Projects Leadership Academy (AMPLA)

AMPLA is a specialised leadership development program designed to equip project directors and senior government officials with the skills needed to oversee complex megaprojects effectively. It is a year-long program delivered by Stanford University and McKinsey & Company, combining in-person experiences, small group sessions and on-line modules.

Key learning areas:
- strategic leadership in infrastructure delivery
- commercial acumen and risk management
- stakeholder engagement and decision-making under uncertainty.

To find out more visit www.vic.gov.au/australian-major-projects-leadership-academy.

[103] Victorian Government (n.d.). Australian Major Projects Leadership Academy. Retrieved from https://www.vic.gov.au/australian-major-projects-leadership-academy

[104] UK Infrastructure and Projects Authority (2023). The Role of the Senior Responsible Owner (SRO). Retrieved from https://assets.publishing.service.gov.uk/media/646769cb43fe01000cac65b0/2023-04-11-V2-AFIGT-The-role-of-the-senior-responsible-owner-2.pdf

UK Infrastructure and Projects Authority (2021). Project Delivery Capability Framework (PDCF) – Version 3. Retrieved from https://assets.publishing.service.gov.uk/media/65561f36046ed4000d8b9a33/PDCF-V3.pdf

explored, current economic constraints mean the focus has shifted to more targeted, lower-cost initiatives such as short courses, networks and targeted learning resources. The Commission's Project Leadership Capability Framework represents a significant step toward improving leadership standards, particularly at the project director level.[105] Identifying the capabilities and personal attributes required of a Project Director will help the public sector become a more sophisticated client, ensuring that project directors can effectively bridge the gap between policy intent and delivery reality. The Commission's recently-released best practice guides for recruiting Project Directors and appointing SROs will help ensure the right leaders are in place from the start – improving accountability, continuity, and the likelihood of successful project delivery. The regular offering of SRO small group training sessions will also build a shared understanding of the role, ensuring that SROs are equipped with the skills needed to provide clear direction.

5.2.2. Build integrated teams that align sponsors, clients, and contractors from the outset

Fragmented teams increase project risk by causing delays, scope misalignment and cost overruns.[106] Early alignment among sponsors, clients and contractors fosters a shared vision and promotes accountability, ensuring that infrastructure projects are delivered efficiently and with minimal disputes.

Crossrail and Heathrow's Terminal 5 projects both demonstrate the benefits of integrated team models. Both projects applied structured integrated team models, aligning stakeholders under common objectives and reducing conflicts between sponsors and delivery teams.[107] These models established clear governance processes, encouraged proactive risk-sharing and embedded mechanisms for continuous alignment between sponsors, clients, and contractors.

Projects should embed formal integration strategies from project inception, ensuring that sponsors, clients and contractors collaborate effectively, rather than working in isolation[108]. Silos occur when different teams or organisations operate independently, with limited coordination, shared objectives or communication. Strengthening the sponsor-client connection is particularly critical, with Denicol et al (2020) emphasising that this relationship *"should be managed through a clear process and by a team with experience and track record from both sides."*[109] As Denicol et al (2020) highlights, successful projects *"combine and reconcile contrasting, complementary and interrelated perspectives to promote motivation toward common project goals."*[110] Early alignment fosters shared accountability, reduces adversarial relationships and enhances project adaptability as challenges emerge.

5.2.3. Invest in teams with a proven track record on both sides

Major infrastructure projects benefit when teams from sponsor and delivery authorities include team members with direct experience on the other side of the project. Misalignment frequently occurs when sponsors lack delivery-side experience, leading to impractical risk allocation, or when delivery teams don't understand governance and funding constraints, causing execution challenges.

[105] New Zealand Infrastructure Commission | Te Waihanga. (2025). Project Leadership Capability Framework Project leadership capability framework | Leadership & Learning | Te Waihanga

[106] New Zealand Infrastructure Commission | Te Waihanga. (2024). Transmission Gully Post-Construction Review – Executive Summary & Insights for the Future. Retrieved from https://tewaihanga.govt.nz. New Zealand Infrastructure Commission – Te Waihanga. (2023). New Dunedin Hospital Expert Review. Retrieved from https://tewaihanga.govt.nz/our-work/reviews/dunedin-hospital-independent-review.

[107] Crossrail Ltd. (2016). Crossrail People Strategy. Retrieved from https://learninglegacy.crossrail.co.uk/documents/crossrail-people-strategy/

Global Infrastructure Hub (n.d.). Heathrow Terminal 5 Case Study. Retrieved from https://infrastructuredeliverymodels.gihub.org/case-studies/heathrow-terminal-5/

[108] Denicol, J., Davies, A., & Pryke, S. (2021). The organisational architecture of megaprojects. International Journal of Project Management 39(4), 339–350.

[109] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?

[110] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?

Denicol et al (2020) emphasise that the relationship between sponsor and client is a critical structural element of major projects and must be managed through a clear process by a team with experience and a track record from both sides.[111]

Investing in professionals with experience on both sides can help strengthen decision-making, mitigate risks earlier and improve knowledge retention. To achieve this, projects should:

- endeavour to ensure that both sponsor and delivery teams include professionals with prior experience working on the other side of the project
- balance experience and seniority within project leadership to strengthen governance and risk management
- develop structured career pathways (e.g., secondments, rotations, and industry-government exchanges) to embed expertise across both sides.

LEADERSHIP & CAPABLE TEAMS: KEY INSIGHTS

Invest in Leadership Development

- Invest in leadership development that is intentional, structured, and continuous.

Build Integrated Teams that Align Sponsors, Clients, and Contractors from the Outset:

- Implement structured team integration strategies to prevent silos and improve collaboration.
- Foster shared accountability and early alignment to reduce conflicts and scope misalignment.

Invest in Teams with a Proven Track Record on Both Sides:

- Ensure project teams include members with experience in both sponsor and delivery roles.
- Balance experience and seniority across leadership teams to improve governance and decision-making.
- Develop career pathways, secondments, and industry exchanges to embed expertise across sponsor and delivery teams.

[111] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?

6. Theme 6: Supply chain integration & coordination

Supply chain efficiency and reliability are fundamental to the successful delivery of complex infrastructure projects[112]. Ensuring supply chains are coordinated, that procurement strategies are well considered and clear and that collaborative contracting approaches are used when appropriate can help ensure projects stay on schedule, reduce cost uncertainties and drive long-term value.[113]

For example, delivering a tunnelled rail line requires a tightly sequenced series of activities – from civil works to track laying, to systems integration – each dependent on the timely availability of materials, equipment and skilled labour. In a well-integrated supply chain, these elements are planned in coordination, with clear dependencies, shared schedules and communication across contractors.

When supply chains are fragmented or contracts misaligned, inefficiencies can arise, increasing risk exposure and reducing project resilience. Denicol et al's (2020) research links project cost and time overruns with systemic failures in supply chain coordination, risk allocation and procurement models.[114] Our project reviews have found similar challenges in several local infrastructure projects.

6.1. What challenges are we observing?

6.1.1. Fragmented supply chains lead to inefficiencies and delays

Multiple tiers of subcontractors, with unclear roles and poorly coordinated planning, reporting and quality assurance processes can result in duplication of work and ultimately cause delivery delays. Without a central coordinator to integrate workstreams and manage interdependencies, project teams can become siloed and disconnected. This lack of coordination makes it harder to identify and resolve issues early, resulting in reactive rather than proactive problem-solving. Over time, this increases risk exposure and leads to delivery inefficiencies. [115]

[112] Denicol, J. (2020). Managing megaproject supply chains: Life after Heathrow terminal 5. In S. Pryke (Ed.), Successful construction supply chain management: Concepts and case studies (2nd ed. pp. 213–235). John Wiley & Sons Ltd. Stefano, G., Denicol, J., Broyd, T., & Davies, A. (2023). What are the strategies to manage megaproject supply chains? A systematic literature review and research agenda. International Journal of Project Management 41(3), 102457.

[113] Denicol, J., Davies, A., & Krystallis, I. (2020)., Infrastructure and Projects Authority (IPA). (2021). Transforming Infrastructure Performance: Roadmap to 2030. https://assets.publishing.service.gov.uk/media/613b7b7fd3bf7f05b5a902db/IPA_TIP_Roadmap_to_2030_v6__1_.pdf , Organisation for Economic Co-operation and Development (OECD). (2021). Procurement Strategy in Major Infrastructure Projects: Piloting a New Approach in Norway.

[114] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance? Denicol, J. (2020). Managing megaproject supply chains: Life after Heathrow terminal 5. In S. Pryke (Ed.), Successful construction supply chain management: Concepts and case studies (2nd ed. Pp. 2013-235). John Wiley & Sons Ltd. Stefano, G., Denicol, J., Broyd, T., & Davies, A. (2023). What are the strategies to manage megaproject supply chains? A systematic literature review and research agenda. International Journal of Project Management 41(3), 102457.

[115] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance? Zani, C., Denicol, J., & Broyd, T. (2024). Organisation design in megaprojects: a systematic literature review and research agenda. International Journal of Project Management 42(6), 102634. Zani, C., Denicol, J., & Broyd, T. (2024). The four coordination roles of clients when designing megaproject organizations. Project Management Journal 55(5), 558–579. Muruganandan, K., Davies, A., Denicol, J., & Whyte, J. (2022). The dynamics of systems integration: Balancing stability and change on London's Crossrail project. International Journal of Project Management 40(6), 608–623.

Traditional vs. Collaborative Contracting Models

Traditional (Transactional/ Adversarial) Contracts

- Risk is primarily allocated to contractors and subcontractors, with clients expecting the supply chain to manage unforeseen costs.
- This can lead to variation claims and extension of time (EOT) requests, as contractors seek to adjust for unexpected challenges.
- More defined contractual boundaries can sometimes result in less flexibility to adapt to project changes.

Collaborative Contracting Models

- Risk is shared between the client and delivery teams, with mechanisms like alliancing, target-cost contracts, and open-book pricing.
- Requires proactive project management and governance, fostering a partnership approach to decision-making and risk mitigation.

The Transmission Gully Post-Construction Review highlights the challenges of managing complex supply chains in large infrastructure projects.[116] With multiple tiers of subcontractors and delivery partners, strong coordination was needed to align workstreams. The review found that supply chain fragmentation caused inefficiencies, with misaligned roles and responsibilities affecting timelines. Quality and compliance processes also faced challenges, with documentation and approvals sometimes lagging behind construction progress, leading to reactive rather than proactive risk management.

6.1.2. Poorly aligned contracts shift risk instead of managing it

Traditional infrastructure contracts are often cited as an important source of inefficiency in megaprojects.[117] These contracts, typically characterised as transactional or adversarial, often push risk down the supply chain, discouraging collaboration and increasing the likelihood of disputes. Rigid contracts further compound these issues by limiting the ability to adapt to unforeseen challenges such as ground conditions, regulatory delays or market disruptions.

The Transmission Gully review highlights that the project was underpriced from the outset, with an affordability threshold that was too low to realistically cover project risks.[118] Bidders accepted financial risk to meet the contract's pricing constraints, leading to disputes and mid-project renegotiations. The review concluded that "*because of the low AT set during the procurement phase, the TG Project was effectively always under-priced given the complex risks involved*."[119]

6.1.3. Balancing cost and long-term value in procurement

Competitive tendering can play a role in ensuring value for money, but a strong emphasis on lowest-cost bidding can often create trade-offs between price, quality and long-term project outcomes. If contracts focus primarily on price rather than broader value considerations, there is a risk that opportunities for collaboration, innovation and sustainable delivery models may be reduced.

The Christchurch Justice and Emergency Services Precinct serves as a New Zealand example of the risks associated with lowest-cost competitive tendering. Procured under a traditional, price-driven model, following the Canterbury earthquakes, the project has been criticised for its outcomes. Some have labelled it "exhibit A" of how prioritising the lowest bid over long-term value can undermine project

[116] New Zealand Infrastructure Commission | Te Waihanga. (2024). Transmission Gully Post-Construction Review – Executive Summary & Insights for the Future. Retrieved from https://tewaihanga.govt.nz.
[117] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?
[118] New Zealand Infrastructure Commission | Te Waihanga. (2024). Transmission Gully Post-Construction Review – Executive Summary & Insights for the Future. Retrieved from https://tewaihanga.govt.nz.
[119] New Zealand Infrastructure Commission | Te Waihanga. (2024). Transmission Gully Post-Construction Review – Executive Summary & Insights for the Future.

success.[120] These concerns are reflected in broader industry research. A 2018 Construction Industry Survey found that an overemphasis on lowest-price bidding was a major issue, with 81% of large construction firms reporting that client focus on cost minimisation has a "high to very high" negative impact on project outcomes.[121]

6.2. What can we learn from international best practice?

International lessons in supply chain integration and coordination suggest that fostering long-term partnerships, breaking projects into modular components and implementing early contractor involvement can reduce risks, enhance efficiency and drive innovation[122].

6.2.1. Foster long-term collaborative contracting to build trust and reduce inefficiencies

Short-term, transactional contracting models – often resulting from competitive tendering processes that prioritise cost certainty and control – can create inefficiencies over the life of a project by discouraging collaboration and increasing risk transfer between parties. Traditionally, competitive tendering has been used as the primary commercial lever to drive efficiency. However, as Denicol et al (2020) highlight, this model often leads to duplicated overheads. *"Typically, contracts are placed with a first-tier supplier who directly executes little or none of the work – instead subcontracting to specialist second-tier organisations, who may engage third-tier suppliers, and so on. This results in overheads and bid costs being duplicated at each stage of the subcontracting chain. Joint delivery models that span all tiers of the supply chain can reduce costs and remove duplication – benefiting both the client and supply chain"*[123].

By contrast, long-term, collaborative contracting models – which focus on shared accountability, early contractor involvement and stable supply chain partnerships – can improve efficiency, reduce conflicts and enhance trust between stakeholders.

New Zealand has a well-established history of collaborative contracting, with alliancing models widely used in transport, maintenance and urban infrastructure projects. While alliancing has delivered benefits such as risk-sharing and flexibility, its challenges include cost transparency and maintaining competitive tension.

Competitive tension should be maintained through structured oversight and performance management. Clients can achieve this by periodic benchmarking, open-book pricing and performance-based incentives to ensure cost efficiency and continuous improvement. Regular market testing and clear accountability frameworks can also help ensure value for money over the contract's duration.

[120] Business Leaders' Health & Safety Forum (2024). Submission to the Productivity Commission Inquiry on New Zealand's Future Research Funding Framework. Retrieved from https://www.treasury.govt.nz/sites/default/files/2024-05/pc-inq-nzfrff-sub-030-business-leaders-health-safety-forum.pdf

[121] Civil Contractors New Zealand (2023). Focus on Lowest Cost Undermining Major Infrastructure Projects. Retrieved from https://civilcontractors.co.nz/focus-on-lowest-cost-undermining-major-infrastructure-projects/10912-9ee76c64-38c7-44d9-bd82-fec9d743b92a/

[122] Denicol, J. (2020). Managing megaproject supply chains: Life after Heathrow terminal 5. In S. Pryke (Ed.), Successful construction supply chain management: Concepts and case studies (2nd ed. pp. 213–235). John Wiley & Sons Ltd. Stefano, G., Denicol, J., Broyd, T., & Davies, A. (2023). What are the strategies to manage megaproject supply chains? A systematic literature review and research agenda. International Journal of Project Management 41(3), 102457.

[123] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?

A successful example of collaborative contracting is Watercare's Central Interceptor, a $1.2 billion wastewater tunnel.[124] From the outset, Watercare adopted an interactive procurement model that allowed both sides to understand each other's drivers, align on risk and create a "thick client[125]" model, with deep, ongoing engagement. Pre-tender planning and early contractor involvement ensured a clear scope and stable design, helping reduce disputes and enable early resolution. Trust was deliberately built into the project structure, with contingency held to allow proactive dispute resolution. [126] Despite the disruption of COVID-19, the project continued tunnelling throughout lockdown thanks to a shared commitment to delivery, mutual respect and robust communication.

> *"It's a hard money contract, but the relationship and trust that had been built allowed for productive conversations and issues to be resolved. Trust – it's a key factor for success."*
>
> *– Francesco Saibene, Managing Director – Ghella NZ*

Kāinga Ora's Te Mahi Ngātahi ("Working Together as One") also provides an example of long-term, performance-based contracting. This 10-year, $4 billion property maintenance contract covers 66,000+ state homes, with five regional partners delivering responsive repairs and upgrades under performance-based contracts. The model has improved service quality, ensured a steady maintenance pipeline and incentivised workforce investment and innovation, earning recognition for enhancing tenant satisfaction and service efficiency.[127]

When selecting a procurement model, project teams should consider agency and supply chain capability, project complexity and the potential for long-term collaboration[128]. Aligning the delivery approach with these factors can help balance efficiency, risk management and innovation.

New Zealand projects can enhance their approach to contracting and supply chains, improving trust, efficiency and project outcomes by:

- evaluating agency and supply chain capability alongside project complexity to determine the most effective contracting approach
- exploring opportunities for longer-term collaborative contracting where stable partnerships can improve delivery certainty and supply chain resilience
- decomposing project complexity to identify elements that could be procured using less complex lump-sum models, reducing contractual and administrative burdens
- designing appropriate contracts and incentive structures – recognising that major participants tailor their behaviour and relationships according to the contract type
- balancing flexibility and accountability through clear governance frameworks that provide oversight while allowing for adaptability as project conditions evolve.

[124] New Zealand Infrastructure Commission | Te Waihanga. *Watercare's Central Interceptor.* Retrieved from Watercare's Central Interceptor | Case studies | Te Waihanga

[125] A "think client" model refers to a highly-engaged, well-resourced client organisation, contrasting with a "thin client" which may take a minimal, transactional role.

[126] New Zealand Infrastructure Commission | Te Waihanga. *Watercare's Central Interceptor.* Retrieved from Watercare's Central Interceptor | Case studies | Te Waihanga

[127] Bickers, C. (2021). People at the Heart of Maintenance. Build Magazine. Retrieved from https://www.buildmagazine.org.nz/assets/Uploads/Build-190-66-Feature-Maintenance-People-At-The-Heart.pdf

[128] Denicol, J. (2020). Managing megaproject supply chains: Life after Heathrow terminal 5. In S. Pryke (Ed.), Successful construction supply chain management: Concepts and case studies (2nd ed. pp. 213–235). John Wiley & Sons Ltd. Stefano, G., Denicol, J., Broyd, T., & Davies, A. (2023). What are the strategies to manage megaproject supply chains? A systematic literature review and research agenda. International Journal of Project Management 41(3), 102457.

6.2.2. Promote early contractor involvement to align supply chain objectives and expertise

Denicol highlights that poor supply chain integration leads to misaligned objectives, inefficiencies and increased project risks.[129] Early Contractor Involvement (ECI) is a collaborative contracting arrangement whereby key contractors are engaged during the early planning and design stages to provide input on buildability, risk management and cost optimisation before major decisions are locked in. ECI can mitigate poor supply chain integration risks by ensuring contractors contribute expertise to project planning and design, reducing later-stage changes and cost overruns.

If used well, the key benefits of ECI include:

- **Risk reduction:** Bringing contractors in early means they can advise on buildability and the cost impacts of design choices, helping to refine delivery methods, avoid costly rework and improve cost certainty.[130]
- **Alignment of expectations:** ECI can help ensure procurement, design and construction teams are on the same page from the start. This includes critical early planning for supply chain capacity and workforce availability, reducing delays and ensuring the project is realistically scoped and resourced.
- **Program-wide visibility:** Giving suppliers early visibility of project goals can ensure better alignment between different teams and workstreams, reducing disconnects, miscommunication and inefficiencies across the project.

The UK's High Speed 2 (HS2) project effectively applied ECI to integrate design and construction teams early in the project lifecycle. HS2 Ltd engaged contractors in a two-stage process, allowing them to shape construction methodologies, manage risks proactively and optimise delivery strategies. This approach improved cost certainty, enhanced efficiency and accelerated project timelines by ensuring alignment between design and execution from the outset.[131]

While ECI can offer significant advantages, it is not a universal solution. Its appropriateness depends on specific project characteristics - this includes project complexity and risk, and early design ambiguity. ECI is beneficial for large, complex or high-risk projects where early collaboration facilitates robust risk management and innovation. ECI is widely used in public projects, but its effectiveness also depends on how it is structured and implemented. To maximise the benefits of ECI, agencies should consider the following strategies:[132]

- **Clearly define the purpose of ECI:** Agencies should define whether ECI is being used to refine design, manage risk, improve cost certainty or drive innovation, ensuring alignment with project objectives.
- **Establish a structured engagement process:** ECI should be integrated into procurement planning with clear timelines, milestones and expectations for contractor input. Without structure, ECI risks becoming a token consultation rather than a meaningful collaboration.

[129] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?
[130] New Zealand Government Procurement and Property (2019). Early Contractor Involvement (ECI) in Construction Procurement. Retrieved from https://www.procurement.govt.nz/assets/procurement-property/documents/early-contractor-involvement-construction-procurement.pdf
[131] UK Infrastructure and Projects Authority (2014). Early Contractor Involvement (ECI) Guidance. Retrieved from https://assets.publishing.service.gov.uk/media/5a7dd855ed915d2ac884de4d/Early_contractor_involvement__ECI__guidance__Oct_2014_.pdf
[132] UK Infrastructure and Projects Authority (2014). Early Contractor Involvement (ECI) Guidance. Retrieved from https://assets.publishing.service.gov.uk/media/5a7dd855ed915d2ac884de4d/Early_contractor_involvement__ECI__guidance__Oct_2014_.pdf and Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?

- **Balance collaboration with accountability:** While ECI fosters partnership, agencies must maintain competitive tension by using performance-based contracting, transparent benchmarking and defined cost expectations.
- **Enable knowledge-sharing and appropriate risk allocation:** ECI is most effective when contractors are incentivised to share expertise and when risk is proportionally allocated based on capability, rather than entirely shifted to one party.

NEW ZEALAND

Case Study: Health NZ – Building Hospitals Better

Overview: Health New Zealand's Building Hospitals Better (BHB) approach is a new delivery model for public health infrastructure. It replaces large, bespoke builds with smaller, standardised components delivered in stages.

Key features:

- Modular, staged hospital redevelopment
- Use of standardised designs
- Integration with digital, clinical and service requirements
- National Major Project Delivery Partners Panel

Intended outcomes:

- Faster commissioning of health services
- Improved cost and delivery certainty
- Enhanced ability to deliver multiple projects concurrently
- Greater flexibility and scalability across hospital campuses
- Better long-term value and patient outcomes

6.2.3. Decompose projects into modular components to de-risk complexity and encourage innovation

Megaprojects often fail due to extreme complexity and interdependencies, making delivery inefficient and prone to cost overruns.[133] Adopting modular approaches can offer a structured approach to managing complexity. It allows different parts of a megaproject to be broken into smaller, standardised, self-contained components – each reducing risk, improving deliverability and managing market capacity. However, modularisation is not a one-size-fits-all solution; its success depends on strong enabling frameworks and well-managed integration, to ensure seamless implementation and avoid inefficiencies.

Modern megaprojects are increasingly adopting modular approaches to manage complexity and reduce risk:

- Health New Zealand's "Building Hospitals Better" approach applies modular principles by breaking large hospital redevelopments into smaller, standardised components delivered in stages. This aims to reduce complexity, enable faster commissioning of health services and improve alignment with local construction and workforce capacity. The approach allows infrastructure to be added progressively, bringing forward benefits and improving cost and delivery certainty across multiple sites.[134]
- Sydney Metro Northwest applied modular principles by designing standardised stations and using precast viaduct sections instead of costly tunnels.[135] This decision simplified construction, reduced project risks and led to significant cost savings. The project was completed on time and $1 billion under budget, highlighting the value of modular construction in de-risking complexity and improving efficiency.

[133] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?
[134] Minister S. Brown (2025). Speech to the NZ Infrastructure Investment Summit. New Zealand Government. Retrieved from https://www.beehive.govt.nz/speech/speech-nz-infrastructure-investment-summit-0
[135] Infrastructure Pipeline Australia New Zealand (n.d.). Sydney Metro Project. Retrieved from https://infrastructurepipeline.org/project/sydney-metro

While modularisation offers benefits, it is not universally applicable. It works best in projects with repeatable components and standardised designs, such as transit networks and prefabricated infrastructure like health and education. Modularisation is particularly effective when standardisation and repeatability can be leveraged to reduce design complexity, improve quality control and accelerate delivery. It enables a positive learning curve, allowing teams to refine and optimise processes with each repetition which improves efficiency and fosters innovation.[136]

Modularisation is less effective for highly bespoke, deeply integrated systems where flexibility and customisation are essential.[137] To support modular delivery, enabling frameworks are also essential in aligning stakeholders and reducing administrative bottlenecks. Denicol et al (2020) note that "*there is a need for more guidance on the rules, procedures, and methods enabling clients to know how to break down each project supply chain into manageable packages and modules*."[138]

Projects should consider modularisation where projects exhibit repeatable design elements or opportunities for off-site manufacturing. Breaking down projects into well-integrated components can enhance efficiency and reduce risk without compromising flexibility.

SUPPLY CHAIN INTEGRATION & COORDINATION: KEY INSIGHTS

Foster Long-Term Collaborative Contracting to Improve Efficiency:

- Use long-term engagement strategies to strengthen supply chain partnerships.
- Maintain competitive tension through benchmarking, open-book pricing and performance-based incentives.

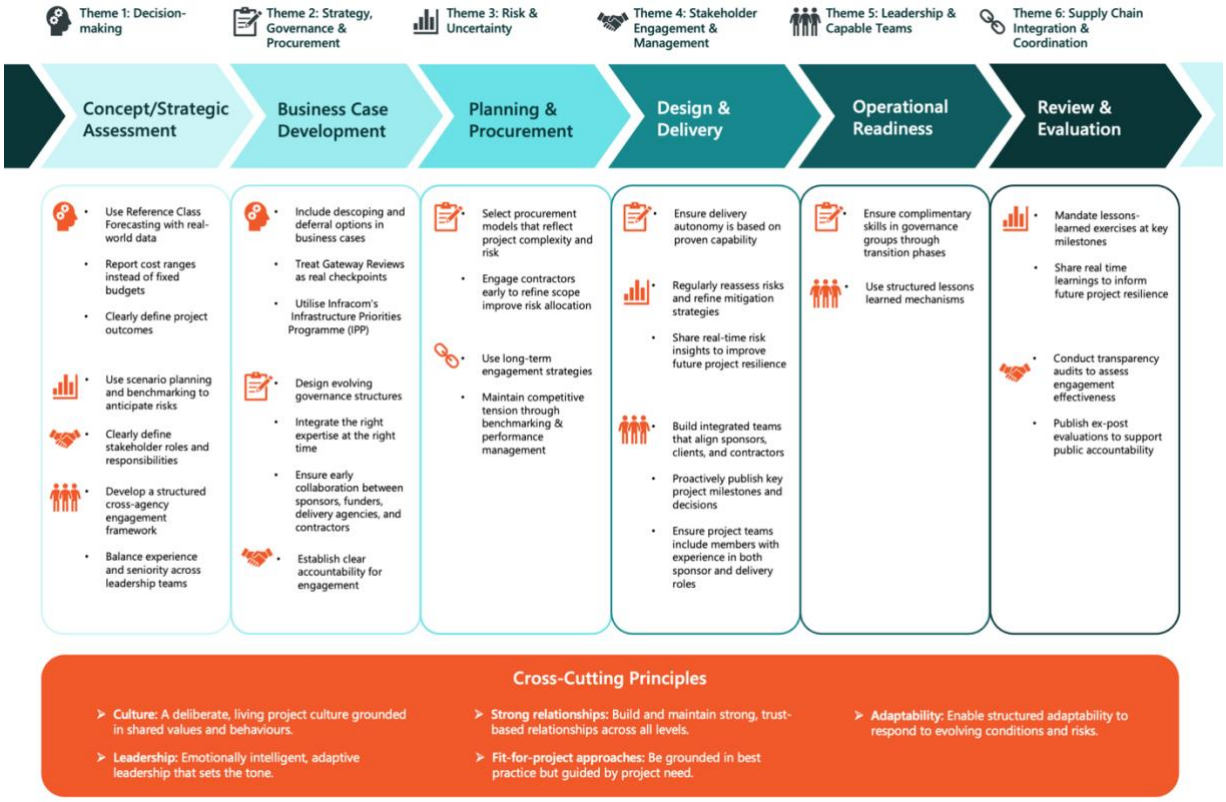
Utilise Early Contractor Involvement Thoughtfully and Where Appropriate:

- Use ECI for projects with high complexity, significant risk or early design ambiguity, to improve buildability, cost certainty and delivery efficiency.
- Structure ECI effectively by clearly defining objectives, establishing engagement processes and ensuring risk is appropriately shared.

[136] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?
[137] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?
[138] Denicol, J., Davies, A., & Krystallis, I. (2020). What are the causes and cures of poor megaproject performance?

7. Pulling it all together

7.1 Consider where you can action our insights across the project management lifecycle



7.2 Apply Cross Cutting Principles for Thriving Projects

While strong governance, risk management and procurement strategies provide the structure for success, high-performing megaprojects are also defined by the culture, leadership and values that underpin them. Experienced megaproject leaders know that communication, trust and a shared sense of purpose are not just desirable – they are critical to success. These factors are rarely captured in evidential or technical reports. As we prepared this report, we identified six cross-cutting principles that, in our opinion, emerged from these elusive factors – distinguishing projects that merely function from those that thrive.

Consider these six cross-cutting principles as an essential foundation upon which successful megaprojects can deliver outstanding outcomes:

- **A clear and intentional project culture is critical.** Too often, initial project values fade under delivery pressure. Successful projects keep these values alive by revisiting them at key milestones, reinforcing them through leadership behaviours and integrating them into everyday decision-making. Culture is fundamentally about people – how they collaborate, what drives them and how they take ownership of a project's success. When teams share a clear purpose, operate with mutual

respect and have the autonomy to make informed decisions, they are more engaged, proactive and invested in delivering quality outcomes.

- **Equally important is recognising that culture is not one-size-fits-all.** Every project has a unique mix of people, challenges and working environments, and leaders should feel empowered to shape culture in ways that work best for their circumstances. Some projects engage cultural experts to bridge diverse working styles, introduce innovative team-building initiatives or visibly embed values into everyday project life. What matters is that culture remains a living, breathing part of the project, tailored to the people and challenges they face.

- **Emotional intelligence is fundamental to team performance under pressure.** Decision-making is rarely a purely rational process; it is influenced by trust, communication and the ability to navigate differing perspectives. The most effective project leaders cultivate an environment where concerns can be raised early, disagreements are seen as productive and feedback flows in both directions. A strong feedback culture, supported and enabled by emotional intelligence, allows teams to challenge assumptions, adjust course before small issues escalate and ultimately reduce risk in a meaningful way.

- **Success requires applying best practice flexibly, tailoring it precisely to each project's unique demands.** Fit-for-project approaches acknowledge that no single procurement model, governance structure or delivery strategy will work in every case. High-performing projects draw on established best practice but remain attuned to the specific needs, constraints and risks of their project. Rather than rigidly applying templates from previous initiatives, these projects invest early in understanding their delivery environment, market conditions and internal capability, and tailor their approach accordingly. This mindset encourages innovation balanced by pragmatism, empowering teams to make deliberate choices rather than defaulting to precedent.

- **Adaptability distinguishes resilient megaprojects from those that falter under pressure.** While delivery certainty is essential – particularly for public accountability and investment confidence – projects must also retain the flexibility to adjust course as circumstances evolve. Successful teams find the balance between structure and agility through features like dynamic governance frameworks, live risk registers and contingency planning that includes descoping or resequencing options. This adaptability is not a sign of poor planning, it reflects the reality that complex projects operate in shifting environments – politically, economically and socially. The ability to respond quickly without derailing progress is a defining trait of projects that stay on track, even under pressure.

At the heart of every megaproject is the ability to bring people together – across agencies, industries and communities – to deliver a shared vision. While infrastructure is measured in steel and concrete, successful delivery relies on human relationships – between agencies, contractors, consultants, and communities. Projects succeed when leaders actively invest in these relationships, foster alignment across diverse teams and recognise the human dynamics that influence every decision.