

Engineering Innovation

In the Department of Transport and Main Roads

September 2014

Foreword

The Department of Transport and Main Roads' role is to provide safe, functional transport infrastructure that is 'value for money'. We connect people to opportunity; that's how we deliver transport for prosperity throughout our great state. We have identified principles that will assist in meeting this objective, specifically:

- determining the scope of projects to ensure functionality is addressed on a 'what is needed?' basis
- encouraging and using innovative products and processes that provide the required functionality for a safety, cost or durability benefit.
- Simply, the department is focused upon reducing the cost of transport infrastructure by:
- making sure we are easy to do business with
- listening to industry (inviting feedback on improvements)
- encouraging and implementing innovation that demonstrably helps us achieve our objective
- asking our suppliers and staff 'can it be done better/smarter?'
- using Austroads and Australian Standards to deliver context sensitive solutions
- implementing cost efficient and competitive processes that are consistent with the community's and industry's expectations
- compromising in a responsible manner, with a priority being safety and reduction in long term costs.

There are many ways to achieve transport infrastructure that is 'functional' and cost effective. Practically, our technical manuals and specifications are highly influential in determining the quality and cost of projects. Specifications may be seen as conservative but they generally provide for standard situations, and provide a reasonable 'benchmark'.

These have evolved over time to 'specify out' practices that may have produced poor results in the past. The poor results, however, may have occurred due to many factors (such as lack of competency or poor implementation), rather than a poor 'concept' or 'innovation'. In different circumstances, some innovations may have proved successful.

TMR staff are responsible for delivering infrastructure, and also operating and maintaining the infrastructure. Consequently, in decision making about innovation these longer term considerations will be weighted more highly than they might be for a contractor.

The diagram below shows ways in which we can deliver infrastructure at lower costs. We encourage and support our staff and suppliers to consider solutions in the green boxes: actively pursue smarter ways of doing things to achieve practical and cost effective, long term outcomes. (Refer to the departmental document '*Project Scoping Guideline*' for further information.)

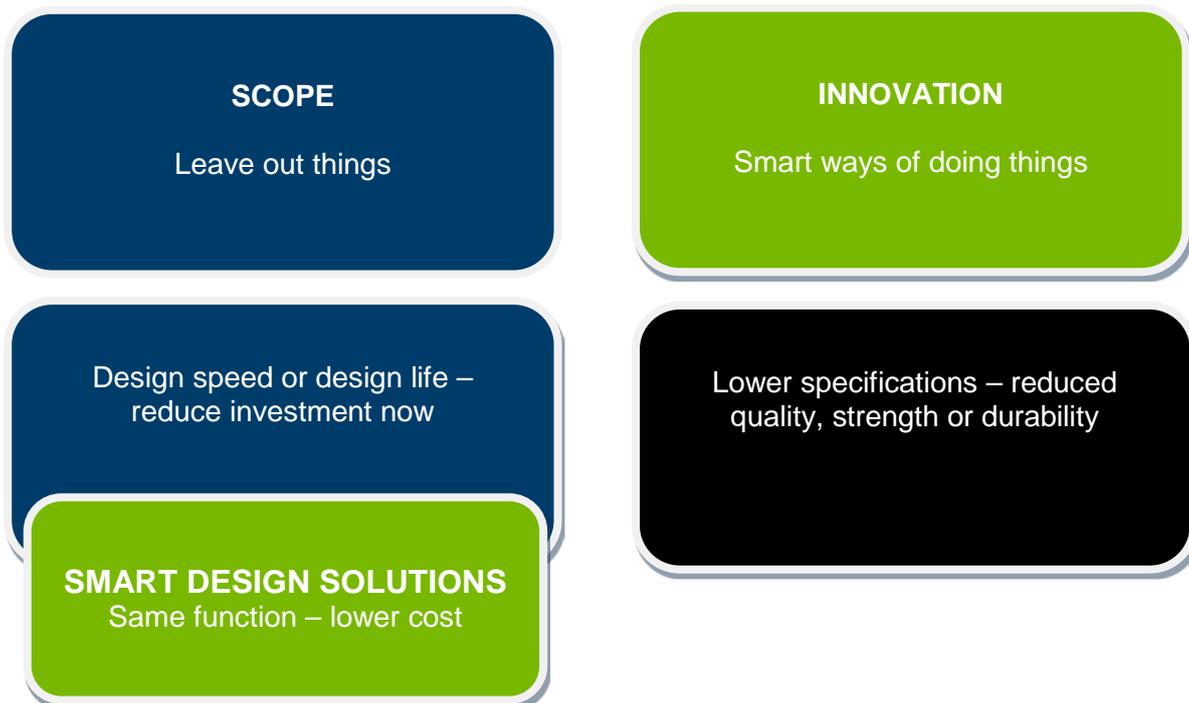
We expect professional engineers to apply 'value engineering' principles to all designs. They need to generate ideas and select those with the potential for achieving best value by:

- reducing costs while maintaining the usefulness, benefit or importance of the works

- keeping costs constant while increasing the extent of usefulness, benefit or importance of the works
- increasing the extent of usefulness, benefits or importance of the works
- applying the reasonableness test that examines whether the cost is reasonable for the standard and scope of the works
- considering the whole of life costs and implications.

Guidelines and Manuals

Specifications and Contracts



We expect design consultants to actively optimise design, and seek guidance on innovative options and the risk appetite of the client. Consultants are expected to deliver options which include appropriate extension of design domains that provide savings.

We do not expect designers to be responsible for options that can't meet standards due to funding restrictions. It is expected that consultants will conduct research and analysis on options and provide advice on benefits and risks of options.

This document '*Engineering Innovation within the Department of Transport and Main Roads*' discusses solutions in the 'green box' – that is, smart ways of doing things.

Caution should be used when adopting Solutions that lower specifications as they may be in the 'black box'.

Julie Mitchell

Chief Engineer

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Feedback

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Purpose of this document

This document:

- outlines the Department of Transport and Main Roads (TMR) strategy regarding engineering innovation
- is written primarily for those who supply the department with products and services, or would like to do so
- recognises this is a 'living' document, and will be revised from time to time.

What is 'innovation'?

TMRs innovation Strategy defines innovation as:

"The application of a new idea or way to do business that creates value for TMR and our customers."

Innovation can be incremental, significant or transformational. With respect to engineering innovation, it is more than simply generating a new idea, taking a small incremental step, sharing knowledge or minor variations from the 'norm' - it is about making a substantial change.

Importantly, innovation is **not** about compromising safety, quality or durability.

Innovation within the department

The department sees innovation as an opportunity to improve Queensland's future.

Innovation plays an important role in improving productivity in the transport infrastructure industry. The department also accepts that with innovation, there are risks and – sometimes – disappointing results.

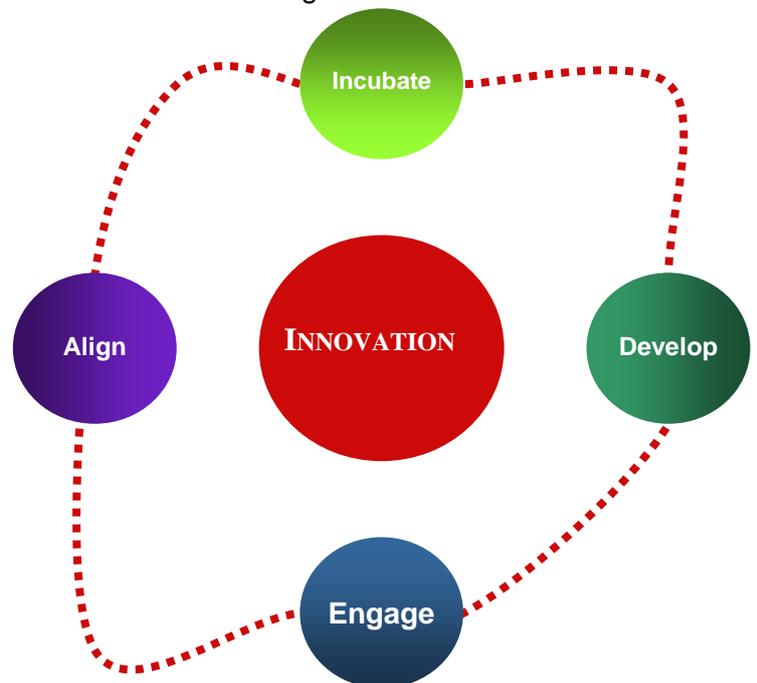
We actively encourage innovation that provides value for money, while retaining acceptable levels of safety and durability.

Development of a whole of TMR culture of innovation is a work in progress.

Department's strategy

TMRs new strategic innovation framework is comprised of 4 elements:

- 1 Creating an environment where innovation can flourish
- 2 Developing our people to cultivate innovation
- 3 Engage and collaborate to connect people and ideas and explore opportunities to maximize potential
- 4 Ensure our innovation efforts generate the greatest value by using evidence based decision making.



Innovation principles

The following are general innovation principles adopted for engineering projects undertaken within the department:

- Both the benefits and the risks of innovation will be considered when assessing new products or ideas.
- We are willing to share the risks and costs of innovation, as well as the benefits.
- Our specifications generally provide for standard situations, and provide a reasonable 'benchmark'.
- Innovation is about significant change – where components, materials or processes are not really anticipated in the scope of our general specifications. Innovative tenders are a type of alternative tender.
- There is often limited opportunity for innovation within an infrastructure procurement process, unless the process is specifically based around achievement of innovation. (Limitation of innovation is due to time constraints and the need for a level playing field in tender evaluation).
- Some of our specifications and processes limit opportunities for innovation. We will continue to regularly review and improve documents and processes.
- We expect professional engineers to understand the basis of our specifications. They should evaluate the risks and benefits of innovation or minor variations that lead to 'value for money' solutions, rather than blindly applying specifications.
- Risks should be reduced as far as reasonably possible through a process of considering pilots, method statements, risk assessment, testing and research.
- Accepting innovation means accepting risk – provided professional engineers identify, assess and reasonably mitigate risk, then we encourage accepting innovation.
- While the altruistic open sharing of innovation would advance industry productivity at a rapid pace, innovative processes and products often provide parties with a competitive market edge. The intellectual property associated with an innovation belongs to the party who has invested in its development, unless the contractual relationship states otherwise.
- Some practices and products presented to TMR as 'innovation' have not been accepted as they do not represent value for money, increase risk disproportionately to their benefit or they have durability/maintenance issues. Ideally, proponents should not waste time on exploring these further unless there are special circumstances. (Refer to Products and Services factsheet).
- We support the Professional Performance Innovation and Risk Protocol (PPIR)¹, which provides a standard for the way in which professional engineers assess risk, make decisions and act.

¹ Warren Centre for Advanced Engineering Pty Ltd

Identifying innovation

In the context of the department's business, innovation is generally initiated in one of four ways:

- Through our issuing a tender or contract
- An approach by a supplier, introducing a new product, service or process
- A submission made, or issue raised, by a departmental staff member
- A submission made, or issue raised, by one of our many stakeholders.

Tenders and contracts

Specifications

The department has an extensive library of technical specifications that form part of project tenders and contracts.

These specifications have been developed over time by experienced professionals, and:

- incorporate learnings
- provide uniformity
- allow easy tendering and evaluation
- offer solutions that are likely to lead to a reliable outcome.

Forms of contract – innovation

Some of the department's forms of contract are designed specifically to encourage innovation that improves project construction, safety or efficiency and reduces project costs (e.g. Design and Construct, Early Contractor Involvement). Details of these forms of contracts (and others) can be viewed on the department's website.

Innovations contained within proposals are assessed using criteria set out in the tender documents. Assessment for acceptance by the department is wholly dependent upon the specific product or process being proposed.

The ownership of the intellectual property for an innovation will reside with the party that paid for the work, unless the contract conditions specify otherwise.

Confidentiality agreements at the proposal stage, and subsequent contractual conditions may be completed to protect intellectual property rights.

Forms of contract – traditional

For most forms of contracts, it is normally mandatory that you submit a fully conforming tender.

Sometimes, innovative products or processes may be precluded by a particular specification. But provided that you can achieve similar (or better) specified outcomes, the department welcomes **outline** proposals for innovation at the time of tender. Any outline proposals should accompany your **conforming** tender.

You should not spend too much time and money on preparing **detailed** innovative proposals at the tender stage. TMR staff will actively assess outline innovation proposals by proponents.

If we see benefits in an outline proposal, we will ask for further information in order to incorporate innovation into the contract.

After contract awarded

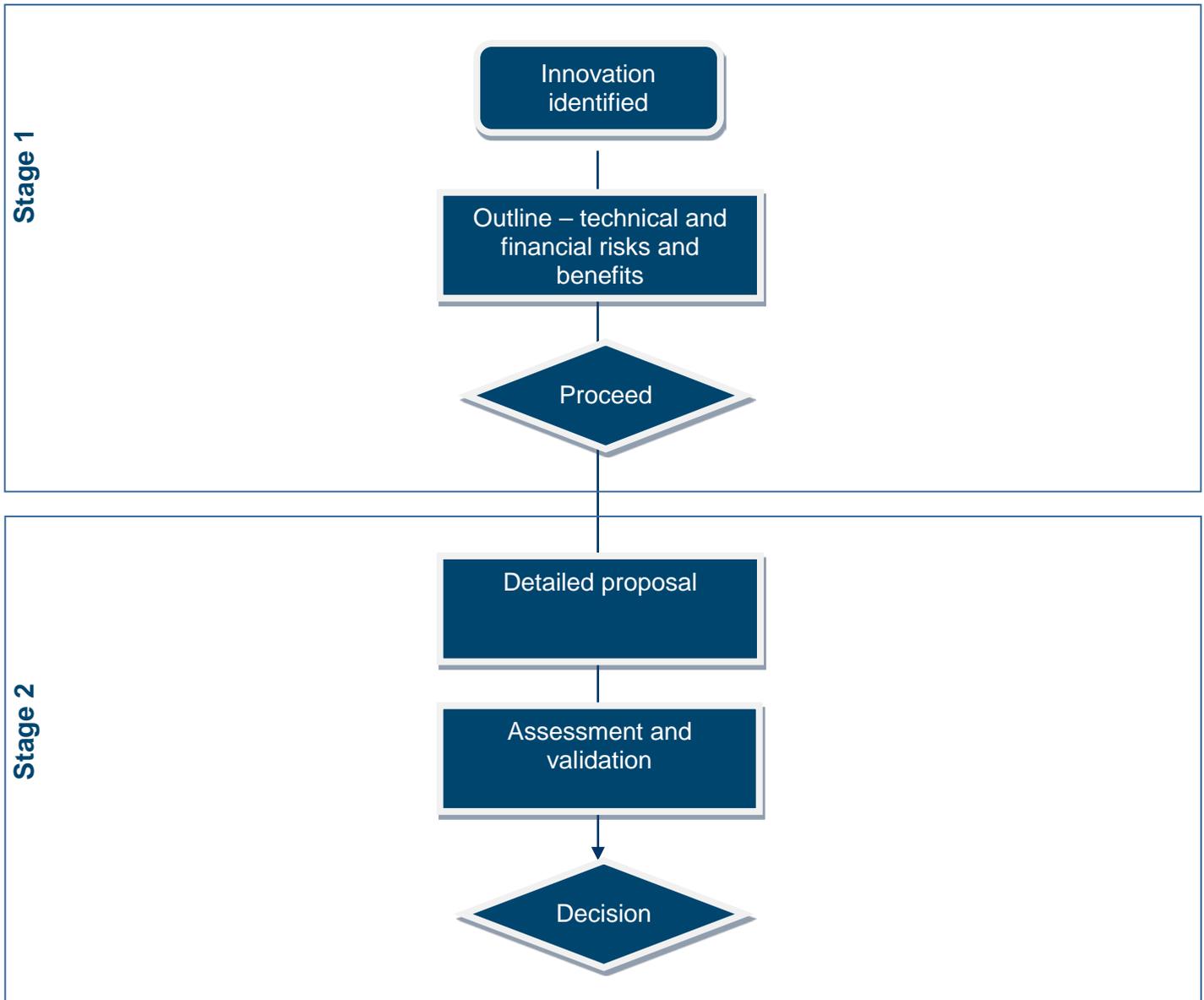
The department generally discourages innovative proposals that require extensive investigation during the performance of a contract. Once a contract begins, it is important that the contract conditions are complied with.

This should not, however, prevent you proposing innovations that could be managed effectively during project delivery. This might include, for example, innovative products that have proven reliable elsewhere, or proposals that comprise a deviation from the specification but that still meet the specification's intent.

The department discourages submitting a tender and entering into a contract on the assumption that innovations (or specification variations) will later be accepted.

Trialling new products or methods usually cannot be effectively managed when a project has started. It may be possible, however, by incorporating the development regime and commercial management principles in the initial contract.

Innovation review process



Supplier initiated opportunities

Where an innovative product or process has been identified, there are a number of ways of advancing its acceptance.

1. TMR has an agreement with ARRB Group where products can be assessed by an expert panel. They determine what is required to substantiate the proponent's claims for the product.

The process involves evaluation, testing and trial of the product. Once a product receives a favourable written technical opinion by ARRB, it may be used to satisfy multiple Australian jurisdictions.

(Refer *TIPES fact sheet*
www.arrb.com.au/Infrastructure/TIPES.aspx)

TIPES evaluations are conducted at the proponent's expense, and belong to the proponent.

2. For innovations that have high potential benefits to TMR and are widely accepted internationally, TMR may partner with industry groups to progress the required literature reviews, research, testing and piloting to bring the innovation into practice. Sharing the benefits, risks and costs will be determined on a case by case basis.
3. Where an innovative product or process is proposed for a specific application, the following should occur as early as possible:
 - 1 Initially, the proponent should provide a short **outline** of the innovative products or processes, and their benefits/risks
 - 2 The department will assess the potential strategic value of the innovation
 - 3 Once the department have indicated acceptance in principle, a detailed proposal should be provided by the proponent. The proposals should include particulars of costing, testing, reference sites, research etc.

Department initiated opportunities

From time to time, the department may identify the need for innovation within a particular process, or product. This may be in response to a specific need or a unique application.

TMR has an ongoing partnership with the ARRB Group which involves a funded research program.

In these cases, the department may approach organisations to work with it on research and development. Depending on the type of product or process, there may be opportunities for future partnerships, profit share and ongoing development.

Assessing innovation

The department uses a number of methods to evaluate an innovative process or product.

The method depends upon:

- when it is initiated
- the particular innovation
- potential risks and benefits.

The department requires adequate lead time and specialist expertise to determine functional performance assessment criteria for a particular innovative application.

In addition, we need to determine how assessments will be conducted and compliance verified.

The following checklist provides example questions which the department may ask in order to best assess your innovation.

This is not a complete list, and not all questions may be relevant to all cases. This checklist is offered as a guide only to preparing your proposal. Not all questions need to be answered in the initial stages of an outline proposal.

The department has developed a fact sheet outlining previous innovations considered by the department. This fact sheet is available on the TMR website

<http://www.tmr.qld.gov.au/business-industry/Business-with-us/Engineering-innovation.aspx>.

Checklist

- Does the proposal meet the intent of the design/specifications and any legal requirements?
- What are the potential benefits short term?
- What are the potential benefits long term?
- Have risks been considered?
- How are they mitigated?
- Have the key issues of safety and long term durability been considered?
- What plans have been put in place?
- What are the safety and maintenance implications?



- Has the process/product been tested elsewhere? Where? When? Who?
- Is the same situation relevant locally?
- Was success demonstrated? How can this be verified?
- Has testing proved durability and reliability?
- What were the plant, labour, material and competence factors that lead to success in its previous use?
- Are all these things available and applicable here for the department's requirements? (e.g. climate, skills, materials, plant)

- Has a work method statement been written?
- What are the skills/experience of resources?
- Can a pilot or test be done before implementation?
- Is it more likely that, due to development timeframe, the innovation may benefit future projects, rather than this one?
- If a process, how will you know it was done correctly after it has been done (how will you prove it?)
- If it goes wrong, how do you fix it/remedy it/remove it?
- How will it be assessed?
- How will compliance with agreed performance criteria be enforced?



