acif
Australian Construction Industry Forum

Submission to the Senate

Education, Employment and Workplace Relations Committees

The shortage of engineering and related employment skills

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Contents

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THE CHALLENGE

1. ACIF welcomes the opportunity for a considered public debate regarding the nexus between the demand for infrastructure delivery and the shortage of appropriate engineering and related employment skills in Australia. The construction industry provides careers for engineers across all three sectors – residential building, non-residential building, and engineering construction. Many of the problems and issues that bedevil engineers also have sub-optimal effects on other disciplines.

ACIF member organisations represent most disciplines within the private sector of the construction industry, including end users and asset managers, investors, designers and constructors. Firms in the industry are primarily responsible for planning, design, construction and operation of the nation's built form.

ACIF defines engineering skills as being those personal qualities and abilities a person - whether a labourer or tradesman, para-professional or professional engineer - contributes to research, design or construction. The availability of an adequate pool of engineering skills is critical to the maintenance and development of our nation's infrastructure assets.

2. ACIFs member organisations will be making independent submissions to address many of the issues raised in the Terms of Reference. In this submission ACIF addresses two overarching issues that affect the whole of the construction industry:

I. the need for a skills forecasting capability; and
II. the need to adopt innovative approaches to procurement.

Skills Forecasting

3. ACIFs Construction Forecasting Council has for more than 10 years produced six-monthly forecasts of demand in the residential and non-residential building, and engineering construction sectors. The information is made available free of charge through ACIFs web site. ACIF is acutely aware of the need for the industry to have available to it a similar capacity to forecast demand for skills across all disciplines, including engineering, that serve the building and construction industry.

4. ACIF welcomes the work undertaken by the Australia National Engineering Taskforce, with Commonwealth Government support, clearly demonstrating the shortfall of Australian engineers. However, ACIF believes that existing labour market policies and programs do not go far enough. In particular, the nation does not have a comprehensive Labour Market Information (LMI) capability to gather and analyse data concerning supply and demand of labour. As one of the mantras of management education in the 20th century put it, "if you can't measure it, you can't manage it". The need for data to inform the debate over engineering skills is, in ACIFs submission, self-evident.

Innovative procurement

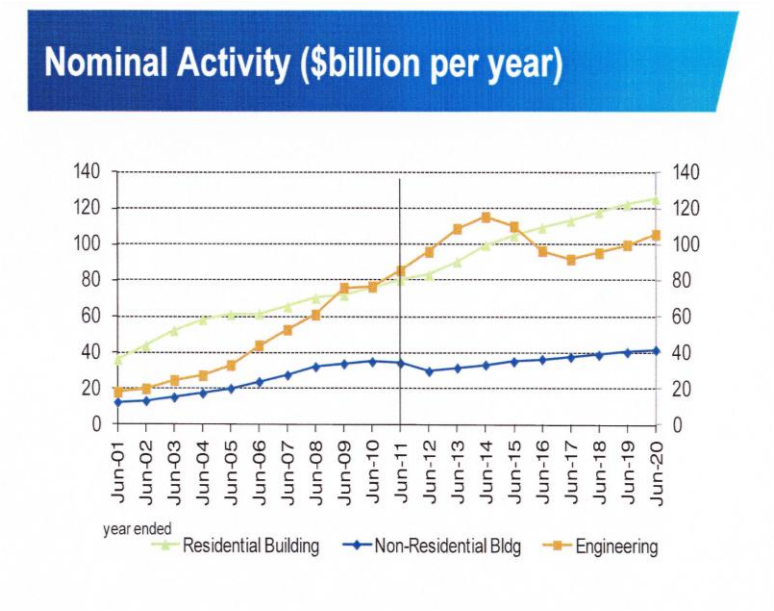
5. ACIF argues that the orthodox approach to procurement in the industry does not necessarily deliver value for money on all projects. Indeed, it embodies significant causes of wasted effort that could be eliminated with a different approach.

Governments have a significant opportunity to profit from adoption of new approaches to procurement, by reviewing policies and procedures that discourage innovation, and trialling those approaches on demonstration projects.

CONSTRUCTION INDUSTRY CHARACTERISTICS

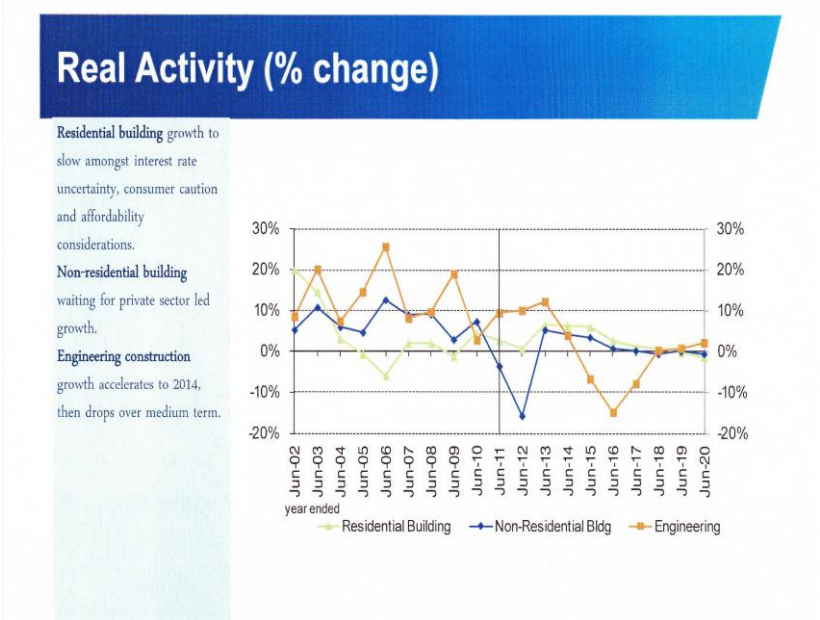
6. The construction industry (residential building, non-residential building, and engineering construction) currently accounts for around 11 per cent of gross domestic product (GDP). After allowing for wider coverage in the national accounts construction work approaches 15 per cent of GDP. The industry employs more than one million people. ACIFs Construction Forecasting Council in September 2011 forecast total (nominal) activity of about $210 billion for 2011/2012.

7. One of the most distinctive features of the industry is the relationship between workers and their employers. Construction is very cyclical, with activity reflecting investment in other sectors of the economy. The industry is also project based, involving the creation of virtual, short-term, organisations, bringing together unrelated organisations as sub-contractors. Workers, even when in long term employment with a single firm, are obliged to "follow the job".



8. If the construction industry was dominated by a few firms, workers looking for employment would only have to contact these firms, and the labour market for construction would function efficiently. But the construction industry is highly fragmented, with many firms operating in all three sectors. It is difficult for unemployed workers to know which firms may be hiring, or the kinds of skills upgrading he or she might need to secure work in the future.

9. Because the industry's level of activity is closely linked to investment, over a downturn of the business cycle, construction activity may be halved and then doubled again over the next growth period. During the downturn, employment opportunities decline dramatically, even for the experienced worker. The volatility is clear from the Construction Forecasting Council's September 2011 forecast of activity across the three sectors.



10. When hiring starts to pick up with the next business cycle, young people may be reluctant to enter the industry. This is a critical issue because it takes a minimum of four years for an undergraduate to complete an engineering or building degree or to properly train a journeyperson.

Three to four years of strong growth will have drained the pool of potential experienced workers but the skills of new graduates and tradespeople won't be sufficient to

meet industry requirements. The call goes out for more apprentices who now enrol in larger numbers in vocational schools during the peak of construction activity, or skills are imported from other countries. But the shortage of skilled workers remains.

11. These features make the construction industry a challenging environment for any kind of labour market information (LMI) intervention. Managing these peaks and valleys to ensure the construction industry has the skilled labour it requires cannot be successfully tackled with the tools presently at the industry's disposal.

THE NEED FOR LABOUR MARKET DATA AND ANALYSIS

12. The problems of volatility in demand for construction are not peculiar to Australia. The Canadian Construction Sector Council (CSC) has developed a skills forecasting capability which has produced provincial and regional forecasts of demand and supply for labour since 2005. The construction industry in the 2 countries is very similar in terms of turnover, employment, and share of GDP.

13. The CSC construction LMI Program comprises the following elements.

Regional Network of LMI – committees comprised of key industry and government stakeholders tasked with bringing regional realities to the forecast. The Network matches the provincial/regional structure of the construction labour market.

Mid term and long term forecast – facilitates planning and the development of supply side solutions.

Macro economic outlook – the construction forecast is grounded in the context of a broader economic forecast.

Construction investment outlook – derived from provincial/regional major project information vetted by provincial/regional stakeholders.

Supply side tracking – builds on the data provided through traditional data sources bringing a greater degree of accuracy and detail.

Labour requirement assessment – provides a quantitative and qualitative analysis of labour requirements for 32 trades/occupations.

14. ACIF has a Memorandum of Understanding with the CSC under which CSC staff and consultants are providing advice and assistance to help formulate a LMI Program in Australia.

15. A LMI program will provide a central location to collect labour market information and distribute this information to regional stakeholders for analysis and validation. The main objective is to increase construction industry productivity levels on a long-term basis by:

- maintaining the experienced workforce in the construction industry;
- attracting experienced workers back to the industry;
- adjusting the flow of new entrants (apprentices, trainees and graduates) so that it corresponds to industry needs, and so that fewer new entrants leave;
- recruiting qualified new entrants by offering more stable employment; and
- modernising and calibrating curricula to reflect changes in industry demand.

16. To achieve these objectives, construction industry stakeholders need a well–structured LMI Program that will enable them to make the right human resource decisions at the right times. These stakeholders include contractors, buyers of construction, unions, industry associations, group training schemes, and governments. ACIF is making approaches to interested government and industry organisations, and NGOs, to fund development of a business case to establish and maintain a LMI Program for the industry in Australia.

17. ACIFs proposal complements and builds on its own Construction Forecasting Council (CFC) work, now in to its tenth year. The CFCs six-monthly forecasts of demand in the residential and non-residential building, and engineering construction sector, are made available free of charge through ACIFs web site. In 2012 the scope of the forecasts is being widened to extend to a total of 21 cities and regions as well as providing National, State, and Territory data. Those geographical focal points are planned to become the core of our proposed LMI data review and analysis.

The Federal Government, as the most significant regular buyer of construction services in the country, has at least as much to gain from a thorough LMI program as any other buyer.

PROCUREMENT INNOVATION - GETTING RID OF WASTED EFFORT

18. The construction industry in Australia and overseas wastes over 30% of its efforts. [1] If that wasted effort were to be reduced by only one third, it would lift Australian construction output by more than $20 billion annually. If the changes required to achieve that reduction were to "ripple" through the industry, it is conceivable that within a few years the improved output would be substantially higher. The studies cited at Footnote 1 include case studies of the cost savings achieved by focusing on elimination of wasted effort.

19. Research studies in Australia and overseas all point to the need for a change in the environment in which project teams are appointed and operate, if those savings are to be achieved. They will not be achieved within the hierarchical, adversarial, industry and project structures that typify the industry. They can only be achieved in a collaborative environment, where all team members are encouraged to contribute to problem solving, and those contributions are respected. In other words, a genuine team environment.

20. Such targets have been achieved on individual projects by changing the project environment, or culture, from adversarial to collaborative. [2]

How the Industry Works Now

21. The achievement of opportunities for better service delivery from capital works assets calls for dialogue between all those involved in asset delivery, and their involvement in suggesting different and better ways of doing things.

22. So who is involved? End users, clients (whether project sponsors or asset owners), funders, planners, designers, constructors, trade contractors, and asset managers, all have a stake in the process. Those who work in the process regularly are familiar with its strengths and weaknesses, and alive to the opportunities that a fresh look at the process can offer. Those who are only occasionally involved (generally end users and asset owners) may be less familiar with the intricacies of the process, but are perhaps better equipped to ask "why do you do it that way?"

23. Once a client has decided that investment in a new asset is necessary to deliver a required service, the client will commission functional design, and financial information to determine a cost budget and decide whether to proceed with a capital works project or not, and to seek required planning approvals.

24. The design of the asset at this stage is sufficient to seek planning approvals, but is not sufficient for construction. Clients' delivery strategy options at this stage are numerous - lump sum fixed price, alliance, PPP, design and construct, managing contractor, are but some. Depending on the strategy adopted, the brief to design consultants will call for deliverables ranging from design sufficient to allow informed negotiations for an alliance, through to complete design of the project ready for construction.

25. The construction industry is characterised by a highly fragmented, hierarchical structure. Once the client's designers have produced a design to the required stage, and a head contractor has taken responsibility for managing construction delivery, the head contractor will subcontract the work to trade contractors who are largely responsible for making the original design a reality.

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[1] Getting it Right the First Time, The Institution of Engineers Australia, October 2005.
Ireland, VT40 Process Re-engineering in Construction, Sydney, 1995.
Koskela, L. Lean Production in Construction, Lean construction workshop paper, Finland, 1993

[2] Construction Lean Improvement Programme (CLIP), UK Constructing Excellence, April 2005
The BRITE Project, Cooperative Research Centre for Construction Innovation, 2006
UK Construction Best Practice demonstration projects, 2003
Getting it Right the First Time, The Institution of Engineers Australia, October 2005. McGraw

What's Wrong with the Way we do Things Now?

26. Head contractors and trade contractors generally first see the design of an asset when invited to tender. That approach to tendering limits the ability of contractors to suggest alternative designs, because they:

- are reluctant to give away good ideas for nothing, nor risk embarrassing design consultants on whom they are dependent for future work;
- generally have limited time available to review and price tender designs and documents; and
- have a typical tender success rate of less than 20%, making the cost prohibitive.

27. The current approach to tendering also results in the original design perhaps becoming wasted effort. The Institution of Engineers Australia, in their landmark study "Getting it Right the First Time" (October 2005) found that design documentation contributes 10-15% of unnecessary cost. Having contractors and "specialist" trade contractors involved in the design of a project would assist in reducing this wasted effort by nominating the essential design information they would "pull" rather than having designs "pushed" onto them. For the purposes of this paper "specialist" trade contractors are those, generally involved in delivering the structure and services, whose work is not "off the shelf" and which, once designed and made, cannot be used on another project. If not used on the project for which it was designed it must be thrown away.

28. Even with design and construction tenders, where specialist trade contractors undertake a design development and documentation role, the core design is generally locked away, with clients and design consultants reluctant to re-open design and incur additional fees other than for relatively minor enhancements.

29. This reluctance is understandable – the designs upon which contractors and trade contractors are asked to tender also have set project budgets and programs, which, subject to contingencies, have been the basis for establishing project financing arrangements. Redesign delays, even if a lower cost solution is found, can have a net cost increase from delays with the potential for new authority approvals being required.

30. This hierarchical structure of the industry often leads to adversarial relationships, with most parties operating in silos, and the transfer of risk along the supply chain. Frequently, delays occur because trade contractors have not had the chance to influence the early design. Disputes and reworking impact on out-turn costs and the quality of the end-product. This puts at risk the improved services or business performance that the project is meant to deliver.

31. The structure of the industry also tolerates and even encourages considerable wasted effort which, on some estimates, adds as much as 30% to the total cost of an asset. Landmark studies point to the common denominators in reducing wasted effort.[3] The sources of wasted effort are diverse and include:

- design drawings typically require multiple pieces of information, which are obtained progressively from different sources, leading to several iterations of a single drawing;
- when the cost budget is unknown or uncertain, several iterations of a drawing may be required, leading to (not uncommonly) between 3 and 10 design cycles being required to bring the design within budget;
- many architects' and engineers' drawings (up to 40%) are not used by the trade contractors for whom they are intended – designers "push" on to trade contractors those drawings they think

[3] Projects as Wealth Creators, Property Council of Australia, 2001
Relationship Contracting, Australian Constructors Association, 1998
Constructing the Team, UK Department of the Environment, 1994
Rethinking Construction, Construction Task Force,1998
Accelerating Change, Strategic Forum for Construction, 2002
Construction Matters, House of Commons Business and Enterprise Committee, Ninth Report of Session 2007-2008, July 2008

trade contractors want, rather than the trade contractors "pulling" the drawings they require for construction;

- poor coordination of different designers' and trades' drawings and the resulting clashes can add 5% or more to costs;
- the cost of re-work because defective work typically accounts for between 5 and 10% of construction cost.

32. The hierarchical structure of the industry effectively excludes specialist trade contractors and manufacturers from contributing to the optimal way of satisfying a project's functional objectives, and is a substantial root cause of wasted effort.

33. The solution lies in increasing integration of the key specialist trade contractors, the head contractor and design consultants. Ideally this should happen before the design is frozen, creating a fully fledged IPT. What does this alternative approach achieve? It is not uncommon for up to 10 disciplines, appointed competitively, to be involved in the design of a project. When price is the dominant selection criterion, without adequate regard for capability or availability of key people, innovation can be a casualty. It is also true that few consultants have manufacturing experience – to optimise design, manufacturing experience is essential, particularly when structure and mechanical elements are concerned. The specialist trade contractors involved in manufacture typically represent between 20% and 40% of capital cost, and have the capacity to contribute significantly to reduce whole-of-life cost.

An Alternative Approach

34. Much of this wasted effort could be eliminated, or at least reduced, if the client, head contractor, design consultants, specialist trade contractors, cost planners, and others could work together as a team and share collective responsibility for the delivery of a project. The greater the level of such project team integration established at the outset of a project, the greater the team's ability to work together on the design, cost plan and allocation of risk before construction begins. Everyone involved in the project team has a collective interest in ensuring its success.

35. The higher the level of integration of team members at the early design stages, the greater the opportunities to get maximum benefit from the use of CAD and in particular its most recent exemplar, Building Information Modelling (BIM). BIM promotes clearer, more accurate, up-to-date communication by consolidating currently disparate project information allowing all team members to contribute to the establishment and population of the databases underpinning the planning, design, construction and operation of the asset. Ideally, an IPT including design consultants and cost planners, head contractor, and key trade contractors, will be involved in developing the design, cost plan, and move on to design development.

36. It is at these early stages of a project when greatest cost savings can be achieved, as shown in Figure 1. The challenge is how to engage or involve a contractor and trade contractors before there is sufficient design to ask the market to tender. The orthodox approach to tendering, which posits that "real" value for money cannot be achieved without asking a head contractor (and trade contractors) to tender against at least some limited design, is one barrier to change. This is a key issue for further development of alternative approaches to procurement.

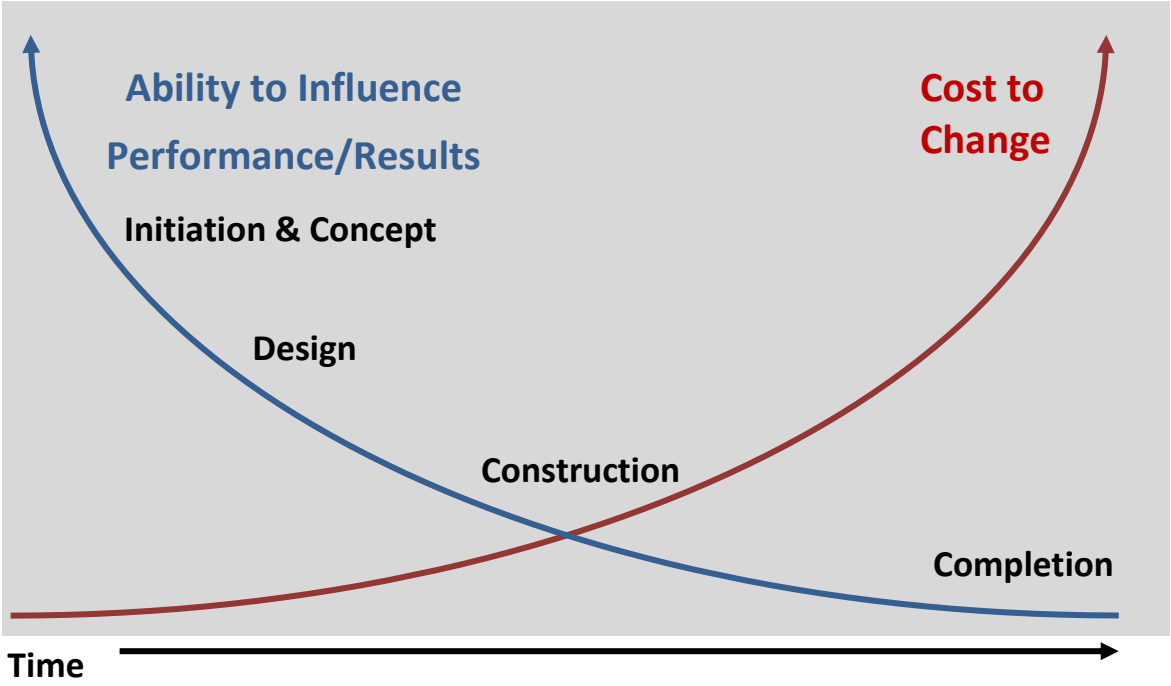
The Benefits of Greater Integration

37**.** The construction industries in the United Kingdom (UK) and the United States (US) are structured along similar hierarchical lines to those in Australia, and are subject to essentially similar laws regarding contracts. The UK Government has encouraged the use of IPTs for more than a decade. Integrated teams and supply chains were at the heart of the Latham[4] and Egan [5]reviews of the UK industry, and are a key part of the good practice guidance promulgated by Constructing Excellence, the UK industry's Strategic Forum for Construction, and the UK Office of Government Commerce.

[4] Constructing the Team, UK Department of the Environment, 1994

[5] Rethinking Construction, Construction Task Force,1998; "Accelerating Change", Strategic Forum for Construction, 2002

Figure 1



38. The Australian Constructors Association in its 1998 research report "Relationship Contracting" suggested that the core values fundamental to good project team relationships are

- commitment
- trust
- respect
- integrity
- fairness
- enthusiasm.

It also identified the need for an Integrated Project Team as a key driver of good relationships, and a tool to better align contractor and client goals.

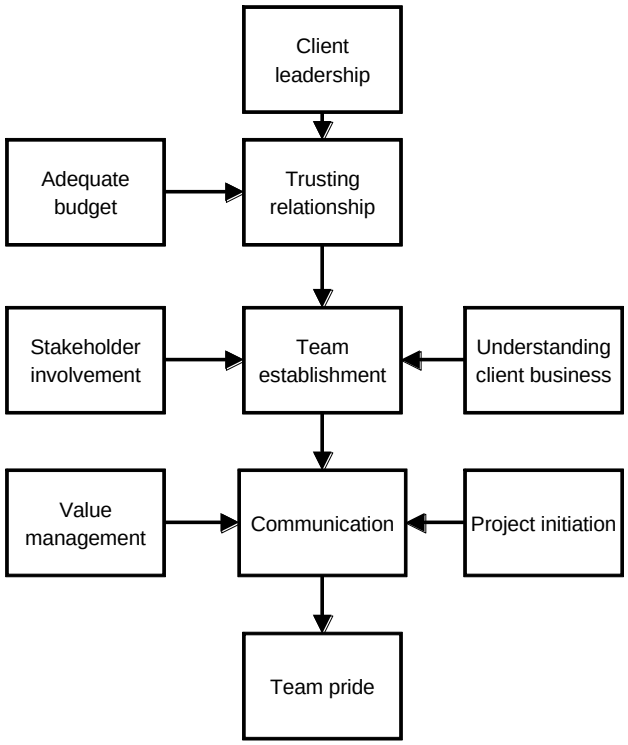
39. The Property Council of Australia in its 2001 research report "Projects as Wealth Creators" described the findings of a study of 28 highly successful projects.

> *"The clear conclusion of this path breaking study of 28 building and engineering projects is that client leadership is the defining feature of excellent projects. That's because clients are best placed to select the team that can deliver value.*
>
> *The job of a client's team is to create and manage a positive project environment from day one, shape the project brief with a clear understanding of end user needs and specifically manage the delivery team as a business unit that focuses on wealth creation."*

40. The study identified the key drivers of successful projects as behavioural (Figure 2).

> *"The study identified ten main 'drivers of excellence' in project delivery. The ten drivers are business related, not technical; they occur before design commences, and help establish a productive project environment. The primary driver was a trusting relationship, which comes from effective and informed client leadership."*

Figure 2 "Projects as Wealth Creators"
Top 10 Drivers of Excellence Behaviour Oriented



41. A House of Commons Committee, in its July 2008 report[6] on progress towards greater efficiency by the UK construction industry, summarised the benefits of integration.

> *"114. Integrated supply chains are able to move from project to project, and apply lessons learnt on one project to the next. This gives firms greater confidence to invest in their capacity, for example, by providing training for their employees or developing new ways of working. As a result, the industry can further improve its performance. However, if they are to survive integrated supply chains need the security of a long-term programme of work. This is one of the main reasons why the development of framework agreements and long-term government expenditure programmes are important to the industry. Without them, it is difficult to hold supply chains together from project to project."*

The Benefits of BIM

42. In a 2008 report[7], the Cooperative Research Centre for Construction Innovation gives this snapshot of BIM.

> *"BIM is "the use of virtual building information models to develop building design solutions, design documentation, and to analyse construction processes" (The Architect's Handbook of Professional Practice' cited by Riskus 2007). BIM has considerable potential for enhancing the efficiency and effectiveness of the Architectural/Engineering/Construction/Facilities Management (AEC/FM) Industry as it extends the functionality and application of existing Computer-aided-design (CAD) technologies. The main extension is by linking the 3D built asset model to a relational database that*

[6] Construction Matters, House of Commons Business and Enterprise Committee, Ninth Report of Session 2007-2008, July 2008

[7] BIM – Implications for Government Case Study No. 5 [2004-032-A + Case study no. 5], July 2008

can carry all information related to the built asset. This added functionality provides a mechanism for extended collaborations between designers, engineers, constructors, and facility managers across the life cycle of built assets. Another aspect of BIM is that information which is created once, can be re-used many times, resulting in less errors, greater consistency, clarity, accuracy, and clear responsibility of authorship."

43. In a 2008 report[8], McGraw Hill Construction points to the dramatic benefits being derived from by rapidly increasing adoption of Building Information Modeling (BIM) in the US.

"BIM involves using digital modeling software to more effectively design, build and manage projects, and is providing powerful new value to the construction industry firms that adopt it. Simultaneously, it is breaking down age-old barriers between these players by encouraging the sharing of knowledge throughout the project lifecycle and closer collaboration to integrate valuable fabrication, construction and operations expertise into the overall design. This improves constructability, adherence to schedule and budget, lifecycle management and productivity for everyone involved.

44. The same report summarised the acceleration in use of BIM in the US.

"Construction is a team sport, and BIM is dramatically reshaping the way project teams work together to increase productivity and improve outcomes for all. This is driving the most transformative evolution the construction industry has ever experienced.

This report, produced in collaboration with 23 construction industry organizations — ***including 15 associations and the U.S. Army Corps of Engineers*** *— is based on extensive interviews with hundreds of owners, architects, civil, structural, and MEP engineers, construction managers, general contractors and trade contractors who are currently using BIM.*

We found that BIM use on construction projects is growing rapidly — ***62% of users surveyed indicated that they will be using BIM on over 30% of their projects in 2009.*** *The research findings also clearly indicate that BIM expertise leads to greater understanding of BIM benefits and the value of using BIM –* ***82% of BIM experts believe that BIM is having a very positive impact on their company's productivity and 44% of BIM experts now regularly track BIM ROI.*** *This powerful trend points to an unstoppable wave of accelerating adoption and creative implementation that will redefine project delivery and affect every company in the construction industry."*

45. Most importantly, the report makes a clear connection between use of BIM, and enhanced team relationships and effectiveness.

"While modeling tools provide significant benefits for individual users, leveraging BIM just to produce "silos of excellence" minimizes the greater potential for large-scale improvement of the entire industry. Encouragingly, a trend called ***Integrated Project Delivery (IPD)*** *is rapidly emerging and leverages the power of modeling to facilitate collaborative decision making. IPD brings key construction management, trades, fabrication, supplier and product manufacturer expertise together with design professionals and the owner earlier in the process to produce a design that is*

[8] SmartMarket Report on Building Information Modeling: Transforming Design and Construction to Achieve Greater Industry Productivity, McGraw Hill Construction, 2008

optimized for quality, aesthetics, constructibility, affordability, timeliness and seamless flow into lifecycle management.

Using model-checking applications to detect system clashes is an effective IPD activity, particularly as a starting place for less-experienced BIM teams. Firstly because of their ease of use and powerful visualization capability; but also because they offer the opportunity to collectively resolve what are often contentious, expensive and time-consuming conflicts in the field in a non-confrontational, collaborative process during design, while they are still relatively inexpensive to correct. This productive engagement around clash detection sets the stage for improved collaboration among team members. For example, the structural design team can provide its structural model to the steel fabricator, who details directly in the same model. The fabricator then utilizes the detailed model both for approval by the design team, thereby reducing the slow and wasteful process of shop drawings, and to drive its fabrication equipment on the shop floor.

Overall, it is the powerful combination of modeling and analysis tools with integrated, collaborative processes that is creating the sea change related to BIM. And as adoption of these tools and processes spreads, teams will continue to find new productivity-enhancing ways to leverage the power of BIM for better projects."

46. The report also points to the clear benefits to clients from the "twinning" of IPTs and BIM.

"Owners will expect much more clarity about cost, schedule and quality far earlier in the process. This will facilitate increasingly earlier engagement by manufacturers, suppliers, fabricators and trade contractors and expand the use of 4D and 5D analysis tools.

Contracting methods will emerge to support integrated project delivery based on principles of mutual respect and trust, mutual benefit and reward, collaborative decision making and limited dispute resolution."

47. ACIFs member the Airconditioning and Mechanical Contractors Association (AMCA) has taken direct action to encourage the use of BIM and IPTs to drive greater efficiency and elimination of wasted effort. Working with engineers, software providers, contractors, and manufacturers, AMCA has developed BIM-MEP^{AUS}, an industry initiative which seeks to effectively address the issues currently impeding the transition to BIM based integrated project delivery. The goal is to achieve significant increases in productivity and a commercial framework for implementation of BIM through industry adopted software platforms, standards and services. During 2012, a number of Australian projects will pilot specifications, standards, models and workflows being developed under the BIM-MEP^{AUS} initiative.

Three key principles underpin the development of the initiative:

- vendor independent, but supporting vendor specific workflows;
- inclusive / collaborative; and
- BIM customized to Australian industry standards and workflows.

The initiative has gained widespread industry support including *in-principle* adoption by many of Australia's largest developers and builders and it is expected to become the industry standard for BIM based project delivery and supply chain integration within the building services sector.

What Stands in the way of Wider Adoption of IPTs and BIM?

48. The evidence from the UK and US is compelling. A series of reports and recommendations here and in the UK over more than 15 years points to the benefits of a more collaborative approach to project team management. The Cooperative Research Centre for Construction Innovation in 2008 made significant progress towards finalisation of National BIM Guidelines, yet adoption of the two performance enhancement tools has been slow in Australia. The major exception is AMCAs BIM-MEP^{AUS} initiative as a key driver of innovation.

49. Clients are being denied the benefits described in both the UK and US. Part of the resistance to adoption lies in the orthodox approach to tendering, which posits that "real" value for money cannot be achieved without asking a head contractor (and trade contractors) to tender against at least some limited design, which must be prepared without their input. The demands of probity and transparency also, it is argued, pre-empt any other approach viz. negotiated appointment of a head contractor and key trade contractors for the purpose of optimising design as early as possible.

50. The industry already uses alternative delivery strategies to deliver clients' commercial objectives, whilst satisfying required standards of probity and transparency, for example:

- design consultants may be appointed competitively, to complete concept design only, sufficient for design and construct tenders to be called, with consultants novated to the head contractor to complete the design;
- consortia of head contractors, design consultants and financiers, are invited to submit proposals for PPP or alliance projects, based on the client's performance requirements;
- two-stage managing contractor strategies are used By the Department of Defence, with preliminary design being undertaken in Stage 1 based on the client's business case, and competitive trade contracts being let in Stage 2;
- design consultants and contractors are appointed competitively to form an alliance with the client to develop design, and call tenders from manufacturers and trade contractors to carry out the work.

51. An alternative approach to early appointment of specialist manufacturing trade contractors, whilst maintaining the client's commercial objectives, could be to select them on the basis of competitive overheads, expertise, previous experience and indicative costs. Their performance could be measured by benchmarking their output against the whole-of-life costs in the client's project business case and cost plan, and against costs from previous projects, rather than just tendered capital costs.

If the client is prepared to also specify the use of proven techniques (including value management, whole-of-life energy modelling, and BIM), it is possible to forecast and achieve even greater certainty of project out-turn costs.

PROPOSED ACTIONS

52. A joint working group of ACIF and its public sector counterpart the Australasian Procurement and Construction Council (APCC) has been working on development of a suite of "tools" required to assist clients adopt a different approach exist.

53. This is an industry of tyre kickers – without demonstration projects, it is difficult to persuade clients, and designers and contractors, to embrace the benefits of the twin developments. What is needed is a concerted effort to persuade clients to trial an IPT and BIM on a single project. The full glare of industry scrutiny, together with professional pride, will ensure that team members on such projects will work as hard as possible to achieve an excellent outcome.

54. The ACIF/APCC working group has concluded that that five actions need to be taken to increase the number of projects which deliver the benefits of the two complementary developments to clients, end users and project team members.

    I. Produce and promote guides for the appointment of team members to IPTs, based on their ability to deliver optimal time, cost, and quality outcomes.

    II. Develop policies and procedures which facilitate the involvement of head and trade contractors in the project initiation and design phases of new capital works assets.

    III. Clients communicating in advance their intentions to require organisations working on their projects to use a particular BIM platform; clients supporting the need for interoperability standards to encourage open communication between platforms; clients who specify the use of a particular BIM platform on a project, ensuring that the specified platform is used;

    IV. Clients being prepared to trial the twinned developments in IPTs and BIM on demonstration projects.

    V. Monitor measure and report on the outcomes from demonstration projects.

55. The end objective should be the achievement of excellent project outcomes, where:

    A. end users expectations are met or exceeded;

    B. the client's strategic and financial objectives are met;

    C. project team members achieve their financial objectives;

    D. the project delivery team enjoys working together, and wants to work together again;

    E. community and stakeholder expectations of the project in terms of safety, design, environmental outcomes, and social objectives, are met or exceeded.