



INNOVATION IN INFRASTRUCTURE

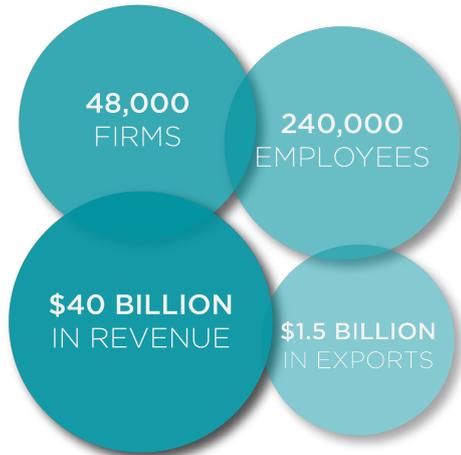
**BARRIERS AND OPPORTUNITIES TO UNLOCK
INNOVATION FOR A BETTER FUTURE**

**Supported by:
Cooperative Research Centre for Low Carbon Living**



**LOW CARBON LIVING
CRC**

About us



Consult Australia is the industry association representing consulting firms operating in the built and natural environment sectors. These services include design, engineering, architecture, technology, survey, legal and management solutions for individual consumers through to major companies in the private and public sector including local, state and federal governments. We represent an industry comprising some 48,000 firms across Australia, ranging from sole practitioners through to some of Australia's top 500 firms with combined revenue exceeding \$40 billion a year.

Some of our member firms include:

AECOM

ARCADIS Design & Consultancy
for natural and
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Executive Summary

Commissioners of infrastructure projects in Australia are seeking innovative solutions to increasingly complex challenges including low carbon goals, population growth, urban and regional development, transport planning, and renewable energy. With the expected growth in Australia's population of 60% by 2050, and a national target of reducing carbon emissions to 26-28% on 2005 levels by 2030 innovative solutions need to be found.

In conjunction with the CRC for Low Carbon Living, public sector clients, consultants, and contractors, Consult Australia explored the desired outcomes of infrastructure projects, the challenges, and the possible solutions. Without exception the optimal outcomes identified for infrastructure projects are that they are on budget, on time, the quality of design is as demanded, and the asset is ultimately fit for purpose.

Governments across Australia are facing increasing pressure to deliver fit for purpose infrastructure on time and on budget. Yet the lack of standard form contracts and the increase in claims suggest that current contracting models are adding additional pressure to the consulting and contracting industry at a time when we need it to be vibrant, agile and innovative in support of our country's objectives.

This report demonstrates a consensus amongst clients, consultants and contractors that innovation in infrastructure is possible. Consultants and contractors are constrained by procurement processes, inappropriate allocation of risk and resource frustrations. Clients are constrained by legacy and inappropriate systems, political will and the fear that innovation is being driven by the desire of industry for immediate revolutionary change rather than a more achievable gradual shift in approach.

This report sets out the results of the research and a number of actions that can be undertaken to bring about change. These actions will require collaboration between industry and government and fall into three areas of opportunity:



1 PEOPLE AND CULTURE



2 EDUCATION AND KNOWLEDGE SHARING



3 CONTRACTS AND PROCUREMENT

Purpose

Compared to other industries the construction industry is known as a slow adopter of new technologies, techniques and materials. Innovation is constrained by the diversity of stakeholders involved and their divergent interests and objectives. This plays out through cumbersome tendering processes, and pre-determined requirements, as opposed to consideration of innovative and sustainable solutions based on the desired outcomes and end user need. This results in a lack of collaboration between the diverse stakeholders.

With global, national and regional targets, the built environment industry is required to meet the increasing demands for liveable communities', carbon neutrality, reduced water use, and continually develop more efficient and sustainable resources. Construction and design organisations face challenges competing for skilled and experienced staff that have the capability for new design, construction and materials development in order to meet the targets set by international, national and regional governments.

Understandably government structures and ability to deliver infrastructure in an agile, innovative way will need to change to meet continuing demands. However, it is apparent that this change is slow to happen and Consult Australia, as the body representing consulting businesses in design, advisory and engineering in the built and natural environment, took the opportunity to facilitate not only discussion and research but identify opportunities for all stakeholders to bring about real change in our industry.

Across our industry consultants, contractors and clients identified a desire to unpack what the expectations are when it comes to including 'innovation' in projects and explore the barriers and opportunities that exist to come up with practical ways to resolve. Table 1 sets out the purpose identified by each stakeholder which we have sought to address through this research.

Table 1:

CONSULTANTS / CONTRACTORS	CLIENTS
A clear understanding of their client's goals and desired outcomes.	Deeper understanding of their need for innovation.
An insight into the common constraints that clients want resolved.	Understanding of the consultant's role and challenges.
Increased ability to identify opportunities for innovation.	Increased ability to identify opportunities for innovation and how these can be delivered with a good public message.
Direction for their approach to providing solutions to clients.	Direction for their own approach to innovation and defining their mission.

Audience

The research was conducted through focus groups held across the country – Melbourne, Sydney, Canberra, Brisbane, Adelaide and Perth - attracting over 140 participants, bringing together client groups from the public and private sectors, contractors and consultants.

Each focus group was asked to consider three questions:

- the need for innovation in infrastructure projects and what innovation means to different stakeholders, and what they consider to be the optimal outcomes of innovation;
- common constraints to innovation in the built environment sector, and
- how to overcome constraints and unlock real innovation through better planning, procurement, collaboration and community engagement.

Desired Outcomes

The research explored what our stakeholders wanted as the key outcomes from a project, i.e. what did success look like for them? Desired outcomes for each stakeholder group were identified consistently as shown in table 2 below.

Table 2:

CONSULTANTS	CLIENTS	CONTRACTORS
Profitable & delivered on time	On time & on budget Value for money	Profitable & delivered on time
To be proud of outcome	To be proud of outcome	To be proud of outcome
Quality of design, future proofing and fit for purpose	Quality of design, future proofing and fit for purpose	Quality of design, future proofing and fit for purpose
Appropriate risk apportionment	Reducing risk	Reducing risk
Joint outcome: greater collaboration to achieve better outcomes		

The common outcomes above in Table 2 were what we would expect, budget, time, and quality were identified consistently by all groups and all stakeholders. However, what also emerged was that outside these priorities there were a number of other factors that were important to all the stakeholder groups.

They were:

- Personal pride in delivering a great project and leaving a legacy,
- Having a competitive advantage and providing innovative solutions,
- Having a well-defined project scope and a shared vision,
- Capability development and personal satisfaction for their teams.

The resounding message from all focus groups was the desire for greater collaboration and greater communication. Not only was there a desire for greater collaboration but also the acknowledgement by consultants, contractors, and clients, that collaboration and (as a result) innovation is achievable in infrastructure projects.

By working together and communicating at the outset all parties can gain invaluable insight into the values, desired outcomes and the restraints that all sides are facing.

Constraints and Challenges

The results of the research fell into three distinct categories:

1 PEOPLE AND CULTURE

2 EDUCATION AND KNOWLEDGE SHARING

3 CONTRACTS AND PROCUREMENT

Whilst the research was conducted with groups adopting personas i.e. consultant, contractor, or client, the results reflect all stakeholders are experiencing the same challenges.

1. People and Culture

Culture and behaviours played a big part in the barriers to innovation, this included a lack of trust and collaborative behaviours between project stakeholders, and a perceived or real lack of leadership from government. All ultimately agreed that communication was the key to making delivery models successful.

Workplace culture is defined as the environment created for employees, it is the mix of an organisation's leadership, values, traditions, beliefs, interactions, behaviours and attitudes that contribute to the emotional and relational environment of a workplace. Culture drives engagement, productivity and trust. Importantly it keeps people not only interested but brings them along for the ride and allows them the freedom to share ideas, test ideas, innovations and develop the right skills, qualifications and diversity of approaches. Achieve a mutual understanding of what is needed and push existing boundaries. This is also true across project delivery teams.

All stakeholders felt that innovation was being stifled due to not having the right people in the right job and in the right environment to thrive and consider innovation outside of the normal performance measures.

For the private sector a primary concern was the struggle with making sure their pipeline of work was sufficient so that they could get the right people in place to take advantage of those opportunities. Without a sufficient pipeline high staff turnover is experienced, as they are impacted by the 'ramp up and ramp down' scenario. This results in a skills and knowledge loss and a standardised culture with a reduction in variety and flexibility to innovate outside of prescribed tasks.

For the public sector the research showed that having the right people with the right skills to consider innovation, its application to the project in question, and its value versus benefit, is a consistent challenge.

2. Education and Knowledge Sharing

Innovation means different things to different people, but we generally all agree that it's about thinking differently. In whichever way we attempt to define innovation, the sharing of experiences and knowledge creates a new and better outcome.

Our research showed that mutual agreement enabling discussion of the client's needs, at the front end of a project, would provide greater clarity in scope. This approach would provide the consultant and contractor an opportunity to present alternative options to reach similar, or better, outcomes than those being prescribed by the client, as would identifying the costs of innovation at tender stage. Front end collaboration would improve the relationship between the client, consultant and contractor for the life of the project and offer an opportunity for the client to understand the true scope of the innovation and its value.

It was acknowledged by our focus groups that the cost of innovation is often a deterrent, but a shared understanding of the upfront investment versus long term savings would result in better whole of life outcomes for our communities and environment.

An acknowledged barrier to innovation by our focus groups is the slow adoption of digital resources and digital delivery of designs. Not everyone is on the same page, there is a perceived lack of buy in from public sector clients, and it is through their leadership that we will witness real change in the industry. If they demand digital delivery the industry will follow out of necessity and consultants and contractors alike will gear up. As Chris Riddell, Futurist and Thought Leader says “*Every business is now a technology business, it’s no longer something special. It’s our new normal.*” [source <http://chrisriddell.com/>]

3. Contracts and Procurement

Unsurprisingly challenges for all are limited time and retracted budgets. Even less surprising are contracts and risk. All stakeholders are suffering from high insurance premiums, unfair risk allocation and inappropriate delivery models.

Appropriate delivery models play a crucial role in determining risk allocation between parties, and in turn drive or create a disincentive for innovation and define behaviours for the life of the project. The challenges all parties are facing is the ability to identify and use the right delivery model for the right project, and identify and allocate appropriate risk transfer versus the rewards. The parties need to appropriately value and manage/balance risk. This means sharing the ownership and consideration for who captures the value.

Whilst consultants and contractors find procurement processes and tender documentation costly, inefficient, and time-consuming, clients admitted that they are faced with ‘institutional baggage’, i.e:

- out of date and cumbersome processes,
- inherited procurement frameworks,
- legacy systems that are no longer fit for purpose, and
- uncertainty on future technologies and the inability to quickly adapt to the fast-moving environment of these technology changes.

To enable innovation, tender processes will need to change and will need to consider adapting the delivery model for major infrastructure projects instead of a one size fits all approach.

As referred to above (item 2 education and knowledge sharing) project scopes are too prescribed and not necessarily outcomes focussed. As an example, Design & Construct is very limiting on scope and does not allow for market engagement, there is no opportunity to learn from international experience or find innovative solutions.

The challenges are common ones, with the exception of one experienced by public sector clients, which is that infrastructure decisions are driven by political will. As advocated for in our report ‘[Infrastructure Governance in Australia](#)’ this challenge could be overcome by State and Territory governments establishing independent statutory infrastructure bodies (‘IBodies’) providing independence, planning, assessment and prioritisation of project delivery.



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Addressing the Constraints

The focus groups set out not only to understand the barriers to innovation but to discuss possible solutions to overcoming them. Clients have the desire to change and deliver infrastructure in an agile, innovative way to meet continuing demands, but as an industry how can we do this collaboratively and help drive the best outcomes?

1. People and Culture

The focus groups discussed cultural changes that would incentivise behaviours and adopt strategic initiatives to create a performance-based approach. For consultants and contractors this may mean rewarding innovative ideas and solutions internally and giving talented employees the scope to operate outside the 'norm'. For clients it might be incentivising innovation through a 'performance reward' and through rewards for early or on time delivery.

Other proposals included:

- Developing innovation metrics (KPIs) beyond those in a contract and linking them back to the innovation versus the realised rewards.
- Enabling innovation by having the right people in the right job, and a dedicated person 'championing' that innovation from the client side.
- Creating an Innovation Diversity Charter within the project team, moving away from traditional approaches. Establishing the charter as pre-strategic goal with an overarching target of identifying and recognising the value of innovation.

2. Education and Knowledge Sharing

The consistent theme that emerged through all focus groups was one of communication, ultimately the concept of 'sharing'. The more all parties share their wants, needs, barriers and solutions the more likely innovation will emerge. The ability of project teams to engage with the client and end users for the duration of the project would provide the consultant and contractor with the opportunity to problem solve on the client's behalf. Such communication would identify future problems, mutual areas of benefit and go a long way to de-risking a project. It would also allow parties to define what value means to them in the context of the project. Is the greatest value the process of delivery or the outcome?

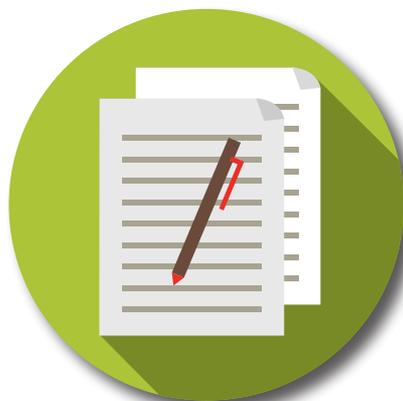
Through the focus groups there were discussions about the fear of failure, the unknowns of innovation, the technical risks, and the lack of room for testing. A number of focus groups proposed using 'Living Labs' to demonstrate innovation, not just products, but approaches. A living lab is a research concept operating in a real environment such as a city or region and can showcase innovative products and processes within a 'safe space'. CSIRO have operated such living labs successfully across a number of projects such as Sydney Science Park and the Darwin Living Lab under the Darwin City Deal. [source [CSIRO, Resilient Cities, Urban Challenges](#)]

Similarly, a common discussion in the focus groups was the need for the demonstration of research and development and how these areas could be applicable to projects to save money, deliver better outcomes, and add value to the end user experiences.

Other proposals included:

- Improved public and industry messaging, a deliverable to be agreed and resourced by all parties for the benefit and understanding of the end user. For example, messaging throughout or at the conclusion of a large infrastructure project to demonstrate its value and promote the service improvements for the end user. For industry, promotion of the successes by highlighting how collaborative projects can be successfully delivered and also enhance long term sustainability through appropriate risk and reward sharing.
- Industry growth centres - collaborative forums capturing other industries to encourage ideas and collaboration on pipeline, procurement and innovation.
- Developing greater influence programs through industry engagement with universities. Investing in graduates and future skills, ensure future workforces are digitally savvy and able to meet the new challenges and technological disruption that our industry is already facing.
- Greater use of digital delivery platforms and open data. Governments around the world are running open data initiatives. The benefits are wide-ranging, for governments opening data to the public contributes to improvements in operational efficiency, savings, and improved engagement with stakeholders.

For the private sector, companies utilising government data are driving business growth and innovation through enhanced engagement and informed decision-making. A possible solution discussed by the focus groups was national reform through funding agreements and incentives for digital delivery such as the awarding of a project because it includes digital delivery.



3. Contracts and Procurement

The majority of project delivery mechanisms are ultimately a complex web of contractual relationships. Project risk and reward are often allocated according to the respective bargaining power of the parties, rather than with the most appropriate party. Too often Design and Construct is used as a default delivery mechanism by public sector clients, a better approach is to give full consideration to the project's requirement and the best suited delivery mechanism. As noted above the focus groups collaborative views were that communication is key, and that there is potential to better evaluate the delivery mechanism for projects because 'one size' does not fit all.

Whilst it was also agreed by the focus groups that there is no 'silver bullet' in terms of contract model and risk allocation discussions focussed heavily on improving the early stages of procurement and design. Traditional public procurement shapes the solution very early in the process and this could be solved with early genuine engagement with the market (consultants, contractors and financiers). The focus groups went so far as to suggest that this could be a mandated approach in order to really drive change through the whole industry.

All focus groups agreed that collaborative forms of contract would be the best outcome for the industry, forming partnerships to more appropriately allocate risk and de-risk projects by identifying problems and solutions early. One proposal put forward was a contract that promotes innovation by genuine engagement through a contract framework that includes a scorecard, which proactively highlights opportunities for innovation and identifies where innovative actions might be taken on a project. Similarly, unlinking innovation from the traditional contract model (chosen as the project delivery model) and using a 'shared innovation scorecard' to approach problem solving separately to the traditional framework.

Other proposals included:

- As the mechanism to define and understand the right solution, the Business Cases process should consider innovation.
- Tender evaluation criteria must match the intent of the project and encourage innovation delivery.
- Remove design silos to open and improve lines of communication between clients, consultants, contractors, and sub-contractors, and together scope the specific needs of the project and the best achievable outcome.
- Avoid motherhood statements in project purpose, understand the true requirements of the project and how the contract model can be used to achieve the best outcome.
- Adopt Performance Based Contracting through industry led solutions rather than predefined solutions from the client. These industry solutions to be supported by, and aligned with, governments' overarching policies rather than a prescriptive mandate.
- Improve incentives for commercial organisations to share their innovations. For example, clients purchasing intellectual property for a fee.
- Clients to communicate future pipelines and projects to allow industry to identify early innovation solutions and opportunities.

Future Opportunities

Despite the barriers to innovation faced by both clients and the design and construction industry, the outcomes of our focus groups have proven that there is consensus between all stakeholders that innovation can in fact happen. However, it may take smaller meaningful steps rather than a large leap of faith.

Below are a number of opportunities that Consult Australia will seek to influence to continue to move towards increased innovation in infrastructure and drive better environmental outcomes.

1. People and Culture

Innovation Diversity Charter

Develop a diversity charter that can be implemented through project teams, moving away from traditional approaches by:

- Creating stakeholder engagement with a dedicated innovation champion within the various stakeholder groups for the lifecycle of the project.
- Establishing the charter as pre-strategic goal with an overarching target of identifying and recognising the value of innovation.
- Explore the opportunity to include the end user in the 'diversity' project meetings to provide a 'layman' perspective.

2. Education and Knowledge Sharing

University Engagement

Develop an influence program in partnership with universities to ensure graduates have the future skills, to meet the challenges of our changing industry. Influence the approach that graduates have to collaborative contracting, recognising that they are our future leaders.

Digital Delivery

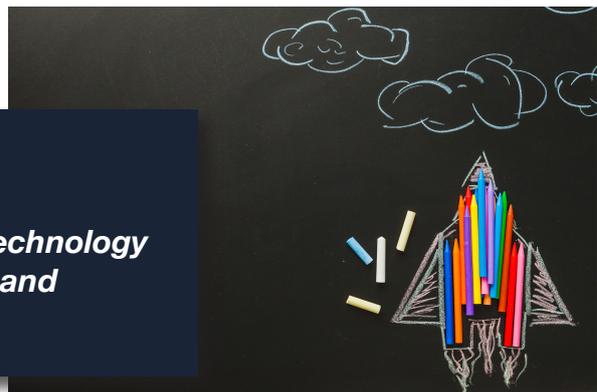
Advocate across government for open data and digital delivery platforms through national reform and incentivisation.

STEM

Develop a white paper to explore skill demands on future workforces and to establish how Australia's STEM education system can be more responsive to these needs. Whilst we lack clarity on some of these advancements, it is clear that we will see an increase in demand for hybrid STEM skills – the ability to deliver 'soft' digital and technology solutions with 'hard' engineering skills underpinned by creative thinking.

Hybrid STEM skills

The ability to deliver 'soft' digital and technology solutions with 'hard' engineering skills and underpinned by creative thinking.



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3. Contracts and Procurement

Model Client Policy

Promote the Consult Australia [Model Client Policy](#) advocating with the public sector for better collaboration with industry to achieve mutually beneficial outcomes.

Risk & Opportunity Register

Develop a Risk & Opportunity Register that is embedded and subsequently mandated by contract. Driving cultural change through education of the merits of opportunities and allow project teams to push the boundaries of traditional contract constraints.

The Register to seek to agree Key Performance Indicators associated with the financial risk versus the financial opportunity, encouraging identification, through the contract, innovation opportunities and capturing a list of ideas and solutions.

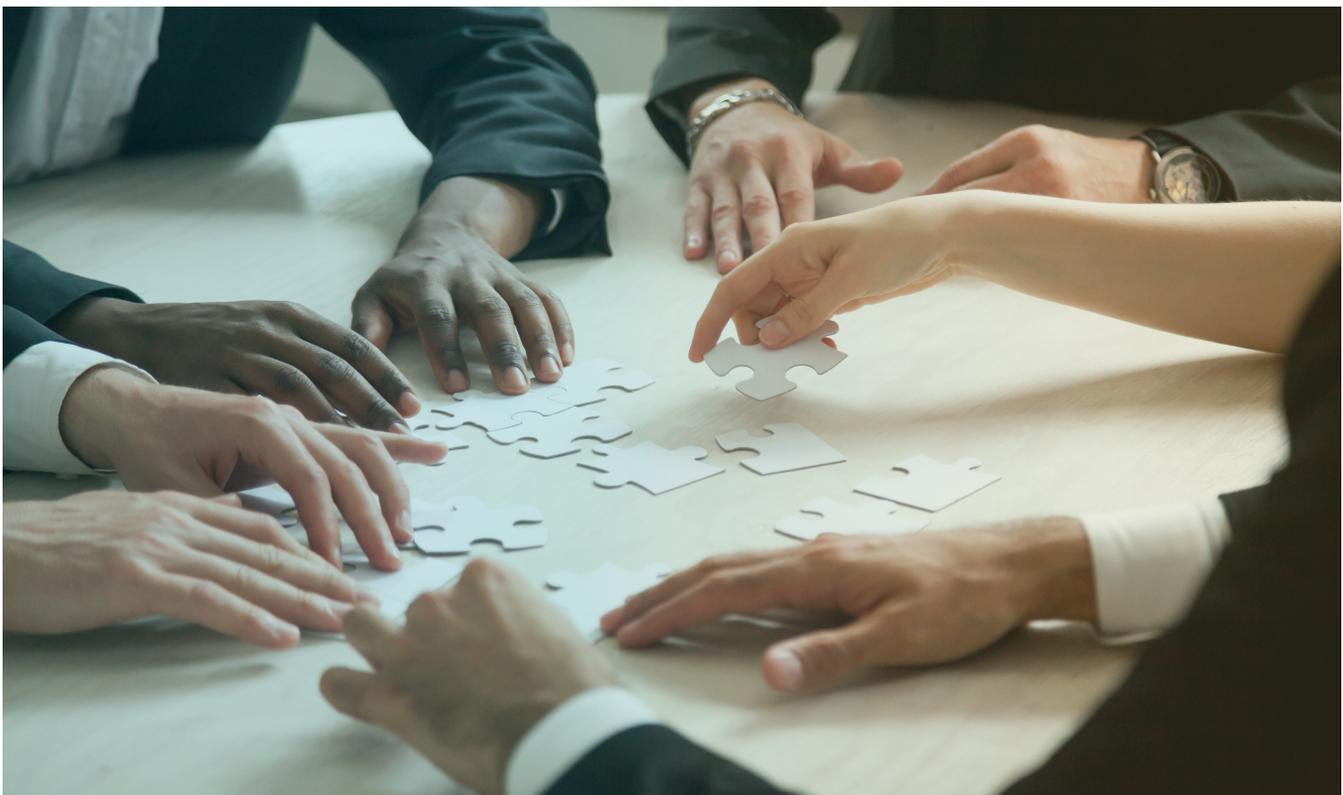
Business Cases

Develop a guide to developing business cases and ensure that new knowledge, social change or innovations are taken into account. Educate that these outcomes can be successfully achieved through collaboration, knowledge sharing and communication from the project team.

Collaborative Contracts

Advocate for standard and collaborative forms of contract that support innovation together with agreed methodology and agreed contract reforms sharing risk.

Educate consultants, contractors and clients on the benefits of using more collaborative contract models. One such option is the NEC (New Engineering Contract), a suite of collaborative contracts that facilitates project management principles and collaborative practices as well as defining legal relationships.



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Conclusion

Whilst the design and construction sector is considered to be a sector with little innovation this collaborative research has found this is not because of a lack of desire for innovation. It will however require cultural change, leadership and a move towards better engagement at the start of project delivery. The focus groups identified incremental changes that can drive change and this report shares just some of the actions that Consult Australia, as the industry body representing businesses in design, advisory and engineering services, can undertake in collaboration with the broader industry and government to increase the use of innovation in infrastructure.

The research identified that the different industry stakeholders all want the same end result, all agree better outcomes can be achieved and that there is space for innovation. Reframing the conversation from one of innovation, which creates anxieties around risk - financial, resourcing and knowledge - to one where the focus becomes about 'doing things more effectively'. Small improvements can lessen risk and save money.

Normalising the conversation to be focussed on 'doing things more effectively' may be a small but essential step in achieving greater alignment across our industry, better support community needs, reduce the impact of large infrastructure on our environment and support Australia's goal of reducing carbon emissions by 2030.



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