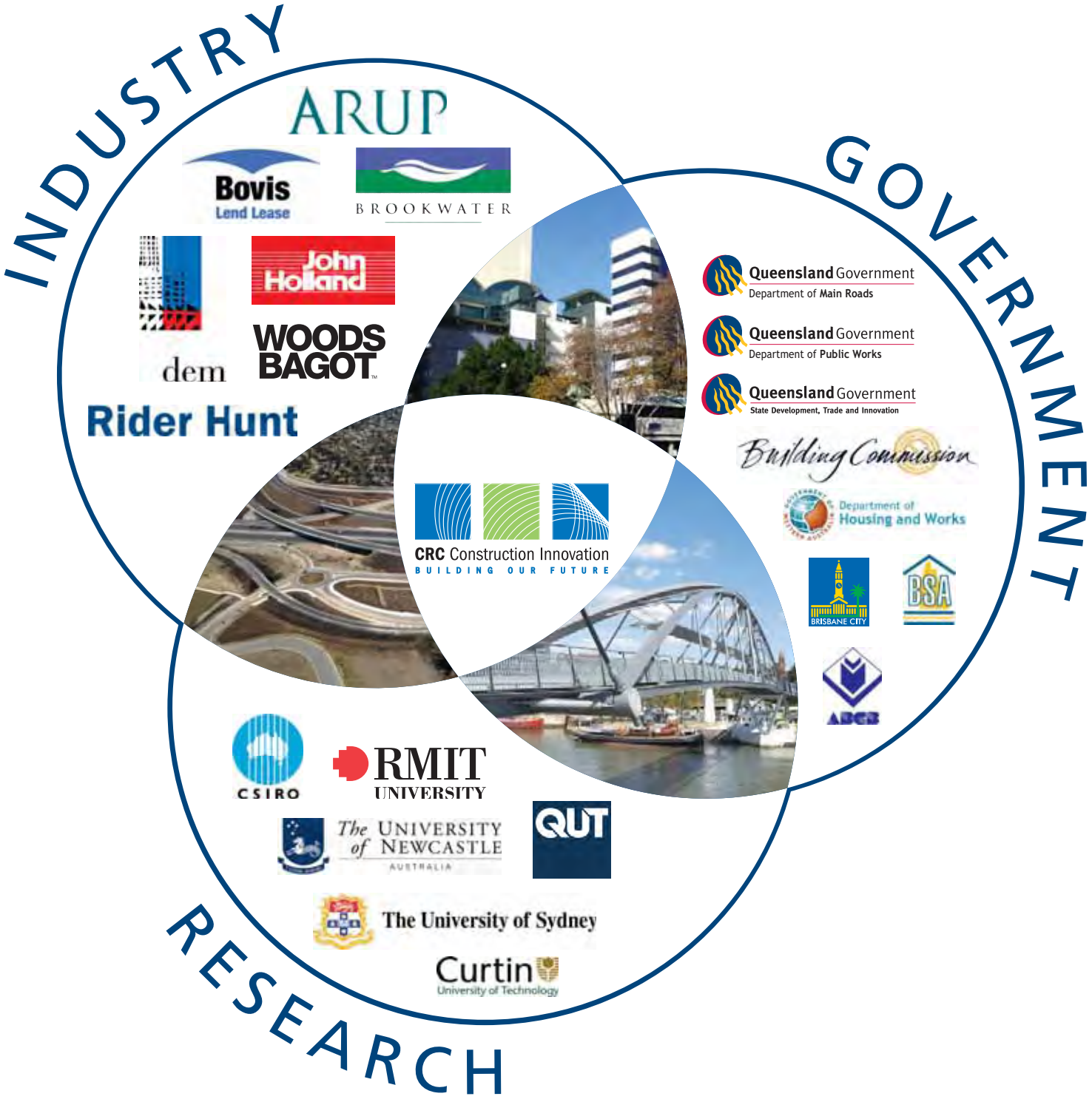
Established and supported under the Australian Government's Cooperative Research Centres Program

ANNUAL REPORT 2005–06

Cooperative Research Centre for *Construction Innovation*

CRC Construction Innovation
BUILDING OUR FUTURE

BUILDING OUR FUTURE


INDUSTRY
GOVERNMENT
RESEARCH
ARUP
Bovis
Lend Lease
BROOKWATER
John Holland
WOODS BAGOT
dem
Rider Hunt
Queensland Government
Department of Main Roads
Queensland Government
Department of Public Works
Queensland Government
State Development, Trade and Innovation
Building Commission
Department of Housing and Works
BRISBANE CITY
BSA
ABCB
CRC Construction Innovation
BUILDING OUR FUTURE
CSIRO
RMIT UNIVERSITY
The University of Newcastle
AUSTRALIA
QUT
The University of Sydney
Curtin
University of Technology

CRC for *Construction Innovation* — Building our future

Construction Innovation began operations in July 2001 and is based at Queensland University of Technology's Gardens Point campus in Brisbane. It has been made possible through a $14 million Australian Government grant through the CRC Programme and complemented by $50 million of cash and in-kind support from partners.

Our objectives are to

- enhance the contribution of long-term scientific and technological research and innovation to Australia's sustainable economic and social development
- enhance collaboration between researchers, industry and government, and to improve efficiency in the use of intellectual and research outcomes
- create and commercially exploit tools, technologies and management systems to deliver innovative and sustainable constructed assets to further the financial, environmental and social benefit to the construction industry and the community.

Our mission is to

- deliver tools, technologies and management systems that will improve the long-term effectiveness, competitiveness and dynamics of a viable construction industry in the Australian and international contexts — this will be achieved through greater innovation in business processes, strengthened human relations and ethical practices, and more effective interactions between industry and its clients
- drive healthy and sustainable constructed assets and optimise the environmental impact of built facilities through sound conceptual bases for economic, social and environmental accounting of the built environment, virtual building technology to examine performance prior to documentation, construction and use, and assessing human health and productivity benefits of smart indoor environments
- deliver project value for stakeholders for the whole of life, from business need, design and construction, through to ownership, asset management and reuse through improved communication and use of knowledge, increased productivity and value, and effective delivery and management of whole-of-life assets.

Contents

Executive summary

The property, design, construction and facilities management sector accounts for 14 per cent of the national economy, employs around 860,000 people through 250,000 firms — the vast majority of which are small-to-medium sized enterprises (SMEs) — and contributes significantly to the rest of the Australian economy as an enabler.

CRC *Construction Innovation* directly contributes to improving Australia's GDP through conducting applied research and developing tools, technologies and management systems for our partners and adding value to industry:

- our initiatives encourage innovation and are delivering significant industrial, commercial and economic benefits
- developing software tools that potentially change the way the design, construction, refurbishment and demolition industries work
- our research is making workplaces safer for construction workers
- our work is helping to reduce water and energy use in our buildings.

We have worked over the last twelve months to further strengthen our ties with industry and have achieved significant outcomes — a few of which are highlighted below:

Second International Conference — *Clients Driving Innovation: Moving Ideas into Practice*

Our March 2006 conference proved to be an outstanding success. Feedback is well summarised by Plenary Keynote, Peter Brandon, '*the content was some of the best I have heard anywhere. In many ways this was a watershed event with 3D now firmly in the commercial domain and virtual prototyping now poised to take off. The quality of the presentations was tremendous and I heard nothing but excellent reports… To get the balanced representation (between researchers and industry) was almost unique…'.*

Over 230 delegates representing 12 countries experienced a comprehensive selection of more than 90 presentations. The contributions of leading industry professionals and researchers from around the world underpinned the success. Keynote presenters came from Stanford University (USA), Australia's Mirvac Group, Property Council of Australia, ISS EastPoint Group (Hong Kong), VTT Technical Research Centre of Finland, and Salford University (UK).

The *third* international conference for our CRC is scheduled for 12–14 March 2008 on the Gold Coast. The over-arching theme *Clients Driving Innovation* will continue as the basis for streaming our industry and research papers — focused on *business benefits of innovation* in the construction process.

Martin Fischer, Stanford University (USA) presenting at the CRC's 2006 International Conference

New National Partners

The more complete national servicing of Australia's property, design, construction and facilities management industry through the addition of participants in Western Australia (WA) was a most satisfying achievement last year. On 1 January 2006, the Western Australian Department of Housing and Works and Curtin University of Technology became core CRC participants.

The official WA launch in May 2006 was a great success and confirmed broad support for rapid engagement on our CRC projects with the fast track development of two new projects and two variations to existing projects to service the WA industry in areas including procurement, government policy, off-site manufacture and occupational health and safety. The commitment from WA to have our CRC contribute to their five year works review program is integral to the value our CRC is able to offer this state. Researchers from Curtin University of Technology in Perth now complement those based in Brisbane, Sydney, Newcastle, Melbourne and Canberra.

The Queensland strength of our CRC was also reinforced with the Queensland Building Services Authority joining as of 1 July 2005.

Value to industry

This fifth year of our CRC has been symbolised by a number of our research projects providing valuable outcomes for industry.

The ICT suite of products (*Automated Estimator, Automated Scheduler, DesignCheck* and *LCADesign*) are currently being trialled in the field by our participants John Holland, Rider Hunt, Bovis Lend Lease, Queensland Department of Public Works, Woods Bagot and a number of international partners (where our intellectual property is protected by agreements). The use of these tools has led to a broader recognition of the value of advanced building information modelling (BIM) as a *value add* for designers, construction managers and facilities managers. The *Sydney Opera House Facility Management Exemplar Project* led by our industry participant Rider Hunt, is making significant advances in BIM, procurement and performance benchmarking. These practical industry outcomes will be disseminated through a national series of industry workshops in November 2006. An important element of the Facilities Management Action Agenda (chaired by our CRC Chair John McCarthy) — an industry-led collaboration to improve facilities management in the Australian economy — is the need to build a more efficient and effective procurement process with reduced timelines and a more integrated value chain. The Sydney Opera House project outcomes will deliver against this action agenda to deliver ongoing benefits to our industry.

The *Construction Site Safety Culture Project*, led by our industry participant John Holland, will be launched by the Honourable the Minister for Employment and Workplace Relations Kevin Andrews MP in September 2006. This project will recommend national uniformity of construction safety supervisor roles to allow more appropriate site safety practices wherever construction sites may be located. This will lead to more effective education and work practices Australia-wide, as well as more economic employment of staff. It represents the commencement of a series of construction safety projects planned to improve safety for workers and reduce the $3.6 billion annual cost to Australia by bringing together key players across the industry — including the Federal Safety Commissioner — and improve cultural and design issues contributing to this industry's poor safety record — with five times more deaths than the mining sector; and an injury and compensation rate twice the national average.

Our *Value in Project Delivery Systems: Facilitating a Change in Culture* has been developed into a series of learning modules to be delivered to private and public industry partners. Given the increased use of relationship-based contracting and the emergence of Public-Private Partnerships (PPPs), the relevance of this knowledge is significant. This *Construction Innovation*-developed learning resource will now form part of QUT's Master of Project Management and be integrated into QUT's offering in the international Shell Project Academy. This progression of applied research developed into local, regional and international skill development modules is an excellent example of this CRC's pragmatic approach to improving Australia's industry.

The future

Continuing to deliver valuable outcomes for the Australian property, design, construction and facilities management sector remains one of the most critical challenges for the future.

In May this year a decision was made by the CRC selection panel not to have our CRC proceed with the 2006 funding process. As a result of this decision, the Board of *Construction Innovation* has proposed a national centre for Construction Innovation be established to meet the needs of our industry and community. We seek to maintain the momentum and collaboration established between our Centre's participants, the broader industry and our international networks. Our future programs are critical to maintain Australia's global competitiveness and growth over the coming 5–10 years as they will:

- ensure Australia is achieving sustainable practices in energy and water use and CO_2 emissions
- drive productivity improvements and allow Australian industry to compete internationally by developing unified standards for building information models
- improve safety for workers through improved design and constructability and an industry-wide approach
- develop tools and optimise our management practices to support the industry's FM Action Agenda
- address the industry's growing skills gap in key areas of new eBusiness technology, sustainability and safety.

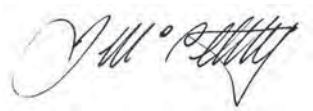
Our existing and new private sector participants are committed to maintaining a dedicated research and development organisation for the building, construction and property services industry under an industry and government partnership.

We sincerely thank all our industry, government and research participants for the vital support provided to our CRC. Particularly, we thank the QUT for providing the Australian headquarters of the CRC — your support from *day one* has been fundamental to our success. We also acknowledge the on-going support of the Australian Construction Industry Forum (ACIF); Australian Sustainable Built Environment Council (ASBEC); Australian Procurement and Construction Council (APCC); Construction and Property Services Industry Skills Council (CPSISC); International Alliance for Interoperability (IAI); International Construction Research Alliance (ICALL); and other industry associations.

The Board of the International Council for Research and Innovation in Building and Construction (CIB) has highlighted the value our CRC is delivering to Australia. We are recognised leaders in providing research benefits to industry, and delivering mutually beneficial outcomes through up-skilling our industry and research community.

We acknowledge the contribution the Australian Government has made to advancing Australia's construction industry through the CRC Programme and the insight and commitment of our CRC participant group. The Australian Government's support of this industry initiative has been central to the national success of our Centre.

We are confident our highly committed staff is well equipped for future challenges in this next phase of our life in delivering business benefits to industry through applied research, education and training and technology transfer. Our Governing Board and committees continue to provide strong and rigorous leadership and with the ongoing support of our participants, we look forward to further demonstrating the value of our industry, government and research collaboration to our partners, our industry and the Australian community in the years to come.



Mr John McCarthy
Chair
CRC *Construction Innovation* Board

Dr Keith Hampson
CEO
CRC *Construction Innovation*

Keith Hampson (L) and John McCarthy

Governance, structure and management

The CRC for *Construction Innovation* is an unincorporated joint venture governed by a Board comprising nine nominees from participants (five non-research and four research) and an independent industry Chair.

In 2005–06 Arup Australasia reduced their contribution to the CRC, thus becoming ineligible to nominate a Board member under the terms of the Centre Agreement. Consequently this reduced the number of Board members by one.

2005–06 also saw the withdrawal of one participant and the joining of three new participants to the Centre following approval by the Governing Board and the signing of a Deed of Accession:

- University of Western Sydney *withdrew* from the Centre effective as of 31 December 2005
- Queensland Building Services Authority joined effective as of 1 July 2005 with the Deed of Accession signed 16 August 2005
- Curtin University of Technology joined effective as of 1 January 2006 with the Deed of Accession signed 10 June 2006
- Department of Housing and Works, Government of Western Australia joined effective as of 1 January 2006 with the Deed of Accession signed 14 June 2006.

As at 30 June 2006, a contract variation was in progress that addressed the joining of Brisbane City Council (effective as of 1 January 2004 through a Deed of Accession signed 11 February 2004) and Queensland Building Services Authority; and the withdrawal of University of Western Sydney.

Icon.Net Pty Ltd has been established to hold all *Construction Innovation* intellectual property on behalf of the *Construction Innovation* participants. The Chair of the Governing Board also chairs meetings of the directors of Icon.Net Pty Ltd. The Directors of Icon.Net met five times during the year.

There are four Committees which also meet to facilitate decision making:

- **The Research Committee** — described in detail on pages 6–7.
- **The Remuneration Committee** meets in conjunction with the Board meetings and provides advice regarding the employment conditions for the Senior Management Team. The Committee members are John McCarthy (Chair); Allen Kearns, CSIRO; John Oliver, Rider Hunt; David Golightly, John Holland; and Arun Sharma, Queensland University of Technology.
- **The Board Performance Committee** met five times in 2005–06 and assists the Board review the performance of the Board. The members are Don Allan, Queensland Department of Public Works (Chair); Gary Moore, University of Sydney; John Oliver, Rider Hunt Sydney; and Carole Green, Business Manager CRC for *Construction Innovation*. In 2005–06, Don Allan was replaced by Max Smith, Gary Moore by Tom Kvan, and John Oliver took on the role of Acting Chair.
- **The Audit and Compliance Committee** assists the Board in fulfilling its responsibilities relating to accounting and reporting practices; improve the credibility and objectivity of *Construction Innovation*'s financial and other reports; and strengthen the systems of internal controls, risk management and compliance with the Centre Agreement, and applicable laws and regulations.

  Members of the Audit and Compliance Committee are John Oliver, Rider Hunt Sydney (Chair); Rod Wissler, Queensland University of Technology; Dennis Wogan, Queensland Department of Main Roads; and Carole Green, *Construction Innovation* Business Manager. The committee met seven times during 2005–06.

'*The construction industry is critically important to WA and its economy, and the Government is keen to ensure it has the support it needs … With the support of research undertaken through the [CRC for Construction Innovation], we look forward to seeing continued success in the drive to increase the efficiency and effectiveness of the WA construction industry … this will support continued strength in the WA economy as a whole.*'
Western Australian Housing and Works Minister **Michelle Roberts**

Governing Board

The Governing Board met six times in 2005–06, in Sydney, Brisbane, Melbourne and Canberra. It retains all responsibility for strategic and policy matters relating to the activities of the Centre and ensures these are carried out in accordance with the provisions of the Commonwealth and Centre Agreements. John McCarthy continues to chair the Board.

There were a number of changes in the membership of the Board and associated Committees in 2005–06:

- Barney Glover replaced Adrian Page as University of Newcastle's nominee
- Allen Kearns replaced Ivan Cole as CSIRO's nominee
- David Golightly replaced Glenn Palin as John Holland's nominee
- Max Smith replaced Don Allan as QDPW's nominee.


1


2


3


4


5


6


7


8


9


10


11


12


13


14


15


16

1 **Governing Board Chair, John McCarthy** is recognised as an industry leader with over 35 years experience in the property industry. His current appointments include Chairman of AEH Property Pty Ltd, Chairman of Strategic Industry Leaders Group — Facilities Management Action Agenda; Chairman of Centrecare (NSW) Property Committee; Director of Australian Building Codes Board (ABCB); Director of the International Council for Research and Innovation in Building and Construction (CIB); Adjunct Professor, School of Urban Development, Faculty of Built Environment and Engineering, Queensland University of Technology; and Chairman, SB08 National Management Board (World Sustainable Building Conference). His professional roles have included Chief Executive of ANZ Property Investment and Advisory Services and Chief Executive of Colonial Mutual Properties.

2 **Don Allan** is Director of the Industry Policy Unit, Queensland Department of Public Works. In this capacity he is responsible for building policy and advice, government and industry relationships, and industry supplier base development. The Industry Policy Unit of the Department works to establish and enhance strong and effective links with the building and construction industry to foster innovation and industry improvement.

3 **Ivan Cole** has nearly 20 years experience studying environmental degradation of materials and has published over 70 papers in this area. Ivan is Deputy Chief, CSIRO Manufacturing and Infrastructure Technology. He is also the Director of Intelligent Manufacturing Systems Australia.

4 **Noel Faulkner** has spent 30 years in management and has extensive experience in change management and organisation restructuring. He has held the position of Chief Executive Officer for a number of large public and private utilities and is currently the Divisional Manager of City Business, Brisbane City Council. This division provides architectural, engineering, urban design, traffic and transport engineering as well as environmental and water management services to Brisbane City.

5 **Neil Furlong** is the Pro Vice-Chancellor (Research and Innovation) at RMIT University and has been an active researcher in surface/surfactant chemistry and environmental technologies for the past 28 years. He is an active contributor to the development of the chemistry profession in Australia. He has taken lead roles in the Royal Australian Chemical Institute and the Academy of Technological Sciences and Engineering and has actively developed international research and technology collaborations particularly around an Australia/Japan exchange program in colloid science.

6 **Barney Glover**, Deputy Vice-Chancellor (Research) at the University of Newcastle, is a distinguished scholar with extensive experience in research management and policy development at local, state and national levels. He has a strong research record and is author or co-author of over 70 research publications in Applied Mathematics. Barney is also a Board member of the Australian Biosecurity Cooperative Research Centre, the John Curtin Institute for Public Policy and the Cooperative Research Centre for Coal in Sustainable Development.

7 **David Golightly** is one of the John Holland Group's most experienced senior managers. He joined John Holland in 1979 and has held various positions in the areas of engineering and technology, including Construction Estimator, National Estimating Manager and General Manager Technical Services. David's current position is General Manager, Engineering and Estimating.

8 **Allen Kearns** strongly supports strategic science, planning and business development activities to underpin sustainable solutions for Australia. Allen is the Deputy Chief, Business Integration, CSIRO Sustainable Ecosystems. He is particularly interested in researching sustainability in urban areas and is currently focussing on developing projects in urban ecosystem management, urban food systems, urban health and industrial ecology.

9 **John Oliver** is a Director of Rider Hunt, Sydney. He has held an executive role in a professional cost consultancy practice since 1975 and has experience in every major facet of the profession working on small projects through to those with multi-million dollar budgets. John has a hands-on approach, and uses his experience in contractual and cost planning matters to provide risk-averse strategies. John serves as Chair of the Research Committee for *Construction Innovation*.

10 **Adrian Page** is an Emeritus Professor in Civil Engineering in the School of Engineering, Faculty of Engineering and Built Environment, University of Newcastle. Prior to his recent retirement he held several senior positions at the University of Newcastle including Deputy Vice-Chancellor (Research), Pro Vice-Chancellor (Engineering and Built Environment) and Dean of Engineering. He is an Honorary Fellow of Engineers Australia and a Fellow of the Academy of Technological Sciences and Engineering.

11 **Glenn Palin** commenced with John Holland in 1993 as a Business Development Manager. Since that time he has held a number of positions within the company including National Business Development Manager — Building Division, NSW Business Development Manager, Operations Manager NSW and National Telecommunications Manager. In January 2003, Glenn was appointed General Manager, Northern Region and in early 2006 was promoted to his current role of Executive General Manager overseeing the company's specialist businesses (Tunnelling and Underground Mining, Structural Mechanical Process, Water, and Telecommunications and Transmission Systems).

12 **Arun Sharma** is the Deputy Vice-Chancellor (Research and Commercialisation) at Queensland University of Technology. He was co-founder of National ICT Australia Limited (NICTA) and of the Cooperative Research Centre for Smart Internet Technology. He sits on the ICT Sector Advisory Committee of CSIRO, is a member of the Queensland Premier's Smart State Council and is President of the Queensland Chapter of the Australia India Business Council.

13 **Max Smith** is the Deputy Director-General, Works of the Queensland Department of Public Works and is accountable for the successful delivery of a Works Program with an annual budget of $2 billion and over 3,500 staff. Max is a civil engineer and is responsible for the Works Division, incorporating the Project Services and QBuild commercialised business units, and areas providing specialist policy, research and technical advice, whole-of-government accommodation services and the delivery of major Government projects. Max is also a Member of the Queensland Building Services Authority Board.

14 **Dennis Wogan** is an Executive Director in the Queensland Department of Main Roads. His current area of responsibility covers the enhancement of the department's technical capability through its programs in R&D, technical training and technical knowledge transfer. He also has a key responsibility for improving the department's works delivery policies and systems including its contractual and prequalification systems for contractors and consultants, and works in close association with road construction industry bodies.

15 **Carole Green** is Business Manager with the CRC for *Construction Innovation* and responsible for the overall financial, contractual, reporting, promotional and human resources management. Carole has a strong background and interest in the development of commercially focused research. She has extensive skills in the preparation of business and research plans, and undertaking negotiations with industry collaborators and researchers in relation to industry-sponsored research, consultancy, training and commercialisation. Carole is the Secretary to the Governing Board and Company Secretary to Icon.Net Pty Ltd.

16 **Keith Hampson** is CEO of the CRC for *Construction Innovation* and has responsibility for crafting a blend of commercial and public good outcomes on behalf of the Centre's industry, government and research partners. Keith is a registered civil engineer and project manager with extensive experience in operating in multi-disciplinary environments in design, construction and maintenance. He is committed to building a more internationally competitive Australia by promoting access to better education, technology and innovative practices. His research interests focus on industry competitiveness and innovation. Keith attends the Board meetings by invitation.

Governance, structure and management

Attendance at CRC for *Construction Innovation* Governing Board meetings 2005–06

Board member	No. of meetings attended	No. attended by alternates
John McCarthy	6	
Don Allan	4	
Ivan Cole	5	
Noel Faulkner	5	
Neil Furlong	4	1
Barney Glover	2	
David Golightly	3	
Allen Kearns	1	
John Oliver	5	
Adrian Page	2	2
Glenn Palin	2	1
Arun Sharma	3	3
Max Smith	2	
Dennis Wogan	5	1
Keith Hampson (CEO)	5	
Carole Green (Secretary)	6	

Attendance at Icon.Net Pty Ltd meetings 2005–06

Board member	No. of meetings attended	No. attended by alternates
John McCarthy	5	
Noel Faulkner	2	
David Golightly	3	
John Oliver	5	
Glenn Palin	1	1
Arun Sharma	3	1
Keith Hampson	4	
Carole Green (Secretary)	5	

Note: Five meetings were held. Glenn Palin resigned as a Director of Icon.Net and was replaced by David Golightly. Noel Faulkner was appointed as a Director effective from the Icon.Net meeting of 26 April 2006.

Research Committee

The Research Committee met four times during 2005–06 and is chaired by John Oliver, a Director of Rider Hunt. The Research Committee, comprising industry, government and research participants, plays an active and essential role in advising the Board on research policy, strategy and planning. It monitors, reviews and evaluates the implementation and outcomes of the Research Management Plan, the Research Budget and research policies and procedures, and provides recommendations to the Board on the establishment, continuation or termination of research projects.

Research committee members

John Oliver, Chair
Director, Rider Hunt, Sydney

Program A: Business and industry development

Neil Ryan, Director
Professor and Head,
School of Management, QUT

Don Allan, Deputy Director (until May 2006)
Director, Industry Policy Unit, Queensland Department of Public Works

Tom Fussell, Deputy Director (from May 2006)
Director, Project Services, Queensland Department of Public Works

Program B: Sustainable built assets

Peter Newton, Director
Chief Research Scientist, Manufacturing and Infrastructure Technology, CSIRO

Judy Kraatz, Deputy Director
Group Manager, The Architecture Group, Brisbane City Council

Program C: Delivery and management of built assets

Ron Wakefield, Director (from August 2005)
Head of School, Property, Construction and Project Management, RMIT

Gerry Shutt, Deputy Director
Group Manager, Knowledge Management, John Holland

ICT Platform

Robin Drogemuller, Director
Principal Research Scientist, Integrated Design and Construction Systems, Manufacturing and Infrastructure Technology, CSIRO

Jeanette Clough, Deputy Director
IT Manager, Rider Hunt, Melbourne

Other Committee Members

John Dalrymple (until August 2005)
Director, Centre for Management Quality Research, RMIT

The RMIT representative is now Ron Wakefield, Director of Research Program C.

Dale Gilbert
Director, Built Environment Research Unit, Queensland Department of Public Works

Richard Hough
Principal, New South Wales, Arup Australasia

Kerry London
Associate Professor, School of Architecture and the Built Environment, University of Newcastle

Mary Lou Maher
Professor of Design Computing, University of Sydney

Matthew McDonald
Manager, Development, Australian Building Codes Board

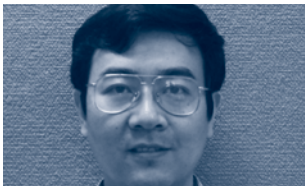
Ken Moschner
Project Director, Brisbane City Council

Peter Nassau
Director, Building Quality, Building Commission, Victoria

Jason Smith
Executive Director, Licensing, Queensland Building Services Authority

John Spathonis
Principal Manager (Research and Development), Queensland Department of Main Roads

Yang Xiang (until Jan 2006)
Associate Professor in Structural Engineering, School of Engineering and Industrial Design, University of Western Sydney



Secretary

Peter Scuderi
Development Manager, CRC for *Construction Innovation*

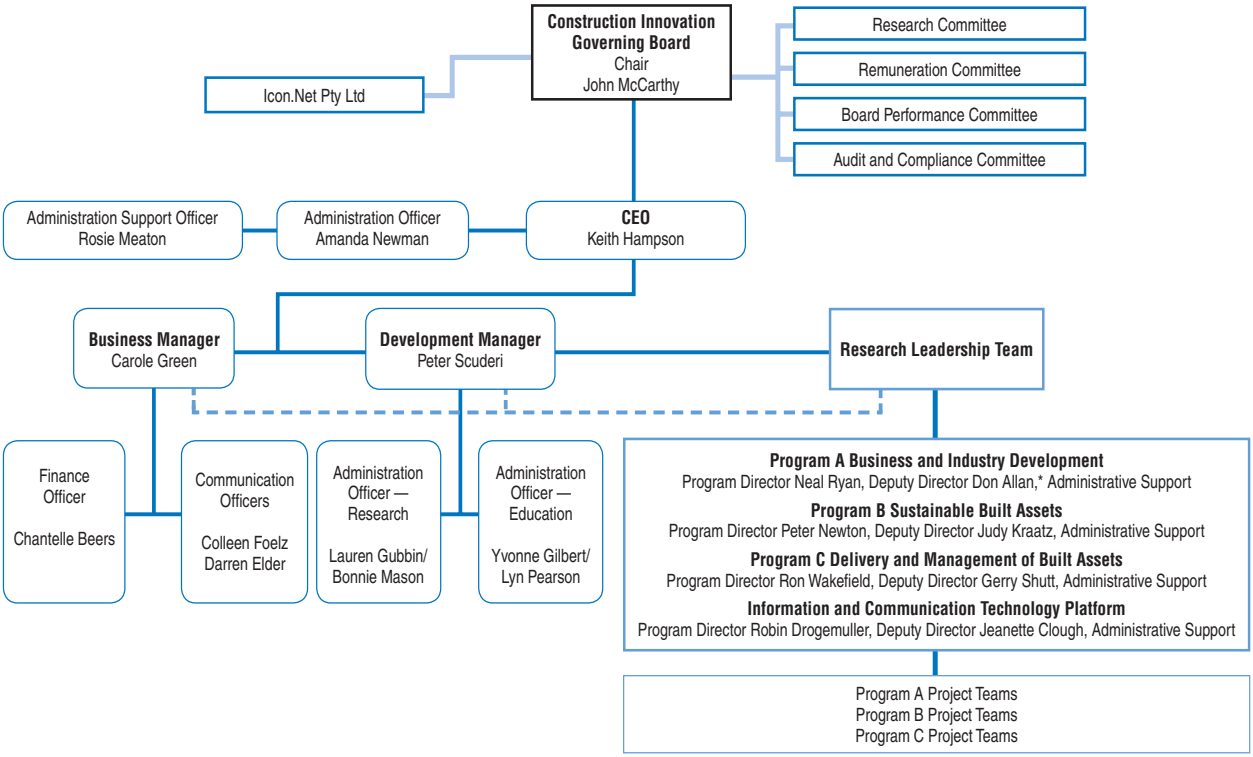
Headquarters Staff

Keith Hampson
CEO, CRC for *Construction Innovation*

Carole Green
Business Manager, CRC for *Construction Innovation*

Governance, structure and management

Organisational structure



* Tom Fussell became the Deputy Director in May 2006

Under Captain Cook Bridge, South-East Freeway, Brisbane

Photo by Peter Brandon

Headquarters

The CRC for *Construction Innovation* has a headquarters team of eleven who look after the five program areas: Research, Education and Training, Communication, Commercialisation, and Administration.

Keith Hampson
Chief Executive Officer and Member, Research Committee

Keith's career has spanned industry, government, education and research, and he has gained a reputation as an energetic leader with a strong blend of technical and management skills.

Reporting directly to the Board, the CEO has overall management responsibility of the CRC for *Construction Innovation*.

Carole Green
Business Manager, Secretary, CRC for *Construction Innovation* Governing Board, Company Secretary, Icon.Net Pty Ltd and Member, Research Committee

Responsible for the overall financial, contractual, reporting, promotional and human resources management.

Peter Scuderi
Development Manager and Secretary, Research Committee

Responsible for research programs and maximising the value of research outputs, education and training strategies, implementation and commercialisation.

Chantelle Beers
Finance Officer

Supports the Business Manager as an accountant and financial reporting specialist.

Darren Elder
Media Officer

Supports *Construction Innovation* activities as a media and communication specialist.

Colleen Foelz
Communication Officer

Supports *Construction Innovation* activities as a publishing, web content manager and communication specialist.

Yvonne Gilbert (July–October)
Administration Office — Education

Supports the Development Manager with education and training activities.

Lauren Gubbin (July–December)
Administration Officer — Research

Supports the Development Manager in administration of the research programs.

Bonnie Mason (December–June)
Administration Officer — Research

Supports the Development Manager in administration of the research programs.

Rosie Meaton
Administration Officer

Supports *Construction Innovation* activities with general administration duties.

Lyn Pearson (February–June)
Education and Training Officer

Supports the Development Manager as an education and training specialist.

Amanda Newman
Administration Officer

Personal assistant to the CEO and general administrative support

Brad Warner
Administration Officer

Supports the Business Manager and Development Manager with research administration duties.

Context and major developments during the year

3.1 Summary of achievements 2001–2006

The achievements, outputs and outcomes of the CRC for *Construction Innovation* during the period of grant funding from 2001–2006 are outstanding and briefly summarised below:

Research

The main research achievements have been in the following areas:

- *Construction Innovation* contributed to the development of the IAI project on *Reinforced Concrete Structures and Foundation Structures*. This project improved processes within the industry through defining the use and sharing of information.
- In collaboration with our government, industry and research participants, *Construction Innovation* developed software tools that use BIM technology to model complex facility designs:
  - *LCADesign* is an automated eco-efficiency design tool for commercial buildings that makes assessments directly from 3D CAD drawings
  - *Automatic Estimator* has the ability to increase productivity by 35 per cent for those involved in the quantification and costing of building designs direct from the information modelling of a building
  - *DesignCheck* checks building designs for compliance with AS1428 *Design for Access and Mobility* (compulsory for all new buildings)
  - *Automatic Scheduler* automates the generation of first cut construction activity schedules for refinement by planners.
- Public policy makers in QDPW, QDMR, QDSDTI, ABCB, Building Commission (Victoria) and Brisbane City Council have actively sought input from *Construction Innovation* projects to develop improved evidence-based policy.
- *Construction Innovation* worked with the Queensland Government to influence policies on road maintenance by developing a methodology for optimising asset data collection, calibrating deterioration prediction models and assessing risk adjusted estimates for life cycle costs.
- The BRITE Project encourages SMEs from the construction materials, consulting, construction and facilities management sectors to recognise the value of innovation and carry out self-analysis of their firm's approach to the use of technology and innovation in their business.
- The project on the web-based portal *Your Building*, an initiative between the Australian Greenhouse Office (AGO), the Australian Sustainable Built Environment Council (ASBEC) and our CRC, was launched by the Minister for Environment and Heritage, Senator Ian Campbell, at Parliament House in June 2005. It is well on the way to providing Australian industry with an integrated resource promoting business and the technical case for sustainability in commercial buildings. The portal will be launched in June 2007.

Minister for Environment and Heritage, Senator Ian Campbell, launching Your Building, *15 June 2005*

- The implementation of *eValuBuild* in QDPW has delivered significant benefit to their portfolio management. Further ongoing refinement of *eValuBuild* in practice will provide additional benefits to QDPW.
- *Sydney Opera House FM Exemplar Project* is developing best practice in procurement, benchmarking and building information modelling. This industry-driven project, has attained a number of significant achievements to date and will provide real benefits to the Sydney Opera House and the project partners with a series of industry dissemination workshops planned throughout November 2006.

'*The general quality and relevance of the research program is of a high order. The Panel is pleased to report considerable satisfaction from the industry and government and a strong desire that this should continue*' 5th Year Panel Review

Dave Balmer (Project Director, Green Bridge Project, John Holland) and Keith Hampson (CRC Construction Innovation)

Commercialisation and utilisation

The CRC recognises the avenue for adoption of much of its research and commercialisation is through public and private owners of infrastructure and building assets.

- The CRC is building partnerships with large private property owners and government departments such as the Queensland Departments of Main Roads and Public Works and West Australian Department of Housing and Works.
- Returns from investment in this CRC are expected to arise from significant improvement to the productivity of the sector — especially through the uptake of advanced software tools designed to operate on building information models developed and promoted by *Construction Innovation*.
- Currently there are five products being trialled as prototypes by participants and external parties: *LCADesign, Automatic Estimator, Automatic Scheduler, DesignCheck* and *Noise Management*. *Project Diagnostics* is the subject of an existing licence agreement with an international commercial partner. In the wider context of utilisation, most, if not all outputs are being used by industry, the community and the educational sectors to improve the performance of the construction industry.
- Environment Australia has partnered on *Sustainability and the Future Building Code of Australia* to capture the research outcomes of this project and adopt them in policy development for the Federal Government.
- The Australian Construction Industry Forum (ACIF) has partnered with *Innovation Potential, Directions and Implementation in the Building Industry and Construction Product System* to disseminate the findings on innovative companies to its national membership base.
- *Construction Innovation* is working with participants to identify the most appropriate way to disseminate research findings within their organisation as well as working with industry associations on joint seminars and/or presentations at industry seminars and conferences.

- The *Noise Management in Urban Environments* project has developed practical software to evaluate noise management options for public roads. This system evaluates and integrates characteristics of the road, geometry, sound mitigation practices and the impact on occupants in local buildings.
- The *LCADesign* eco assessment tool, operating directly from a BIM, has the potential to revolutionise sustainable design practices — allowing direct evaluation of the environmental impact of material selection options on the ecological footprint of the facility.
- The relationships developed through the *Construction 2020* initiative since 2004 are resulting in increased international recognition and reference to the CRC by international research and industry development groups. For example, the relationships with our ICALL partners have opened the door to targeted potential business activity — including current commercial activity in The Netherlands and Italy and implementation trials of CRC products in Norway and Finland.

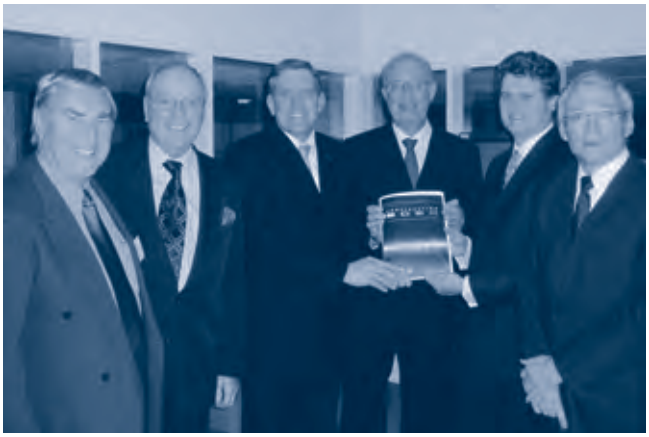
Education and training

- One of *Construction Innovation's* legacies will be its postgraduate students. To date it has provided funding for 23 scholars, with 14 of these programs being completed (8 PhD and 6 Masters). All PhD and Masters scholars either have industry associate supervisors or direct contact with industry in their areas of research.
- *Construction Innovation* has convened industry workshops and breakfast sessions with industry to disseminate research outcomes — including the Facility Management Association, Property Council of Australia, Engineers Australia, Royal Australian Institute of Architects, Master Builders Australia, Air Conditioners and Mechanical Contractor's Association of Australia and Urban Development Institute of Australia.
- Organisations like the Australian Construction Industry Forum, the Australian Institute of Project Management and the International Alliance for Interoperability have also partnered with *Construction Innovation* to deliver these outcomes to industry.
- Our CRC is committed to distributing research outcomes to industry and the broader community through the production of publications, media coverage, information sheets, booklets and books. Research reports that are not IP sensitive are made available to the public through the *Construction Innovation* website.
- *Construction Innovation* has developed its own Research Leadership Development program to, among other things, ensure key personnel have an understanding of intellectual property issues.
- The *Construction 2020* initiative set a leadership agenda for Australia's property and construction industry, and is shaping the direction of Australian curricula development for this industry.
- A series of CRC industry-focussed events explicitly highlighted the benefits of industry, government and researchers working together for mutual benefit. In particular, the 2004 and 2006 *Clients Driving Innovation* International Conferences each brought together over 200 people from across 12 countries, from research and research user organisations, in a strongly supported knowledge exchange model.
- The BRITE Project extended its innovation case study program and a national innovation survey investigating the industry's innovation performance. The project's activities demonstrably increased awareness of the benefits of innovation in the industry through the distribution of over 7000 case study booklets and media coverage, reaching an estimated 1.8 million readers.

'Thirteen PhD students are associated with the programs and all are progressing satisfactorily. It is to the credit of the students that they have made their own contribution to each Program area … The recent bringing together of Brisbane-based CRC scholars and researchers with the CRC headquarter's team is seen as a positive move to enhance the overall strength of the CRC,'
5th Year Review Panel

'Beyond the obvious financial benefits of the scholarship, the valuable personal contacts that I can easily access, being associated with the CRC would be difficult to replicate. The additional training and opportunity to meet and swap ideas with other scholars has been exciting and educational. The CRC leaves no stone unturned in providing reasonable benefit that will aid their scholars in successfully completing their research.'
Colin Greville CRC Scholar (PhD)

Adrian Cupitt, Microclimate Impacts on the Built Environment Project



L to R Neil Marshall (Australian Construction Industry Forum), John McCarthy (CRC Construction Innovation), Ian Macfarlane MP (Minister for Industry, Tourism and Resources), Peter Brandon (University of Salford, UK), The Hon. Peter McGauran MP (former Minister for Science) and Keith Hampson (CRC Construction Innovation) at the launch of Construction 2020

Context and major developments during the year

Grants and Awards

- The CRC project *Investment Decision Framework for Infrastructure Asset Management* received a High Commendation at the 2005 Queensland Engineering Excellence Awards in the award category of Research, Development and Innovation.
- Lan Ding was one of 16 finalists selected in 2005 Fresh Innovators Awards for *DesignCheck*.
- $100,000 Innovation Access Program — Australian Government Industry grant for the *Sydney Opera House FM Exemplar Project* (Feb 2005–06)
- *Project Diagnostics* was awarded the Professional Excellence Award (R&D) at the 2006 Queensland Professional Excellence in Building Awards.
- *DesignCheck* was awarded the Professional Excellence Award (R&D) at the 2006 NSW Professional Excellence in Building Awards.
- *Construction Innovation* was awarded three awards during on the Australian Institute of Project Management Awards, on 9 September 2005:
  - Peter Scuderi (*Construction Innovation* Development Manager) awarded Individual Project Manager Achievement Award, Project Director Queensland
  - *Project Diagnostics* awarded Product Development Queensland
  - Garry Creedy (*Construction Innovation* scholar) awarded Student award Queensland
- The *Your Building* project was awarded a $750,000 grant from the Department of the Environment and Heritage to advance the Australian Government's programs for *Greenhouse: Meeting the Challenges of Climate Change — Action on Energy Efficiency* and *Measures for a Better Environment: Sustainable Cities — Green Buildings* (October 2005–June 2008)

3.2 Context and major developments during 2005–06

The construction industry in Australia is booming, however it has a high level of fragmentation which is a clear inhibitor to innovation. It is evident the use of ICT in the construction industry is lagging behind that of other sectors of the economy (ABS, 2004).

Recent developments which have improved quality, reduced time and made costs more predictable in manufacturing have been largely ignored by the construction industry. While there has been discussion of the importance of lean construction, process reengineering and similar ideas, these have generally not been translated into new or innovative construction processes when viewed from an industry or site perspective. However, there are initial indications this is changing.

Construction Innovation is working hard to encourage the take-up of ICT, as it considers this to be crucial in contributing to an integrated and innovative industry. Outcomes will include increased efficiency and improved delivery for clients. Our industry partners accept they need to increase their use of ICT in order to maintain currency with the rest of the Australian and world economy. This has come about in part because the CRC actively encourages and involves industry to trial the ICT products under development, which provides a first hand experience of the many potential benefits offered.

By providing industry partners with the opportunity to develop comprehensive building information models (BIMs) and trialling industry foundation classes (IFC) compliant analysis tools at the design stage, they have had the opportunity to discover first hand the insights and learnings through the testing process. This has provided our partners with valuable knowledge regarding the capability of the tools, and in one case provided the industry partner with a competitive edge in order to win a project.

Construction Innovation will continue to work with its partners to extol the benefits of ICT by transferring project outcomes to partners and industry.

There has been one key staff appointment over this period. Tom Fussell from the Queensland Department of Public Works was appointed Deputy Program Director for Program A in May 2006, replacing Don Allan.

There have been no purchases of major equipment over this period.

Peter Scuderi (CRC Construction Innovation) and Brisbane Lord Mayor Campbell Newman at the AIPM Awards, 9 September 2005

Photo by EventPix

Commercialisation/technology transfer/utilisation

4.1 Commercialisation/utilisation strategies and activities

To effectively exploit the outputs of a research project it is important the commercialisation strategy is appropriate to the specific output. For this reason, our project agreements address a process for commercialisation and/or utilisation of the outputs, when a project commences. Each six-monthly project review considers the commercialisation opportunities, with, where appropriate, a more focused strategy being developed six-to-nine months from the completion of the research. This approach has been successful to date.

We do not hesitate to engage external expertise. Legal professionals are engaged to develop appropriate licence agreements. When the option of a spin-off company was proposed, an accountant experienced in financial arrangements for a start up company was engaged. Market analysis and economic impact reports are sourced externally.

To facilitate the management of Intellectual Property and strategies for commercialisation, *Construction Innovation* educates and trains key personnel. For example, workshops were held for students and researchers in July 2005 and December 2005, focussing on developing skills in IP management and commercialisation processes. This approach is important in the industry within which our CRC works as it is not a major focus of traditional activities.

Construction Innovation is transferring valuable project outcomes to partners and industry through industry workshops, international conferences and specific partner workshops. Trials of project outputs allow partners to become familiar with tools or processes developed at a project level. Often, the learnings from projects influence processes within participant organisations. For example, two of our government agency partners are reviewing the requirements of their electronic tender and contract administration procedures to allow appropriate electronic signatures to be used, electronic contract formations, electronic contract administration, issues of IP, evidentiary and archive issues. The BRITE project also encouraged innovation in two government agencies and allowed suppliers and contractors to share risk and develop procurement contracts which give suppliers and contractors more scope for innovation in their delivery approach.

Our first preference for commercialisation partners are our CRC participants. In all projects it is a requirement that there are at least two research users. Therefore, potential commercialisation partners are likely to be the industry participants involved early in the specific project.

Industry participants have had the opportunity to trial five IFC-compliant analysis tools at the design stage, which has provided insights and learnings through the testing process, before construction for environmental impact, cost, code compliance, scheduling and specification generation before these technologies are available and used more broadly. This has provided them with valuable knowledge of capability of the tools, and in one case provided the industry participant with a competitive edge in order to win a project.

The Sydney Opera House has been able to employ knowledge, processes and tools developed to demonstrate to its stakeholders that there is the option to increase the effectiveness of their FM Services portfolio. The CRC work has provided prototypes and guidelines that will also contribute to the development of the new 25 year strategic asset management plan, provided a new model for the on-going procurement of design works to the current refurbishment program and insights into the strategic decision making on digital modelling and the FM tools and systems. This is a Demonstrator Project under the FM Action Agenda.

The Courier Mail 19 August 2005 (P.38)
Smarter design shown to boost home efficiency

Smarter design shown to boost home efficiency

Melissa Maugeri

HOMES could be at least 90 per cent more environmentally sustainable, according to research findings to be released today.

"The research by the Co-operative Research Centre for Construction Innovation will be released at today's Urban Development Institute of Australia, Queensland state conference in Port Douglas.

CRC chief executive Dr Keith Hampson says the research suggests detached homes can be more than 200 per cent more energy efficient by adopting better designs.

"The research suggests that subdivision and home designs addressing aspect, shape, typography, slope and density can result in a mix of homes with good orientation for maximum solar access and ventilation," Dr Hampson says.

UDIA Queensland president Peter Sherrie says consumers need to be taught to have a greater appreciation of more sustainable products.

"Exciting improvements are possible," Mr Sherrie says.

"We are becoming increasingly aware that the industry requires a supportive market, along with a supportive planning framework which rewards, rather than inadvertently penalising, sustainable developers.

"Unfortunately, restrictive regulations, added costs and untrained planning staff are unintentionally favouring mainstream development over the unfamiliar territory of sustainable innovations."

Dr Hampson says more sustainable houses should be built in Queensland.

"To achieve this, we will work with industry to optimise the environmental impact of built facilities as well as delivering a sound conceptual basis for economic, social and environmental accounting of the built environment," he says.

'IMPROVEMENTS are possible' . . . Peter Sherrie

According to the report, medium and high-density multi-storey apartments can be up to 50 per cent more energy efficient than the equivalent-sized detached dwellings.

But even they could still achieve up to a 92 per cent increase in efficiency with good design issues.

The report found altering the orientation of homes on lots reduced energy use by 10 to 32 per cent and good breezes can improve efficiency by 5 to 15 per cent.

According to the report, developing an appropriate subdivision design rating tool for energy efficiency in south-east Queensland would implement energy efficient innovations.

"Assessment of existing lot rating methodologies has found they go only part of the way in assessing the issues that need to be considered in land development in Queensland," Mr Sherrie says.

He adds that the UDIA will launch a sustainable development program called Enviro-Development in Queensland next year.

It is a ratings system whereby developers could be eligible for a range of incentives for sustainable practices and would earn the right to market their product as an Enviro-Development.

A number of our projects have produced software that complements existing CAD software. We have been actively seeking interest from the three international CAD developers and have strong interest from two Australian companies to take two of our tools to market. We are also actively engaged with a northern European group who are validating our technology for the purposes of a web-based business model:

- *DesignCheck* and *LCADesign* and the *Life Cycle Inventory* database continue to be of interest to two Australian companies, with discussions developing the terms for a Licence Agreement for *DesignCheck*. The interested companies are proposing to take these two products to the Australian market as a precursor to the international marketplace.
- *Automated Estimator* is also sparking commercial interest and although no formal commitment has been received by the CRC as yet, industry trials are underway. It is anticipated the interested parties will submit a proposal to the Board after the 6 September 2006 Research Committee meeting to fund further development work of the *Automated Estimator*, to resolve a small number of technical issues and to continue the population of trades in the tool.
- *Automated Scheduler* has been the focus of early discussions with two Australian software companies interested in a commercial arrangement.
- *DesignSpec*, the latest ICT tool is an auto generating specification tool that interfaces with a 3D CAD model. While *DesignSpec* is of interest to a number of specification companies it is too early to identify a particular commercial partner to work with.

No spin off companies have been formed.
No patents have been registered.

The following trade mark has been registered:

Trade Mark No. 1036957
Project Diagnostics — registered for a period of ten years commencing 10 January 2005.

'A key value of this CRC is that it is raising the performance of the whole industry and changing its culture towards self improvement' 5th Year Review Panel

Commercialisation/technology transfer/utilisation

Commercialisation Milestones and/or Outputs

Type of Milestone and/or Output	Description of all 2005–06 milestones and/or outputs incl. past milestones which have not been met (and date)	Achieved (yes/no)	If achieved, progress during 05–06 and planned activities in 06–07	Reasons why milestones and/or outputs have not been achieved	Strategies to achieve milestones which have not been met
Commercialisation	IP register and IP valuation	On-going	For all projects, background IP is identified and review processes capture new IP. Specific IP valuation has not been required to-date.		
Commercialisation	Commercialisation strategies — review and development	On-going	Overall commercialisation strategies remain as agreed in the Strategic Plan 2005–08. Specific project commercialisation plans are developed at the commencement of a project and refined throughout the project.		
Commercialisation	Partner/student development on commercialisation	Yes	Workshops in July 2005 and March 2006 specifically addressed processes of commercialisation		
Utilisation	Industry workshops	Yes	Various workshops were held in 2005–06 as outlined in Section 6. In particular, workshops were held for industry partners in July 05, August 05, November 05, December 05, February 06 and May 06. Currently planned industry workshops will be held on: 22 Sep 06 — Melbourne 16 Nov 06 — Sydney 21 Nov 06 — Melbourne 23 Nov 06 — Brisbane		
Commercialisation	Venture capital linkages — seek for commercialisation	On-going	We are encouraging two Australian software companies to apply for AusIndustry Commercial Ready grants.		

4.2 IP management

Intellectual Property is managed according to the terms and conditions of the Centre Agreement and in the specific agreements at the project level, as outlined in the Annual Report 2004–05. While these processes continue to serve the CRC well, they are reviewed annually to ensure continued adherence to the National Principles of IP Management.

Only one licence agreement has been entered into that licences CRC IP for commercialisation. It was signed on 5 October 2005 with Arup Australasia for *Project Diagnostics*. Commonwealth approval has been received for this licence agreement. The licence allows Arup to continue the development of the IP and for commercial sale of the consultancy service it supports. Some commercial benefits will be provided to Arup. However, the nature of the consultancy service potentially results in large savings for construction companies by identifying if a project is not meeting its time, cost or other significant criteria to ensure satisfactory completion.

A number of software evaluation licence agreements have been put in place to allow the trial of software by organisations external to our partner group. These agreements are typically of only three months duration and require a report to be provided outlining software errors, suggestions for enhancements and details of building information models used. The aim is to protect the IP while at the same time sourcing valuable user feedback on its suitability.

4.3 End-user involvement and CRC's impact on end-users

A full listing of the 'research users' and their involvement is provided in Section 5, Research Collaboration, which lists all organisations involved in each project.

There are many SMEs in the property and construction industry. The principal strategy with SMEs is to work with industry and professional associations to deliver information sessions through breakfast sessions or half-day industry forums.

The involvement of end-users in CRC activities

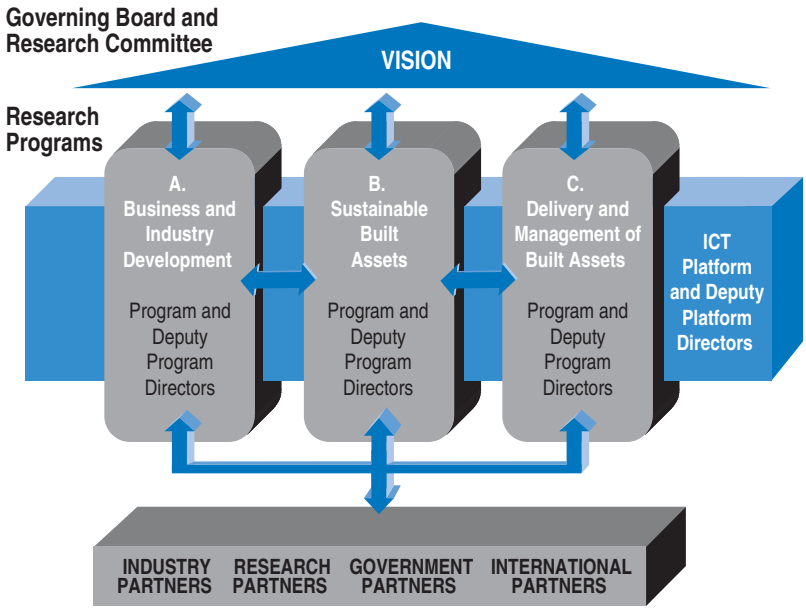
Industry or other research users and the basis of their Interaction	Type of activity and location of activity	Nature and scale of benefits to end-users	Actual or expected benefit to user
Arup Australasia (Core Participant)	Commercialisation	Licence to use outcomes from project 2002-052-C *Project Diagnostics* for a two-year period to undertake further development and to offer as commercial service	Able to sell consultancy service commencing March 2006. Product expected to have application to Australia, USA and UK markets

Research collaboration

5.1 Research activities and achievements

Construction Innovation's goal is the development and delivery of a high-quality, industry-led research program. The research program contributes strongly to the achievement of this goal, and it remains this CRC's core activity with a total of 61 projects. Of these, 30 are currently underway and the remaining 31 are now complete.

Construction Innovation's research structure is shown in the diagram below. The research program has three core programs of research, supported by an advanced information and communication technology (ICT) platform. This structure incorporates the research goals of its participants — shaped through a process of regular consultation at multiple levels.



Industry collaboration is paramount to the success of *Construction Innovation* as it is fundamental to driving collaboration among the CRC participant group, across the national supply chain and globally.

Research and industry are both represented on the Research Committee, the Board and in Project workshops with leadership from industry participants. Furthermore, each research project requires a minimum of two researchers and two 'research-user' organisations, as listed in each project detailed below. Publications and presentations arising from CRC projects often have joint authorship by researchers and research users.

Construction Innovation liaises with a range of industry associations which often provide an additional forum for industry collaboration on CRC projects, in particular with, CPSISC, ASBEC, ACIF, APCC, ACA and IAI. The CRC also collaborates with leaders in construction research in Europe, North America and Asia through the International Construction Research Alliance (ICALL) and CIB.

'The developments around the 3D modelling approaches to the development cycle have been particularly successful and the provision of tools of this kind is exactly what the industry is demanding' 5th Year Review Panel Report

Grants

Type of Grant

Through the Department of the Environment and Heritage to advance the Australian Government's programs for *Greenhouse: Meeting the Challenges of Climate Change — Action on Energy Efficiency* and *Measures for a Better Environment: Sustainable Cities — Green Buildings.*

Title

Your Building: The Business and Technical Guide for Sustainable Commercial Buildings

Amount of Grant

$750,000

Period of Agreement

7 October 2005 to 30 June 2008

Description

To develop a web-based information repository called *Your Building* that allows stakeholders in the building, construction and property sector to understand and communicate the commercial and economic benefits of environmentally sustainable commercial buildings. The project aims to:

- improve the commercial and environmental performance of commercial and public buildings from a whole-of-life perspective
- develop materials that encourage industry professionals to use a common language, have a common understanding of the issues, and a means for creating long-term sustainable solutions that enhance the performance of a building over its effective life.

'Private and public industry representatives interviewed strongly supported the research projects and outcomes and valued the collaborative process, the cooperative linkages between participants and users, and the research community outside the CRC' 5th Year Review Panel

Program A: Business and industry development

Program director:
Neal Ryan, Queensland University of Technology

Deputy program directors:
Don Allan/Tom Fussell, Queensland Department of Public Works

Purpose

To improve the long-term effectiveness, competitiveness and dynamics of a viable property and construction industry in Australian and international contexts through:

1. greater innovation in business practice
2. more effective interactions between industry and clients
3. strengthened human relations and ethical practices.

Program A has seen an increase in project activity over the past 12 months, some of which have Project leaders from the industry participants. Projects in this program address areas including eBusiness through legal and security issues, eBusiness barriers to adoption, models for sustainable businesses in a global environment, occupational health and safety from a site culture perspective, and culture in the context of relationship management.

'Program A research aligns with the objectives of the CRC, partially meets industry's objectives as expressed through Construction 2020 — A Vision for Australia's Property and Construction Industry *and is leading to improvements in the industry's training and education programs'* 5th Year Panel Review

Theme 1: Greater innovation in business practice

Building Research Innovation Technology and Environment (BRITE)

Research project 2004-021-A

Project duration

1 January 2006–31 December 2007

Project leader

Karen Manley, Queensland University of Technology

Project members

Arup Australasia: Richard Hough

CSIRO: Stephen McFallan

Queensland Department of Main Roads:
Michael Swainston

Queensland Department of Public Works:
Dale Gilbert, Wendy May-Taylor, Julia Willis

Queensland University of Technology:
Mary Hardie, Stephen Kajewski, Robyn Keast, Neal Ryan, Linden Spindler

Innovation typically refers to positive changes — *improving* existing arrangements and *developing* new ones. Twelve BRITE innovation case studies have now been completed and show how innovations can be successfully implemented in a range of projects in the construction sector, and the benefits that can be gained. These case studies show successful innovations on Australian building and construction projects. The six recently completed case studies are:

- Managing stormwater with storage gutters and infiltration
- Saving on-site remediation costs
- Post-tensioned steel trusses for long span roofs
- Twin-coil air conditioning at the Art Gallery of South Australia
- Better project outcomes with relationship management and 3D CAD
- Using recycled tyres to construct an access road over saturated terrain.

In July 2006 the BRITE team created a new publication entitled *Innovate now!*, which distils the outcomes of the survey and case studies for those building and construction businesses trying to create an innovation program. This industry focussed booklet will be launched at AIB's National Conference on the Gold Coast in September 2006.

'The Queensland Government is highly supportive of the CRC for Construction Innovation, which is helping us encourage a smarter state. The BRITE Project shows how all construction organisations can become more innovative, including SMEs and regional businesses.' Deputy Premier of Queensland, and Minister for State Development, Trade Innovation and Finance, the **Hon Anna Bligh MP**

'The project has had a significant impact on industry culture — creating a 'can do' attitude to innovation. These new case studies show that both original innovation and adoption of best practice, improve project and business performance.'
Dr Karen Manley, BRITE Project Leader

2005 BRITE Innovation Case Studies launched

THE DEPUTY Premier of Queensland, and Minister for State Development, Trade Innovation and Finance, the Hon Anna Bligh MP, launched the 2005 BRITE Innovation Case Studies of the building and construction industry in Brisbane on November 2, 2005.

The Department of State Development, Trade and Innovation is a partner in the CRC for Construction Innovation, and a contributor to the BRITE Project.

The Deputy Premier said, "The Queensland Government is highly supportive of the CRC for Construction Innovation, which is helping us encourage a smarter state. The BRITE Project shows how all construction organisations can become more innovative, including SMEs and regional businesses."

Innovation is widely seen as the key to better productivity and profitability. Increasing innovation in the building and construction industry, which employs more than 730,000 people in Australia, contributes to economic growth.

The BRITE Project is a research project of the Cooperative Research Centre for Construction Innovation, based at the Queensland University of Technology in Brisbane. The project's aim is to increase the rate and quality of innovation in the industry.

Speakers at the launch were a mix of innovative contractors, consultants and clients, including:

- Michael Deare, chief executive, South Australian Cricket Association
- Max Smith, deputy director general – Works, Qld Dept of Public Works
- Diana Kurreen, (former) bushland environment officer, Hunters Hill Council
- Phillip Marsh, director, Marsh Civil Contractors
- Scott Bird, managing director ENV Australia
- Jeremy Harding, business development manager, S-Squared Corporation
- Rebecca Hoskin, manager Capital & Facilities, Dept of the Premier & Cabinet-Arts SA
- Collin Harvey, director, Ecoflex Australia.

The innovators described how they had overcome obstacles to innovation. The clients spoke about how they had encouraged innovation. All speakers shared the lessons learned on construction projects. The topics covered new contracting methods, water management, 3D CAD, toxic waste disposal, long span roofs, airconditioning and pavement technologies.

Dr Karen Manley, Leader of the BRITE Project, said, "The project has had a significant impact on industry culture – creating a 'can do' attitude to innovation. These new case studies show that both original innovation and adoption of best practice improve project and business performance."

The CEO of the CRC for Construction Innovation, Dr Keith Hampson has commended the case studies, saying they are "another way SMEs across Australia can learn to lead the way through smarter approaches to technology and business".

"Small and regional doesn't necessarily translate into a disadvantage. We have shown through these case studies that Australian firms can mix it with the best and win! These are great lessons for our industry," said Dr Hampson.

Full details of all BRITE case studies can be found at www.brite.crcci.info ■

Keith Hampson, CEO CRC Construction Innovation, the Hon Anna Bligh MP, Deputy Premier of Queensland, and Karen Manley, BRITE Project Leader Photographer: Pierre Colombet

December 2005 NATIONAL BUILDING NEWS VOL. 5, NO. 11 PAGE 13

Theme 2: More effective interactions between industry and clients

eBusiness adoption

Research project 2003-003-A

Construction Innovation is undertaking several projects centred on eBusiness. The aim of eBusiness adoption is to develop a greater awareness in the construction industry of the value of eBusiness to individual organisations, and the industry, and to increase uptake of various eBusiness technologies. The project will:

- confirm and investigate the nature of the constraints to eBusiness adoption through theory and practice
- identify strategies and techniques to raise awareness and increase adoption and diffusion in the industry based upon a literature review and four case studies of various levels of eBusiness adoption environments
- propose a technology adoption profile based upon the results of the case studies and conceptual basis.

Project duration

1 August 2004–30 June 2006

Project leader

Kerry London, University of Newcastle

Project members

Brisbane City Council: Neil Abel

Building Commission (Victoria): Paul Crapper

John Holland: Brad Marriott, Gerry Shutt

Queensland Department of Main Roads: Ross Guppy, John Spathonis

Queensland Department of Public Works: Don Allan, Dayv Carter, Rob Williams

RMIT: Guillermo Aranda-Mena, Ron Wakefield

University of Newcastle: Nic Croce, Ben Egan, Anton Kriz, Jonathan Mentink, Loong Wong

Supply chain sustainability

Research project 2004-016-A

This project aims to improve economic, social and environmental sustainability of the pre-cast concrete and construction and demolition-waste supply chains through the development, trial and evaluation of an innovative supply-chain management strategy. This is expected to help improve competitive behaviour and market sector performance.

Another goal is to improve the business process efficiency and effectiveness of public-sector programs by influencing policy development, changing organisational behaviour and implementation development to achieve more economic, social and environmentally-sustainable markets.

Project duration

1 July 2005–30 June 2007

Project leader

Kerry London, University of Newcastle

Project members

Brisbane City Council: Harry Copeland

Queensland Department of Main Roads: John Spathonis

Queensland Department of Public Works: Don Allan, Wendy May-Taylor

Queensland University of Technology: Fiona Cheung, Michael Charles, Steve Rowlinson, Neal Ryan

Rider Hunt: Stuart Rayner

University of Newcastle: John Burgess, Amir Mahmood

Construction industry business environment (CIBE)

Research project 2004-032-A

The CIBE project is undertaking a comparative analysis of the context and content of regulations and policies affecting the construction industry in Australia and analysing the implications of *Construction Innovation* research on the regulatory and policy framework.

The project team will conduct six themed case studies to explore the regulatory relationships between jurisdictions, and identify barriers for coherent policy-making and productivity gains. The case study areas are:

1. training and skill development
2. occupational health and safety
3. eBusiness including 3D CAD and eTendering
4. procurement
5. environmental sustainability (particularly focussed on energy and water)
6. builder's licensing, particularly mutual recognition between states and Australia and New Zealand.

Project duration

1 July 2005–30 June 2007

Project leader

Kerry Brown, Queensland University of Technology

Project members

Brisbane City Council: Neil Abel, Alex Fisher

CSIRO: Greg Foliente, Stephen McFallan

John Holland: Gerry Shutt

Queensland Department of Main Roads: Michael Swainston

Queensland Department of Public Works: Don Allan, Sheena McConville

Queensland University of Technology: Craig Furneaux, Norm Katter, Glenda Maconachie

University of Newcastle: John Burgess, Kerry London

Research collaboration

BSITE: Mobilising construction

Research project 2005-016-A

This research project is benchmarking the utilisation of a specifically developed integrated web and mobile communications software product developed by Melbourne-based technology company BSITE on a construction project over a field-trial period of 12 weeks. The project will also measure process efficiencies attained by businesses utilising the software.

The final report will document the field trial of the software, provide an assessment of its practical utilisation and accrued benefits, and make recommendations for the uptake of this IT initiative in the construction industry.

Project duration

1 July 2005–31 March 2006

Project leader

Ron Wakefield, RMIT

Project members

RMIT: Guillermo Aranda-Mena, Nick Blismas, Carolyn Hayles

Modelling construction business performance

Research project 2005-017-A

This project seeks to develop a software prototype that will provide early warning signals to predict the performance of construction firms. By using existing financial and non-financial data, this software will develop a series of measures that can be leveraged in order to promote business health in the construction industry.

A system that highlights early indicators of potential business distress will enable government authorities charged with the responsibility of monitoring business activity in the construction industry to interact with these firms to ensure mutually satisfactory outcomes. Positive outcomes will have a flow-on effect in terms of safeguarding the business health of construction firms, and the rest of the industry associated with that firm.

Project duration

10 February 2006–30 June 2007

Project leader

Natalie Gallery, Queensland University of Technology

Project members

Building Commission (Victoria): Roger Frith

Queensland Building Services Authority: Bob Johnson, Shelley Lockton, Cameron Murphy, Dale Rylko, Jason Smith

Queensland Department of Public Works: Dayv Carter

Queensland University of Technology: Michael Falta, Neal Ryan, Steve Su, Roger Willett

University of Sydney: Robert Czernkowski, Stewart Jones

Electronic contract administration–legal and security issues

Research project 2005-025-A

This current project uses a case study approach to evaluate the eTendering systems of the Queensland Department of Public Works and Brisbane City Council against the technical and legal guidelines published in previous *Construction Innovation* research, with the aim of determining the level of compliance and promoting best practice. Additionally, this research will look at the legal and security issues for the formation and administration of building and construction contracts wholly within an electronic environment.

The research is focusing on several aspects of electronic contracting and administration, including:

- processes for electronic contract formation
- processes encompassing contract administration
- contract retention and archiving.

Through key case studies the research will support research into eContracting and contract administration and assist large enterprises and SMEs in the building and construction industry.

Project duration

1 December 2005–15 December 2006

Project leader

Sharon Christensen, Queensland University of Technology

Project members

Brisbane City Council: Neil Abel

John Holland: Geoff Gannon, Gerry Shutt

Queensland Department of Main Roads: Ross Guppy

Queensland Department of Public Works: Dayv Carter

Queensland University of Technology: Martin Betts, Edward Dawson, Bill Duncan, Ernest Foo, Praveen Gauravaram, Audun Josang, Debbie Smit

University of Newcastle: Kerry London

Theme 3: Strengthened human relations and ethical practices

Ethical construction procurement

Research project 2002-062-A

Knowledge of what helps and hinders ethical conduct in the construction industry remains limited. This project explored the perspectives of key stakeholders and participants directly involved in the design and construction industry and what they consider negates/contributes to ethical behaviour.

The focus of previous research into ethics has been around developing codes of conduct for the industry. This research report went further by addressing the question of *why* codes of conduct previously developed have proven difficult to implement. It examined the complexity of ethical issues and the obstacles preventing the practice of codes and ethics in real-life industry settings. Workshops conducted uncovered some of the complexity of practices that operate in the industry from the practitioners' perspective.

Project duration

1 June 2003–31 October 2005

Project leader

John Oliver, Rider Hunt

Project members

Building Commission (Victoria): Roger Frith

John Holland: Jeff Horsley

Queensland Department of Public Works: Don Allan

Queensland University of Technology: Debbie Smit

University of Newcastle: Kerry London

Construction site safety culture

Research project 2003-050-A

This project team has conducted research and is currently finalising the deliverables in three key areas of safety management on construction sites:

- which management and supervisory positions within a construction company/ project are safety critical positions?
- what types of competencies/skills/ knowledge/behaviours are required to shape the understanding, attitudes, behavioural competencies, norms and ultimate commitment of line management/ supervision to site/project safety and safety culture?
- what type of training packages and learning tools are in place and to link their effectiveness to individual site and industry OH&S outcomes and safety performance?

In addition to the above deliverables, the project's findings can also be turned into a National Standard or Code of Practice, which is being supported through continual consultation and involvement with Office of the Federal Safety Commissioner. The project findings will be launched at an industry workshop by the Federal Minister for Employment and Workplace Relations, the Hon. Kevin Andrews MP, in Melbourne in September 2006.

Project duration

31 March 2005–30 September 2006

Project leader

Dean Cipolla, John Holland

Project members

Bovis Lend Lease: Tom McFadyen, Linda Sokolich

Office of Federal Safety Commissioner: Wayne Artuso

Queensland University of Technology: Herbert Biggs, Brett Mayze, Valerie O'Keeffe

University of Western Sydney: Don Dingsdag, Vaughn Sheahan

Safer construction

Research project 2005-027-A

This project is working collaboratively with the Engineers Australia-convened Safer Construction Taskforce, chaired by Leighton Holdings Chief Operating Officer, Bill Wild. The Taskforce seeks to reduce construction workplace accidents by creating a voluntary national code of practice in occupation health and safety for the industry.

The *Construction Innovation* project is supporting the Taskforce by examining occupational health and safety practices at the design, procurement, construction and commissioning stages of built assets in order to develop the voluntary code of practice and supporting tools. This project brings together stakeholders across the supply chain of the project — ensuring a whole-of-industry solution.

Project duration

1 February 2006–30 June 2007

Project leader

Tim Fleming, John Holland

Project members

Bovis Lend Lease: Murray Coleman, Tom McFadyen

Queensland University of Technology: Kerry Brown, Michael Charles, Janet Pillay, Neil Ryan, Paul Barnes

RMIT: Nick Blismas, Helen Lingard, Ron Wakefield

Steering committee

Association of Consulting Engineers Australia: Paul Dougas

Australian Procurement and Construction Council: Jane Montgomery-Hribar

Bovis Lend Lease: Murray Coleman

CRC *Construction Innovation*: Peter Scuderi

John Holland: Tim Fleming, Stephen Sasse

Engineers Australia: Peter Godfrey

Leighton Holdings: Bill Wild

Master Builders Association: Richard Calver

Property Council of Australia: Peter Verwer

Royal Australian Institute of Architects: Bill Barlow

RMIT: Ron Wakefield

Queensland University of Technology: Neal Ryan

Research collaboration

Program A milestones

Type of milestone and/or output	Description of 2005–06 milestones and/or outputs	Achieved	Progress in 2005–06 and future planned activities for 2006-07	Reasons for not achieving milestones	Strategies to achieve outstanding milestones
Research	Litigation	Yes	Completed research on the reasons why there is unethical behaviour in the industry and what strategies might be taken to explore ways around this. A training course has been developed introducing relationship management in the construction procurement process providing a less adversarial approach.		
Research	Image	Yes	Completed 12 case studies on the building and construction industry highlighting the innovativeness of the industry.		
Research	Occupational health and safety	Yes	Developed a matrix of roles and responsibilities for OH&S in construction companies and then highlighted the areas of training needs.		

National Museum of Australia, Canberra

Photo by Peter Brandon

Program B: Sustainable built assets

Program director:
Peter Newton, CSIRO

Purpose

To drive healthy and sustainable constructed assets and optimise the environmental impact of built facilities through:

1. a sound conceptual basis for economic, social and environmental accounting of the built environment
2. virtual building technology to examine design performance prior to documentation, construction and use
3. assessment of human health and productivity benefits of smart indoor environments.

Much implementation of research outcomes in *Construction Innovation* partner organisations has come from Program B. Partners have benefited from trials of *LCADesign* (an environmental footprint calculator); *DesignCheck* (a code-checking software); life prediction of materials in coastal environments; and energy-efficient design principles in sustainable subdivisions.

'(This research program) includes projects that will change the culture, behavioural patterns, public policy and the way in which the construction industry operates in Australia, as well as projects that will advance the technology and science of construction in Australia'
5th Year Review Panel Report

Theme 1: A sound conceptual basis for economic, social and environmental accounting of the built environment

Sustainable subdivisions — ventilation
Research project 2002-077-B

Project duration

1 October 2005–30 June 2007

Project leader

Anne Miller, CSIRO

Project members

Bovis Lend Lease: Daniel Grunbaum

Brisbane City Council: Helen Caswell, Medha Gokhale

CSIRO: Michael Ambrose, Fanny Boulaire, Angelo Delsante, Robin Drogemuller, David Paterson

Queensland Department of Public Works: Michael Ball

Queensland University of Technology: Nur Demirbilek, Rosie Kennedy

The aim of the research is to determine the relationship between Bureau of Meteorology monitoring stations and a variety of dwelling types through monitoring of wind conditions in south-east Queensland. The research will verify and quantify the role natural ventilation has in cooling residences in sub-tropical climates, inform the development of a lot-rating methodology for south-east Queensland and may also make a recommendation that the existing lot-rating methodology in use in other parts of Australia, be modified to allow for the impact of ventilation. The research is also expected to highlight the fundamental importance of good sub-division and dwelling design and will also inform the ongoing development of thermal programs.

The Summit subdivision located at the Springfield Lakes development (20 kms west of Brisbane CBD). Typical subdivision development that is the target of the Sustainable Subdivisions

Research collaboration

Sustainable subdivisions — energy and water efficient design

Research project 2002-063-B

A review was undertaken of the water technologies and systems to capture and re-use water that is available and has been tried at a subdivisional level in Australia. The review considered systems implemented in both outer and inner urban developments and included:

- grey water capture and re-use
- stormwater capture and re-use — individual versus community
- third pipe systems to supply water for garden use and toilet flushing.

A number of case study systems are also being examined in detail to provide examples of possible ways forward for developers in South-East Queensland. A report to industry will be produced and disseminated through the industry associations.

This project will encourage designers and regulators to use grey water systems in subdivisions.

Project duration

1 October 2003–30 June 2006

Project leader

Steven Kenway, CSIRO

Project members

Brookwater: Dayan Jayasekera

CSIRO: Michael Ambrose, Clare Diaper, Anne Miller, Grace Tjandraatmadja

DEM Architects: Marina Chung

Queensland Department of Public Works: Michael Ball

Queensland University of Technology: John Bell

Learning system for life prediction of infrastructure

Research project 2005-003-B

The project will further develop the software tools created in previous case-based reasoning in construction and infrastructure for lifetime prediction of metallic components projects, to widen their applicability and usefulness.

The metal façade application will be extended to include up to ten components. Maintenance costs will be used as a guideline in choosing the components that are most expensive from a life cycle perspective, either because they need replacing frequently, or have a high cost of replacement. In addition, maintenance records and methods will be determined to incorporate the ongoing input of this information into the program's maintenance database, ensuring output data is based on current conditions.

The bridge application will include more bridge structures, as well as incorporating the effects of height above water level and natural wash-off on the salt deposition levels. A corrosivity index which indicates the aggressiveness of the environment in which a bridge is situated will also be incorporated into the program, alongside the bridge component analysis to give greater detail and more information.

Project duration

1 October 2005 — 30 June 2007

Project leader

Penny Corrigan, CSIRO

Project members

CSIRO: Angela Bradbury, Ivan Cole, Robin Drogemuller, Stephen Egan, Wayne Ganther, Tim Muster, David Paterson, Gerardo Trinidad

Queensland Building Services Authority: Peter Hope

Queensland Department of Public Works: Michael Ball, Frank Turvey, Lee Wade

Queensland University of Technology: Richi Nyak

Your Building

Research project 2005-015-B

Your Building is a web-based information portal that is under development. Once on-line in mid 2007, it will be a one-stop-shop for answers to the real questions regarding how to finance, design, construct, occupy and manage a sustainable commercial building.

The key aims of *Your Building* include:

- create a one-stop knowledge bank explaining the 'why' and 'how' of sustainable commercial building and influence changes in market behaviours
- bring together research expertise, skills and knowledge to develop best practice and innovative content
- build the capacity of the industry in sustainable knowledge and implementation
- demonstrate the strategic benefits of sustainable commercial buildings in terms of social, environmental and economic outcomes.

Project duration

1 July 2005–30 June 2007

Project leader

Tony Stapledon, CSIRO

Project members

CSIRO: Peter Boxhall, Robin Drogemuller, Greg Foliente, Murray Hall, Melissa James, Peter Newton, Michael Syme, Emily Yip

Steering Committee

Committee Chair: Peter Newton, CRC for *Construction Innovation* (CSIRO)

Development Manager: Peter Scuderi, CRC for *Construction Innovation*

Project leader: Tony Stapledon, CRC for *Construction Innovation*

Australian Greenhouse Office Representatives: Tony Marker, Stephen Berry

Australian Sustainable Built Environment Council Representatives: Caroline Pidcock, Royal Australian Institute of Architects; John Ridgway, Association of Consulting Engineers Australia; Peter Verwer and Paul Waterhouse, Property Council of Australia; Tony McDonald, Building Products Innovation Council; and Peter Szental and Mark Lister, Szencorp

'Environmentally sustainable buildings are better designed buildings. They are not only more comfortable to work in, they use fewer resources such as water and energy, they have better indoor air quality and have less impact on the environment in the short and long term … the Your Building *guide will be prepared by industry for industry in conjunction with the Australian Government. This is a valuable partnership that will help us make gains in air quality levels, water conservation, reduced greenhouse gas emissions and in ensuring our built environment is energy efficient and sustainable in the longer term.'* Minister for the Environment and Heritage, **Senator Ian Campbell**

Theme 2: Virtual building technology to examine design performance prior to documentation, construction and use

SpecNotes and viewer extension

Research project 2004-014-B

The SpecNotes component of the project was envisioned as a way of linking a building specification with components of a building model, and then leveraging those linkages to enhance the BIM by, for example, adding covering elements to building components. This has required three software components to implement.

The first component parses and interacts with the specification documents. This running depends on a consistent document format and style, and is based around NATSPEC specifications.

The second component associates sections of the specification with building elements in the BIM. The associations are defined implicitly using a rule-based framework, or explicitly on an element by element basis.

The third component acts on the associations. This may prove to be far more useful when combined with other BIM related projects such as *LCADesign* and an extended *Building Estimator*.

The View Extensions, developed as a part of this project, enables new forms of interaction between all the tools in the *Construction Innovation* software suite, along with enabling non-CAD users to interact with the relevant BIM without having access to a specific CAD licence.

Project duration

1 July 2005–30 June 2006

Project leader

Stephen Egan, CSIRO

Project members

Brisbane City Council: Joyce Law

Central Node: Melissa James

CSIRO: Fanny Boulaire, Robin Drogemuller, Kevin McDonald, Cheryl McNamara

Queensland Department of Public Works: Thomas Fussell, Lee Wade

Rider Hunt: Jeanette Clough, John Oliver

Woods Bagot: David Marchant

Team collaboration in high-bandwidth virtual environments

Research project 2002-024-B

Recent developments in networked 3D virtual worlds and the proliferation of high bandwidth communications technology have the potential to transform the nature of collaboration in professional design and to offer significant process improvement. There have been numerous studies of collaboration in Europe and the USA that have resulted in system architectures to support information sharing. While these initiatives have led to important advances in the enabling technologies required to support changes in global economic practices, there remains a gap in our understanding of the impact of the technologies on the working practices of those who are the primary users of such systems.

Studies focused on the collaboration processes adopted by designers. The empirical results will support organisations in the drive towards more effective use of virtual environments. The results provide the foundations of further work which was disseminated to the design and construction industries through workshops, guidelines and recommendations.

Project duration

15 May 2003–31 December 2005

Project leader

Mary Lou Maher, University of Sydney

Project members

Arup Australasia: Richard Hough, Steve Pennell

CSIRO: John Crawford, Lan Ding, Robin Drogemuller

University of Newcastle: Thomas Bellamy, Rod Gameson, Willy Sher, Tony Williams

University of Sydney: Kirsty Beilharz, Andy Dong, John Gero, Mike Rosenman

Woods Bagot: David Marchant, Carolyn Mitchell, Kanyarat Nemprempree

Microclimate impacts on the built environment

Research project 2004-003-B

Presently, there are individual tools available for the assessment of shading, thermal, radiation and wind flow characteristics of a proposed design that require assessment by expert users. This project will quantify and model the potential microclimatic influences and impacts of a building, within a precinct of buildings, through interrogation of a 3D CAD model. If the proof of concept is successful, this tool could enable planners/developers/designers to model this interaction at an early design level. It has the potential to provide local authorities Australia-wide with a tool to rapidly quantify impacts of building designs within a precinct or region of buildings.

'The information being collected by the Construction Innovation researchers is essential to gauge the impact of modern construction on climate, and will provide valuable information for the future planning of sustainable urban areas … It will also be used in future growth management strategies to ensure Brisbane remains a livable and subtropical city.'
Brisbane Lord Mayor Campbell Newman

Project duration

1 February 2005–31 October 2006

Project leader

Judy Kraatz, Brisbane City Council

Project members

Brisbane City Council: Heidi Astin, Medha Gokhale, Nelson Ross

CSIRO: Fanny Boulaire, Angelo Delsante, Robin Drogemuller, Melissa James, Anne Miller, Steven Moller, David Paterson, Gerardo Trinidad

Queensland Department of Public Works: Ron Apelt, Dale Gilbert

Queensland University of Technology: Ian Cowling, Steve Coyne, Adrian Cupitt, Nur Demirbilek, John Hayes, Ross Hayward, Rosie Kennedy, Anthony Nguyen, Zinmar Thein, Jinglan Zhang

Research collaboration

Theme 3: Assessment of human health and productivity benefits of smart indoor environments

Regenerating construction to enhance sustainability

Research project 2003-028-B

This current project is designed to assist in the delivery of demonstrably superior green buildings in respect of:

- eco-efficient re-design: achieving a smaller ecological footprint and within budget
- enhanced indoor environment quality and performance, reflected in improved health, well-being and productivity
- waste minimisation through re-design for dis-assembly.

Project duration

1 January 2005–31 December 2006

Project leader

Peter Newton, CSIRO

Project members

Arup Australasia: Ken Stickland

Brisbane City Council: Ken Moschner

CSIRO: Michael Ambrose, Steven Brown, Robin Drogemuller, Melissa James, John Mahoney, Phillip Paevere, Selwyn Tucker

Queensland Department of Public Works: Dale Gilbert, Del Jones

Queensland University of Technology: Philip Crowther

University of Western Sydney: Mary Hardie, Shahed Khan, Graham Miller

Right-sizing air-conditioning systems

Research project 2002-051-B

The key objective of this research was to collect and disseminate information to reduce over-specification of heating, ventilation and air-conditioning systems and to assist in the delivery of efficient environmental control systems that are more effective at providing better thermal environments in buildings. This research shows our traditionally designed HVAC systems are over-designed, resulting in inefficient use of resources.

Project duration

1 October 2004–28 February 2006

Project leader

Steven Moller, CSIRO

Project members

Arup Australasia: PC Thomas

Rider Hunt: Gregory Nowak

RMIT: Helen Lewis, Alison Terry

Indoor air quality estimator

Research project 2004-033-B

A model for estimating indoor air quality in commercial buildings will be developed by combining existing indoor air measurement, product emission and ventilation/filtration knowledge into a practical model for estimating the indoor air quality of indoor spaces over time — providing an air quality profile of indoor environments. The capabilities of the model will be demonstrated by industry partners implementing the model as a beta-tested prototype using data for selected materials from a 3D CAD model of a building design and characteristics of typical ventilation systems.

Project duration

1 February 2006–31 January 2007

Project leader

Selwyn Tucker, CSIRO

Project members

Brisbane City Council: Medha Gokhale

CSIRO: Steven Brown

Queensland Department of Public Works: Dale Gilbert

Queensland University of Technology: Lidia Morawska

Woods Bagot: David Marchant

Program B milestones

Type of milestone and/or output	Description of 2005–06 milestones and/or outputs	Achieved	Progress in 2005–06 and future planned activities for 2006-07	Reasons for not achieving milestones	Strategies to achieve outstanding milestones
1. Informing policy					
Research	Prototype home that demonstrates key attributes of smart, sustainable housing.	No		Not pursuing this area of research as it is no longer a priority of the participants.	
2. New products and services					
Research	*LCADesign* accepted as eco-efficient design assessment tool nationally — lifecycle operation.	Partially	*LCADesign* is being trialled by industry and government as a tool to reduce the environmental foot print of facilities. *LCADesign* is undergoing further development over the next 12 months so it will be more user friendly and have more robust reporting.	Major cultural change required in the industry to accept the need for environmental assessment.	Continue developing the tool, encourage more trials, work with industry groups to promote the use of environmental tools and negotiate a licence agreement with a suitable commercialisation partner.
Research	More effective collaboration on design projects.	Partially	Case studying the use of on-line collaboration tools by industry partners and continuing to develop suitable tools for better information flows and team collaboration.	Major industry cultural change required.	Continue developing the tools, encourage more case studies and trials of CRC tools, work with industry groups to promote the use of on-line collaboration tools and developing on-line courses on the use of collaboration tools.
3. Improved human and environment health					
Research	Legionella eliminated as a public health risk — research completed.	No		Following initial research, the CRC is now not pursuing this area of research as it is no longer a priority of the participants.	

Sun shading battens located on one of the HIA GreenSmart homes that were built at Springfield Lake. The GreenSmart homes were 5 star rated and combined energy efficiency, water conservation and natural ventilation in the design

Program C. Delivery and management of built assets

Program director:

Ron Wakefield, RMIT

Purpose

To deliver whole-of-life project value for stakeholders from business need, design and construction, through to ownership, asset management and reuse through:

1. improved communication and use of information
2. increased productivity and value
3. effective delivery and management of built assets.

Construction Innovation's first commercialisation opportunity has arisen from Program C. A licence agreement with one of the CRC participants has allowed *Project Diagnostics* to be used commercially. This diagnostic approach provides clients and contractors with the ability to monitor on an on-going basis how well a construction project is adhering to defined benchmarks.

In addition, Program C has developed decision-support tools that are being used by the Queensland Departments of Public Works and Main Roads to assist with the strategic management of built assets.

Construction Innovation's *Sydney Opera House FM Exemplar* project will provide the facility management industry with best-practice guidelines and benchmarking data.

Deputy program director:

Gerry Shutt, John Holland

This project extends the original work done on estimating costs for concrete on building projects (2003-037-C) by focusing on civil engineering quantities rather than building quantities. The extraction of civil quantities will be more difficult since the shapes are more complex, while the BoQ itself will be simpler. This project will examine both in situ and precast concrete components.

This project will examine existing design practices within the design related industry partners, assess capabilities of current bridge design software to provide the necessary geometrical information and to develop recommendations on how bridge designers could move from their current practices to 3D modelling for concrete civil structures.

This involves the examination of the current use of CAD and analysis packages within the industry partners and identifying how they can add value and reduce time and effort. One output of this stage of the project will be specifications of software modifications required to maximise the benefits of moving to 3D models.

Theme 1: Improved communication and use of information

Automated estimating civil concrete structures

Research project 2005-008-C

Project duration

1 November 2005–28 February 2006

Project leader

Robin Drogemuller, CSIRO

Project members

Brisbane City Council: Darren Leeson

CSIRO: Kwok-Keung Yum

John Holland: Gerry Shutt

Queensland Department of Main Roads: John Spathonis

RMIT: Guillermo Aranda-Mena

Waterfront Place, Brisbane Photo by Peter Brandon

Team collaboration through wireless computing

Research project 2002-057-C

This project has two streams that consider the use of pervasive* computing technologies in two very different contexts. The first context is the on-site (construction site) deployment of mobile computing devices. The second context is the use and development of intelligent rooms based on sensed environments and new human-computer interfaces (HCI) in the design office. The primary objectives of this project are to:

- identify relevant human-computer interfaces, and wireless mobile computing devices for use in the design office and on site
- use a pervasive computing ICT platform to enable the smooth flow of design information from the design office through to the construction site and back again
- stimulate the uptake of appropriate pervasive computing technologies in the construction industry.

* Pervasive or ambient computing provides the ability to access and interact with ICT wherever you are.

Project duration

28 September 2004–1 March 2007

Project leader

Stephen Kajewski, Queensland University of Technology

Project members

John Holland: Justin Lee

Queensland University of Technology: Sugiharto Alwi

University of Sydney: Andy Dong, Brian Lee, Mary Lou Maher

Woods Bagot: David Marchant

Way-finding in the built environment Phase 2 and 3

Research project 2004-028-C

Phase 1 of this project included a worldwide review identifying those way-finding systems and technologies that could be used to make it easier and safer for people with a sensory impairment (and in particular a vision impairment) to find their way around buildings and large public spaces. The project reviewed systems that may be used in buildings and other external public places.

The extent to which these systems could or should be required to be incorporated into buildings and other venues and whether the Building Code of Australia and other related legislation should be amended to take these systems into account requires further investigation. The project made recommendations on how these technologies and systems may be incorporated into Australia's building and construction practice. Conclusions from this study were addressed as short, medium and longer term actions.

Current project work in Phase 2 of this project includes the evaluation of way-finding systems uncovered in Phase 1, the writing of an audit checklist proposed for implementation on an office building and a best practice guide to be available for designers of constructed assets.

Project duration

1 December 2004–30 June 2006

Project leader

Dennis Hogan, Building Commission (Victoria)

Project members

Australian Building Codes Board: Matthew McDonald

CSIRO: Robin Drogemuller, Melissa James, Loretta Kivlighon, John Crawford

Queensland Department of Public Works: Ron Apelt, Dale Gilbert, Stuart Grierson

Queensland University of Technology: Debbie Smit, Paul Smith

Research collaboration

Theme 2: Increased productivity and value

Off-site manufacture in Australia

Research project 2005-004-C

Off-site manufacture (OSM) has long been recognised, both in Australia and internationally, as offering numerous benefits to parties in the construction process. More importantly, it is recognised as a key vehicle for improvement within the construction industry, including better quality control, more efficient site processes, better health and safety control, more environmentally-friendly manufacture and reductions in cost. The uptake of OSM in construction is, however, limited, despite well documented benefits.

The research will determine the 'state-of-the-art' of OSM in Australia. It will confirm the benefits and identify the real and perceived barriers to the widespread adoption of OSM. Further, the project will identify opportunities for future investment and research. An industrial report will be produced that will map the current state of OSM in Australia, and also identify where future efforts need to be directed for the industry to improve.

Project duration

1 May 2006–31 October 2006

Project leader

Tom Fussell, Queensland Department of Public Works

Project members

Building Commission (Victoria): Peter Nassau

John Holland: John Reddie

Queensland Building Services Authority: Jason Smith

RMIT: Nick Blismas, Carolyn Hayles, Ron Wakefield

Business drivers for building information models

Research project 2005-033-C

This project will develop understanding of the business drivers and barriers to digital building information models adoption in the Australian property, construction and facilities management (FM) sectors. This project will also show how the CRC is working across our industry to create industry and national economic benefit. To enable this, the objectives of this project are to:

- confirm and investigate the nature of economic, process and industry constraints to BIM adoption
- identify business strategies, cost and benefit models that may support adoption of BIM in the property, design, construction and FM industry. This will be based on case studies from this industry as well as other industries and interviews with business leaders and users of advanced applications of CAD in the industry.
- propose different business cases for adoption of BIM models.

There has not been an investigation that has focussed specifically on BIM and business benefits — specifically in relation to diminishing the *uncertainties regarding economic benefits*. A more effective adoption will be developed for industry.

Project duration

1 May 2006–30 June 2007

Project leader

Ron Wakefield, RMIT

Project members

Building Commission (Victoria): Paul Crapper

Queensland Department of Main Roads: John Spathonis

Queensland Department of Public Works: Tom Fussell

Queensland University of Technology: Martin Betts, Debbie Smit

RMIT: Guillermo Aranda-Mena, Arun Kumar

Theme 3: Effective delivery and management of built assets

Sydney Opera House facility management exemplar

Research project 2005-001-C

The *Sydney Opera House Facility Management (FM) Exemplar Project* showcases innovative methods for measuring and managing the economic, social and environmental impacts of FM across many of the twenty recommendations for the industry contained within the Australian Government's Facilities Management Action Agenda.

This project features three key research themes:

- digital modelling
- procurement
- performance benchmarking.

Each theme will be mapped to the Sydney Opera House's strategic asset maintenance plan and business objectives, followed by the Action Agenda's platforms.

This project will highlight the link between best practice FM and effective use of capital assets as a 'business enabler'.

Project duration

28 February 2005–24 November 2006

Project leader

Stephen Ballesty, Rider Hunt

Project members

CSIRO: Lan Ding, Robin Drogemuller, Melissa James, John Mitchell, Hans Schevers, Marcello Tonelli

Queensland Department of Public Works: Selwyn Clark, Frank Seed

Queensland University of Technology: Andrew Frowd

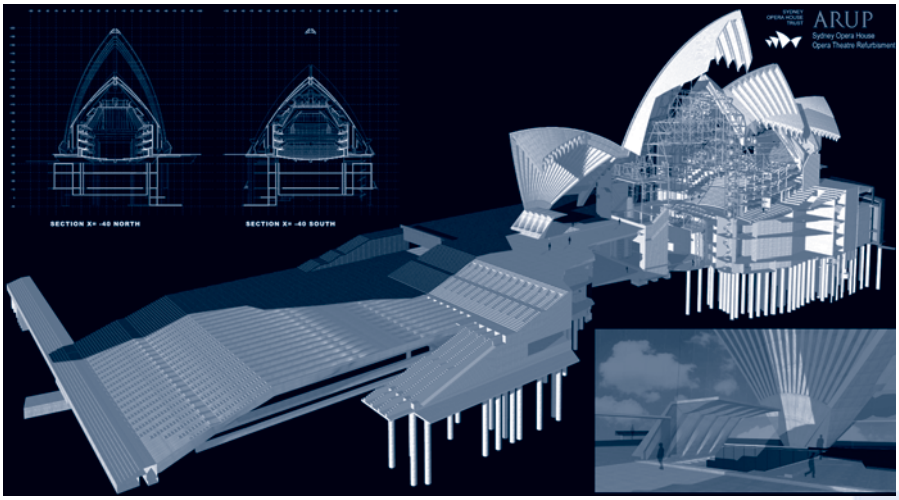
Rider Hunt: Ankit Shah,

University of Sydney: Janet Henriksen, David Leifer, Alan Tracey, Jeremy Wu

Woods Bagot: Peter Hoskins, David Marchant

'With over 4 million visitors and 2000 performances a year, effective facilities management is critical to the success of SOH. This project will enhance the SOH Facilities team's understanding of how we contribute to the experience of all our customers and enable us to demonstrate and improve our effectiveness through the development of business-oriented benchmarking, information management, planning tools and processes.'
Paul Akhurst, Director, Facilities, Sydney Opera House

Courtesy: Sydney Opera House



Courtesy: ARUP & Johnson Pilton Walker

Delivering a re-life project

Research project 2003-026-C

This project investigates the characteristics of re-lifing or refurbishment projects that impact upon the effective management of the construction process. This includes the identification and mitigation of risks, issues of decanting and interfering with existing tenants, identification of existing structure and services, work scheduling, occupational health and safety issues for construction personnel and tenants, demolition, waste and recycling, issues of quality and workmanship, cost planning and cost modelling methodologies.

Specific outcomes are:

- identification and documentation of issues impacting on re-life projects, design, engineering and procurement, and issues of decanting and sustainability.
- developing methodologies for assessing the condition of the existing building structure, the residual service life, and modelling operating and maintenance costs, and the utility and productivity expected from the refurbished building. This will include investigation of the potential applications for new remediation processes causing, for example, fibre reinforced composites (FRC).
- identification of opportunities for waste avoidance, reduction, reuse and recycling, and construction programming to minimise waste generation.

Project duration

1 August 2004–30 September 2006

Project leader

Jay Yang, Queensland University of Technology

Project members

John Holland: Bruce Carlyle

Queensland Department of Public Works: Selwyn Clark

Queensland University of Technology: Matthew Humphreys, Soon Kam Lim

Rider Hunt: Michael Gilligan, John Oliver

RMIT: Arun Kumar, Tom Molyneaux, Chintha Perera, Sujeeva Setunge, Srikanth Venkatesan

University of Western Sydney: Mary Hardie, Graham Miller

Research collaboration

Maintenance cost prediction for roads

Research project 2003-029-C

To effectively manage road infrastructures, agencies require sound information based on knowledge and data describing the assets to support their investment decisions. This research project is developing innovative decision support processes for road agencies, namely:

- road agencies need to optimise expenditure for asset data collection by determining the minimum amount of data required to predict maintenance and rehabilitation costs without jeopardising reliability
- agencies need to accurately predict the deterioration rates of infrastructure to reflect local conditions so that realistic budget estimates can be calculated.

Methods being developed by the research team for effective decision making for road asset investment include:

- optimising data collection
- calibrating pavement performance models
- assessing risk (probability) of errors in budget estimates.

The project has identified critical inputs that influence the reliability of road investment models and improved methods for calibrating the road investment models. These achievements allow for more accurate quantification and understanding of variability of critical factors influencing road network performance.

'Through this research we've attained a four-fold increase in the length of network we could test for the same cost. Or to put it another way, this adjusted sampling plan for the road network makes it an affordable exercise by effectively saving between 3.5 and 4 million dollars on state-wide data collection costs. And that's without losing the quality, reliability or statistical relevance of the data.' **Neil Robertson**, Manager of Road Asset Management Systems, Queensland Department of Main Roads and project team member *Maintenance cost prediction for roads*

Project duration

1 August 2004–30 June 2006

Project leader

Arun Kumar, RMIT

Project members

Queensland Department of Main Roads: Neil Robertson, John Spathonis

Queensland Department of Public Works: Dale Gilbert

Queensland University of Technology: Selvaraj Jeyachandran, Andreas Nata-Atmadja

RMIT: Richard Heaney, Anthony Piyatrapoomi, Ron Wakefield

Sustainable infrastructure in aggressive environments

Research project 2004-018-C

The objective of this project is to develop a tool that will help interpret the symptoms of degradation of concrete structures, estimate residual service life and recommend appropriate and cost effective remedial action. The study will focus on structures in aggressive environments with estimation of residual life based on a probabilistic methodology.

In developing the tool, significant advancement of knowledge is occurring through establishing a knowledge-based system to support maintenance inspections and diagnosis of observed signs of deterioration of concrete structures. Evaluation of the residual capacity and performance curves of a given structure using a probabilistic methodology will deliver a useful tool for industry application.

Project duration

1 July 2005–31 December 2006

Project leader

Sujeeva Setunge, RMIT

Project members

Queensland Department of Main Roads: Lex Vanderstaay, John Fenwick, Peter Rotolone

Queensland University of Technology: Matthew Humphreys

RMIT: Rebecca Gravina, Tom Molyneaux, Srikanth Venkatesan

Program C milestone

Type of milestone and/or output	Description of 2005–06 milestones and/or outputs	Achieved	Progress in 2005–06 and future planned activities for 2006-07	Reasons for not achieving milestones	Strategies to achieve outstanding milestones
Research	Reduction in documentation costs by 50 per cent	Partially	Evidence of an increase in the use of 3D CAD leading to increased productivity and better use of information on projects.	Major industry cultural change required.	Continue working with industry groups like International Alliance of Interoperability as well as out industry partners in promoting the use of 3D CAD and Building Information Models.

5.2 Research collaboration

Construction Innovation uses a wide range of formal and informal approaches to foster relationships, and provide a level of collaboration across our private and public industry participants and business associates with our researchers not before seen in this industry. In particular, emphasis is placed on the development of collaborative mechanisms between researchers and end-users, predominantly through our industry participants, relevant industry associations; and to other CRCs, and national and international industry and research leaders. The breadth of our network spans clients, property developers, design consultants, constructors and facility managers across Australia and internationally. Approaches include:

- research program workshops
- Research Committee — ensures industry, government and research partners provide early input to the development of research ideas, manage the current research portfolio and strategically evaluate future directions of applied research
- Research Leadership Team — core industry, researcher and headquarters executive team reviewing research proposals and operational and strategic activities
- scholars' workshops — two-day workshops to assist CRC PhD and Masters scholars' skill development and maintaining an applied research focus and national collegial collaboration
- regular email bulletins to all participants providing updates of research management and events of interest
- strategic planning retreat — attended by Governing Board, Research Committee, and at least one representative of each participant with CRC headquarters, to strategically review progress and set longer-term CRC direction
- bi-annual industry and research conference with an international focus — formal presentations of research successes and challenges across projects to showcase CRC projects to a national and international audience
- annual Executive Report Card meetings with partners — customised partner discussions to review value of engagement and identify improved opportunities for the future
- special initiative groups such as the renewal working groups
- intranet — allows each project team to share information within their project team or across all CRC personnel
- communications collaboration — networking the marketing and communications functions across the CRC participant network and industry associations to maximise industry knowledge of *Construction Innovation* benefits.

Construction Innovation's Governing Board is committed to ensuring strong linkages between CRC partners and industry — within Australia and internationally. This is supported by initiatives including:

- bi-monthly partner and industry newsletter to update stakeholders on *Construction Innovation* initiatives
- industry forums and presentations — as research project outcomes are delivered *Construction Innovation* holds a series of national forums disseminating the results to our partner network and to the industry generally. *Construction Innovation's* Senior Management Team, Program Directors and Project leaders also have an extensive program to disseminate information through industry conferences and workshops. These have been coordinated by industry associations or external conference organisers. A list of these presentations is provided in the appendices
- expanding the CRC Association communication network — our Communication Officer is active in developing valuable networks with other CRCs together with our Business Manager, Development Manager and CEO.

Construction Innovation's strategic alliance with the Australian Construction Industry Forum (ACIF) continues to be important in linking to end-users. This CRC grew out of early valuable support from ACIF. Through the *Building for Growth Action Agenda* we continue to consolidate this relationship through active engagement at Board level (facilitated by planning respective Board meetings in a common location). ACIF is also a formal participant on one of our projects, focussed on innovation and industry development, and will be an important partner in our Centre's future.

Additional external engagement by other research users on research projects is also encouraged for mutual benefit. For example, the Australian Greenhouse Office and the City of Melbourne participate in our sustainability research; the Office Federal Safety Commissioner is working with us to develop competencies in relation to safety; and the Sydney Opera House, Transfield Services and the Facility Management Association are assisting with a demonstrator project under the Facility Management Action Agenda; and *LCADesign* is also being used to provide preliminary environmental assessment on a commercial building in The Netherlands.

From Contractor, *August 2005*

Environment

BGC Contracting

A Brite future

A NEW rain-storage gutter that recycles rainfall for use inside (such as toilet flushing) or directs it into the soil has attracted the attention of Australia's Cooperative Research Centre for Construction Innovation.

Developed by New South Wales company Rainsaver, the storage gutter is one of the innovations that will be featured in the centre's latest round of BRITE case studies, to be published later this year.

Frank Smith, of Rainsaver, was living with a young family in a home reliant on tank water when he began investigating ways to better manage rainwater. He developed an oversized gutter that would replace a water tank and use all the rainwater that fell on a roof.

Instead of downpipes, the overflow from the storage gutters is returned to the soil by a process of infiltration.

Plugs can be installed at suitable points for plumbers to connect the gutters to toilet cisterns or other outlets and overflow holes direct excessive flow into garden beds.

The installation of rain storage gutters at the Gladesville Road Community Centre in Sydney has reduced its mains water demand by 26%. Because overflow is directed into the garden, all the rain that falls on the roof is used on-site except in extreme storms.

The Urban Water Resources Centre at the University of South Australia has estimated water storage gutters could save between 30-60% of mains water usage a year. Other studies show installation of the gutters is up to 27% less expensive than traditional guttering plus an equivalent-sized rainwater tank.

Further information on the case study will be released at the BRITE Case Studies 2005 Launch in Brisbane on November 2.

They are the product of a national search conducted every two years by the BRITE (Building Research, Innovation, Technology and Environment) project to find projects that encourage innovation in the property and construction industry by demonstrating its benefits and showing how obstacles can be overcome.

Keith Hampson, chief executive officer of the research centre, said the examples of technical and operational excellence discovered through the BRITE project were a vital tool for the industry in improving efficiency and lifting economic performance.

"The project is proving to be a successful way of promoting innovation in the building and construction industry," Hampson said.

New storage gutters are said to save up to 60% of mains water usage

Abrasive breakthrough

A WET abrasive blasting system recently released on to the Australian market is attracting high levels of interest from mining, manufacturing and service industries.

The German-made Torbo system is claimed to be the only blasting system able to operate effectively and efficiently at low or high pressure.

Developed originally for use in stone masonry, for the fine restoration of monuments and statues, it allows the operator to vary both the pressure and blast media flows for a vast range of surfaces.

Coupled with the ability to use a large range of media types with different measures of hardness, the Torbo system can be used to clean surfaces from stone and fibreglass to steel, without damage. Case studies include its use for the steel surface preparation of a United States Navy submarine for a new coating, where it was credited officially with saving $US500,000 in reduced worker hours.

The wet abrasion system produces no dust, ensuring its environmental acceptance compared with standard blasting systems, is quieter than existing systems, and requires little protective clothing for the operator.

Haydn Ledger, of franchise holder Westate Equipment, said the Torbo system had been accepted into many overseas mining operations. It was quickly being acknowledged by mining, marine and industrial businesses in Western Australia for its effectiveness, environmental advantages and other benefits such as low operating costs and portability, Ledger said.

46

Contractor August 2005

Research collaboration

Construction Innovation has acted as an *innovation broker* by facilitating linkages between our participants and other international leaders. For example, we provided Arup Australasia with entrée to leaders in their areas of interest at Stanford University (USA). We have also served our international colleagues by providing them with links to Australian industry and research leaders.

Construction Innovation's Senior Management Team, Project Directors and Program leaders also have active engagement at a senior level with key industry associations in property, design construction and FM. For example, our Board Chair John McCarthy is the former inaugural Chair of the Australian Sustainable Built Environment Council, former National President of the Property Council of Australia, Chair of Australian Construction Industry Forum and currently Chairs the Facility Management Action Agenda Implementation Committee. He is also Director of the International Council for Research and Innovation in Building and Construction and a Director of the Australian Building Codes Board.

International linkages

The goal of achieving national and international leadership requires the ability to work with the world's best. Nowhere was this more apparent than at the 2006 *Clients Driving Innovation: Moving Ideas into Practice* International Conference. This event explicitly highlighted the benefits of industry, government and researchers working together for mutual benefit, by bringing together 230 people from across 12 countries, from research and research-user organisations. Participant feedback was extremely positive, with special mention being made of the appropriateness of the 50:50 blend of researchers and end-users speaking and attending this event.

This conference was supported by the International Construction Research Alliance (ICALL), with this network providing considerable support in terms of coordination and promotion. This international support through ICALL, together with the CIB and the IAI provided strong grounding for significant international attendance at this CRC's second international conference.

Internationally renowned industry professionals and researchers also underpinned the success of the Conference. For example, Arto Kiviniemi, from VTT Technical Research Centre of Finland, and the International Chair, Technical Committee of International Alliance for Interoperability (IAI) benefited our industry partners through one-on-one and internal workshops with John Holland, Rider Hunt, QDPW, and Woods Bagot. Arto's international leadership in the business benefits of building information modelling (BIM) provided a reality check on the growing use of BIM internationally and the sense that we are on the cusp of significant growth in industry uptake of this technology and practice. Arto's contribution together with our other international and local speakers at our international conference was deemed an international watershed by industry and research leaders alike.

Additional international keynote presenters included Professor Peter Brandon, University of Salford (UK); Professor Martin Fischer, Stanford University (USA); Dr Keith Futcher, ISS EastPoint Group (Hong Kong); and Gualtiero Bonvino, Cresme (Italy). We look forward to growing our relationship with these and other key individuals from across the industry nationally and internationally into the future.

'One innovative initiative has been the bi-annual conference relating to Clients Driving Innovation drawing together the international research community in the field. These conferences are building the status of the CRC CI internationally but also setting the agenda for research in this important field,' 5th Year Review Panel

'The content [at the conference] was some of the best I have heard anywhere. In many ways this to me was a watershed event … the quality of the presentations was tremendous and I heard nothing but excellent reports.' **Professor Peter Brandon**, Director — Strategic Programmes, University of Salford, UK

Construction Innovation will continue to host further international visitors from our ICALL partners — particularly in the joint global advancement of our ICT tools.

Peter Verwer (Property Council of Australia)

Greg Paramor (Mirvac Group)

Arto Kiviniemi (VTT Technical Research Centre of Finland)

Three of the keynote presenters at the CRC's 2006 International Conference

Education and training

Education Program

Construction Innovation's education and training program is recognised as a significant contributor to enhancing the collaborative culture of construction. By partnering with industry, government and researchers to develop educational and professional development courses; and by encouraging industry participants to co-supervise students; *Construction Innovation's* scholars' program successfully attracts a high calibre of students. Many of those who have completed their scholarships have gone on to practically apply their studies in the property, design, construction and facilities management sector.

An integral part of *Construction Innovation's* education and training program is to hold workshops, forums and other events to help build the skills and knowledge of its scholars and research teams.

Construction Innovation conducted the following events:

Scholars' Workshops

Three Scholars' Workshops took place over 2005–06.

The first, in July 2005, coincided with the Queensland University of Technology Research Week. It was themed 'Entrepreneurship', and based on the Australian Technology Network on-line *Learning Employment Aptitudes Program*.

The second workshop, held over two days in December 2005, focussed on *Project Management*.

Coinciding with *Construction Innovation's* second international conference, a two-day Scholars' Workshop was held at the Gold Coast in March 2006, focussing on 'Teams, Communication and Leadership Skills'.

Each of these workshops received excellent feedback from attendees, as they were provided an opportunity to develop skills, build networks and gain an appreciation of what other scholars are achieving.

Construction Innovation researchers and scholars also attended 'Commercialisation Bootcamps', held by the Australian Institute for Commercialisation. Attendees were introduced to the various stages of the commercialisation process, from structuring a research program through to realising the potential of commercial outcomes in the marketplace.

Industry forums

To disseminate the benefits to industry of research findings *Construction Innovation* conducted a range of events from industry information breakfasts to presentations and forums to case study industry sessions. A sample is listed below with a full list in Appendix 1:

- Sustainable Infrastructure in Aggressive Environments
  - workshops for industry partners at Queensland Department of Main Roads (July 2005)
  - workshop and technical evening at Queensland Department of Main Roads (April 2006)
- Sustainability and Facility Management Forum, Sydney (August 2005)
- Innovation in the Building and Construction Industry, Road Systems and Engineering Forum, Department of Main Roads, Brisbane (August 2005)
- An overview of CRC major research findings/results and future plans, 3D CAD Analysis Tools and the Automatic Estimator was presented key industry members, Sydney (August 2005)
- Presentation of six final BRITE Project case studies to industry, Brisbane (November 2005)
- Queensland Department of Main Roads industry partner workshop (December 2005)
- *DesignCheck* industry information session, Melbourne (November 2005)
- *LCADesign* demonstrations to help industry gain an understanding of its capabilities, Sydney (February 2006)
- *Your Building* workshops, Sydney and Perth (May 2006).

Courtesy: Queensland Department of Main Roads

Education and training

Scholarship program

In 2005–06 three new Scholars were welcomed into the scholarship program. During the same period, five scholars completed their scholarship period with the finalisation of their studies continuing, in some instances, for a further six months.

As of 30 June 2006, *Construction Innovation*'s Scholarship program included eight PhD and three Masters by Research students.

Degree: PhD, Queensland University of Technology

Start/end: March 2003–June 2006

Supervisors: Martin Skitmore (Queensland University of Technology), Tony Sidwell (Queensland University of Technology), Dennis Wogan (Queensland Department of Main Roads)

Garry Creedy

Title: Identifying and matching project risk factors to delivery capability in highway construction projects

Research focus: This research focuses on highway construction projects in Queensland and uses a road organisation case study to research and analyse a broad range of historical data that has lead to cost overruns in client budget estimates during project delivery. It developed a statistical risk probability model that can quantify risk provisions as a percentage contingency on-cost for various planned highway project types.

Impact on industry practice: The client has a need to achieve accurate risk assessment of project cost estimates at the time the decision to build is made. The outcomes of this research will assist clients in identifying a broader range of risk factors by incorporating realistic contingency percentage on-costs in project budget estimates.

Garry's final seminar and oral defence for his PhD was held in June 2006. Garry has now returned to his position Director for Roads Information, Queensland Department of Main Roads.

Degree: PhD, Queensland University of Technology

Start/end: June 2005–June 2006

Supervisors: Kerry Brown (Queensland University of Technology), Gerry Shutt (John Holland)

Craig Furneaux

Title: Policy networks: Demonstrating their presence, structure and influence

Research focus: In recent years governments have become increasingly reliant on networks of informants to provide policy advice. Interest in these sets of relationships commonly termed 'policy networks', has risen dramatically over recent years. Networks, which are seen to operate somewhere between hierarchies and markets, are an important and little understood element of Australian policy processes, and could enable efficient problem definition and solving if they could be understood. This project analysed a number of policy networks in the construction industry in Australia, as in depth case studies.

Impact on industry practice: This research will facilitate an improved understanding of inter-organisational relationships in the construction industry, and how these relationships in turn are able to influence government policy. In particular a better understanding of networks of inter-organisational relationships based on influence, knowledge and trust will have practical application to the areas of supply-chain management, risk management, procurement, innovation, knowledge management, as well as public policy.

Craig's scholarship period is now complete however he is continuing his PhD while working as a researcher on *Construction Innovation* Project 2004-032-A.

Colin Greville

Title: Psychology of sustainable development

Research focus: This research focuses on influencing factors for client decision-making in relation to environmentally sustainable development (ESD). As an industry, if we are serious about ESD, we need to know why people think about it the way they do. Statistically, economics plays a limited role in the development of environmentally sustainable construction. What are the triggering factors for the purchase of ESD homes? Are these factors replicable and can we turn the residential side of the industry towards ESD on a large scale that is economically viable for builders and developers?

Impact on industry practice: The project is most likely to have its greatest effect in the area of marketing for environmentally sustainable design. The research area has been narrowed to examine psychological factors (primarily marketing psychology) in relation to energy efficiency in buildings. This research has the short-term potential to alter the system of marketing for those involved in environmental construction and thus increase market share, and broaden the environmental market allowing new players to enter the arena.

Col's scholarship period is now complete, however he is enrolled part-time to finish his PhD in 2007. Col is currently working as a building inspector and is a self employed builder in the residential industry, based in Bundaberg, Queensland.

Degree: PhD, University of Western Sydney

Start/end: March 2001–October 2005

Supervisors: Graham Miller (University of Western Sydney), Alan Jeary (University of Western Sydney), John Oliver (Rider Hunt)

Joanne Jakovich

Title: A model of auditory gesture for intelligent environments.

Research focus: Auditory gestures are sound signals that represent spatially located information that can be accessed by human gestural interaction in space. A review of related research highlights that there is no formal understanding of the relationship between the features of an intelligent soundspace and performance of users. The primary contribution of this research is to establish a model of auditory gesture for application in intelligent environments that enables computationally generated sound to be employed in the realtime development of interactive spaces that can be used by other users of the space. By building a detailed understanding of the particular propensities of gesture toward certain patterns of sound generation, it should be possible to construct a model to describe auditory gesture in interactive soundspaces.

Impact on industry practice: While much research effort has been directed toward the development of visual interfaces and representations to support human interaction in intelligent spaces, little attention has been directed toward sound-based interaction and intuitive body interfaces. Numerous potential applications for auditory gestures exist since they allow the user to spatially store and access information without relying on vision, and using intuitive, accessible controllers — body gestures. This is applicable to virtual design prototyping, remote collaboration and communication in design, urban navigation, auditory augmented reality systems, design of virtual environments and operation of controls in complex work environments.

Degree: PhD, University of Sydney

Start/end: August 2004–December 2007

Supervisors: Kirsty Beilharz (University of Sydney), David Marchant (Woods Bagot)

Judy Kraatz

Title: Critical success factors in delivering relationship-based facilities

Research Focus: This research will focus on the establishment of critical success factors for major economic infrastructure projects procured via relationship-based contracts, focussing on projects delivered by local government in South East Queensland. A key element of investigation is the role of corporate responsibility in informing these critical success factors, with a focus on understanding and tracing the value equation for major economic infrastructure projects. This will lead to better definition and understanding of project impacts across the project life-span for new delivery processes and partner roles and responsibilities. One expected outcome is the development of a 'value map' and identification of subjective and objective measures for inclusion in project-specific critical success factors.

Impact on industry practice: Local authorities have core responsibilities for the provision and maintenance of much of the physical and social infrastructure of a region; are required to maintain high standards of public accountability; and are responsible for establishing and administering local by-laws and regulations related to a range of issues including that of urban planning. Recent partnering arrangements with the private sector to design, deliver and/or maintain and operate infrastructure and/or services has changed the nature of the responsibilities and accountabilities of all involved.

The management, financial and contractual issues associated with these relationship-based contracts (partnering, PPP's, alliances etc) are already subject to much research activity. This research will investigate how key areas of corporate responsibility (i.e. environmental and social impacts) are identified, forecast and managed under these new partnering arrangements and what are the new roles of the project partners and stakeholders.

Degree: Masters by Research, Queensland University of Technology

Start/end: May 2006–May 2009

Supervisors: Stephen Kajewski (Queensland University of Technology), David Stewart (Brisbane City Council)

Education and training

Degree: PhD, RMIT

Start/end: August 2002–December 2005

Supervisors: Derek Walker (RMIT), Gerry Shutt (John Holland)

Tayyab Maqsood

Title: Investigating the role of knowledge management in supporting innovation for effective planning and delivery of construction projects

Research focus: Innovation is regarded as a key to improving productivity in the construction industry. This investigated the role of knowledge management in supporting innovation. Soft systems methodology was selected as a basic qualitative research tool to carry out such investigations. The outcomes included the development of models of knowledge management encompassing innovation and organisational learning. These models can be used to assist in the transformation of a traditional organisation into a learning organisation.

Impact on industry practice: This research produced useful guidelines and frameworks to enhance learning in the construction industry and to manage, understand and practise knowledge management more efficiently.

Since completing his PhD, Tayyab has been appointed as a lecturer at RMIT, contributing to the undergraduate and postgraduate programs in property, construction and project management.

Degree: PhD, Queensland University of Technology

Start/end: January 2005–April 2008

Supervisors: Lisa Bradley (Queensland University of Technology), Glenda Maconachie (Queensland University of Technology), Dean Cipolla (John Holland)

Brett Mayze

Title: Safety culture in the construction industry: A multilevel perspective

Research focus: This research will provide conceptual clarity to the safety culture literature, and contribute to the debate distinguishing between safety climate and safety culture. It will build on the existing theoretical framework underpinning safety culture to strengthen this concept. A triangulated set of measurement instruments to facilitate multilevel analysis of safety culture will be developed.

Impact on industry practice: This research broadens existing research into safety culture from other industries (such as nuclear and shipping). It will propose multilevel measures of safety culture that facilitate benchmarking across the construction industry and identify key drivers and characteristics of an effective safety culture. This research will also seek to measure and compare construction 'safety culture' over time and across sites (with a longer-term view of benchmarking across the Australian industry over time).

Ensuring his industry relevance, Brett carries out applied consulting with the John Holland Group.

Degree: PhD, University of Sydney

Start/end: February 2003–August 2006

Supervisors: John Gero (University of Sydney), Rabee Reffat (University of Sydney), David Marchant (Woods Bagot)

Wei Peng

Title: An adaptive design tool that learns

Research focus: Computer-aided design tools continue to be built on a paradigm that says that the tool is unchanged by its use. This research aims to develop an approach that enables a design tool to 'learn' by use, and hence to adapt itself. We explore a computation model that is founded on the ideas of 'situatedness'. A situated agent extends an existing design tool to model interactions, from which the agent is able to learn from its 'experiences'. Through the agency provided, the tool would be able to embody learning and to develop adaptive behaviour to assist designing.

Impact on industry practice: Designing is an arduous process that requires design expertise and creativity. Designers interact with their design environments and change the course of developing the design depending on these interactions. To help designers we need tools that connect the interactions between the tool, the problem it is being used in, and the use.

Wei Peng was awarded the Scholars' Award at the CRC's 2006 International Conference.

Tim Rose

Title: Optimising the impact of financial incentive mechanisms in Australian commercial building projects

Research focus: This research identifies the major indicators that predict the level and direction of effort under project-based incentive contracts. It also explores the specific project drivers that determine the impact financial incentives have on motivation in major government non-residential building projects. The identification and assessment of these contextual drivers will contribute significantly to the research area as it will present a clearer picture of what determines the success of financial incentives and what aspects should be taken into consideration when designing financial incentive contracts in this arena.

Impact on industry practice: This research will identify how financial incentives can be applied to improve the level and direction of effort in building projects. With the identification and prioritisation of the major motivation drivers in incentive construction contracts, government clients will be better equipped to implement successful strategies that improve project performance and decrease project risks.

Degree: PhD, Queensland University of Technology

Start/end: July 2003–December 2006

Supervisors: Karen Manley (Queensland University of Technology), Keith Hampson (CRC for *Construction Innovation*), Don Allan (Queensland Department of Public Works)

Derek Thompson

Title: Transitional soundspace

Research focus: This research looks at interdisciplinary theory relating to acoustics and aural perception of complex, dynamic, and populous spaces in the built environment. It includes extensive field recording, analysis and experiments with 3D-spatial sound recording and reproduction techniques. It intends to bring together theory from diverse specialist disciplines to inform processes of documentation, analysis and design of complex aural environments, in virtual and real-world applications.

Impact on industry practice: The research will generate greater awareness of perceptual and aesthetic considerations of sound in space, beyond traditional methods of acoustic measurement and analysis. It will advance understanding in dynamic aural perception of transitional soundspaces as a basis for application of emerging technologies in real-time, navigable virtual environments.

Derek submitted his research project in August this year, and has now returned to full-time employment with Arup Acoustics. He is based in Melbourne, working on a range of local and international projects. Derek's project work has a new focus on performing arts venue design, and he is leading further development of SoundLab, Arup's local facility for spatial auralisation.

Degree: Masters by Research, RMIT

Start/end: July 2004–December 2005

Supervisors: Lawrence Harvey (RMIT), Mark Burry (RMIT), Neil Woodger (Arup Australasia)

Marcello Tonelli

Title: Impacts on the commercial property market through planning policy, economic development strategies and fiscal change

Research focus: This research presents a conceptual model which builds on resource-based theory of competitive advantage, systems theory, and change management theory, arguing that Corporate Real Estate (CRE) decisions be broadened to include customers (approach-avoidance behaviour), human resources (industrial psychology, intellectual capital) and internal processes. The design of the conceptual model based on system dynamics methodology allows for the inclusion of causal relationships, time delays, and feedback structures. Tacit knowledge is an important component of decision-making, and transfer is generally difficult, because 'we can know more than we can tell'. The use of expert systems allows the conversion of such tacit knowledge into explicit knowledge that is then made available to others through information systems such as simulations.

Impact on industry practice: For most businesses, CRE decisions imply large capital expenses and, generally, decisions are made by people who do not have all the necessary information. The use of an expert decision-support system based on cognitive maps, that capture the expertise from different departments will enable a more fully informed and improved decision. For example, the research outcomes will be of use to managers interested in how the prestige of a building influences customers' future repurchase intentions.

Degree: PhD, Queensland University of Technology

Start/end: August 2003–February 2007

Supervisors: Boaz Bernstein (Queensland University of Technology), Terry Boyd (Queensland University of Technology), Teng Hee Tan (Queensland Department of Public Works)

Education and training

Degree: PhD, Queensland University of Technology

Start/end: February 2002–April 2006

Supervisors: John Bell (Queensland University of Technology), Brian Hudson (Queensland University of Technology), John Byrne (Queensland Department of Housing)

Ned Wales

Title: A framework for incorporating ecological sustainability practices in master-planned communities

Research focus: Through a series of publications, this research examines a body of work that addresses principles for incorporating ecological sustainability into master-planned communities. It looks at case studies that have incorporated environmentally sustainable development principles into their planned communities with various levels of commitment and success. The study will examine principles of sustainable subdivision and barriers perceived by the building industry. The final paper will evaluate policy models that local or regional governments could include in the development application process.

Impact on industry practice: The impact of this research has informed change agents and other professionals in the land development and construction industry on what are perceived as barriers to implementing sustainable principles into new built form. The work has had a particular emphasis on energy efficiency and the adoption of rating tools where land development is seeking a standardised approach to rating tools and input–output accounting systems. The final work evaluates models of implementing incentives to achieving sustainable practice though the development approval process at the local government level.

On completion of his PhD studies, Ned intends to continue his career as an environmental change agent with the Gold Coast City Council, where he will focus on the balance between built and natural environments. Ned's association with *Construction Innovation* has taught him about the growing need for a significant shift away from current human resource dependence and its accumulated impact on our biosphere. Upon his retun to the Council he will work to implement these issues associated with rapid environmental change through encouraging new practices in the building industry and effective public policy implementation.

Degree: PhD, Queensland University of Technology

Start/end: February 2006–February 2007

Supervisors: Boris Kabanoff (Queensland University of Technology), Amanda Gudmundsson (Queensland University of Technology)

Colleen Yuile

Title: Attention to corporate and social responsibility by Australian corporations: Trends over time and the relationship with financial performance

Research focus: This research will investigate the relationship between corporate social responsibility (CSR) and firm profitability by undertaking a comparison of multiple industries including the construction, telecommunication and education industries. It is anticipated that this research will also result in identifying the value and stability of firms and the effects of change on employee engagement. This research will also examine whether firms with CSR agendas actually practice what they preach and how this influences external attitudes toward the organisation, and the effect on organisation's bottom line and employee engagement.

Impact on industry practice: This research will provide valuable information to organisations considering the implementation of CSR strategies as well as to those organisations wishing to examine the impact of existing CSR approaches. It will provide industry with the knowledge of the significant dimensions of CSR considered important by numerous stakeholder groups and provide data regarding the dimensions of CSR currently being used by Australian organisations. Further, the research identifying the dimensions of CSR and the corresponding relationship to financial performance will enable organisations to make informed decisions regarding CSR strategies and estimate the impact and return for shareholders.

Degree: PhD, University of Sydney

Start/end: February 2003–October 2006

Supervisors: Mary Lou Maher (University of Sydney), David Marchant (Woods Bagot)

Ji Soo Yoon

Title: Way-finding in dynamic virtual worlds using swarm intelligence

Research focus: Virtual world technology is slowly starting to be integrated into the construction industry worldwide in various stages of design which include conceptual design tasks and evaluating designs by simulation. The fundamental problem in current usage of virtual-world technology is that there is no intuitive way-finding capability. Research in way-finding has focussed primarily on static worlds and consequently becomes obsolete. This research concentrates on resolving this issue using swarm intelligence (swarm intelligence is the design of algorithms or distributed problem-solving devices inspired by the collective behaviour of social insect colonies and other animal societies).

Impact on industry practice: This research will contribute to the development of various forms of navigational assistance that enable visitors to a virtual environment to find their way without previous training. It examines both the applicability of swarm-intelligence-based agent behaviour models for way-finding and the role of stigmergy (type of communication) in the way-finding context. The intention is to develop an alternative strategy to way-finding within virtual worlds which better adapts to dynamically changing environments.

Completed scholars

In 2004-05 four scholars completed their studies, all of whom are currently employed in areas relating to their studies.

Cameron Beard completed his Masters at the University of Newcastle in 2006, undertaking research in *ICT integration in the construction industry*. Cameron is now employed as a Quantity Surveyor at Muller Partnership, a professional practice based in Newcastle, specialising in providing quality surveying and project control services. Cameron's *Construction Innovation* research has assisted him in the evaluation and implementation of a number of technologies within the practice, resulting in Cameron now heading up Muller Partnership's IT department.

Agustin Chevez completed a Masters by Coursework at RMIT, on *Sources and effects of uncertainty in the management of construction projects*. Upon completion he worked as a Project Manager in a construction company providing him with first-hand experience in applying his focus of research. Participating in *Construction Innovation's* first International Conference, gave Agustin the inspiration and topic for his current PhD research. Based on the paper given by Pekka Huovila from VTT Technical Research Centre of Finland, Agustin is currently researching the impact of technology in architecture under his research entitled *Evolution of workplace architecture as a consequence of technology development*.

Merv Cowley completed his PhD at Queensland University of Technology in 2004, undertaking research on *Property market forecasting: valuation implications*. Merv is currently employed as a Senior Property Analyst with the Queensland Department of Public Works. The *Construction Innovation* research has had many practical applications in managing the department's $1.6B commercial property portfolio and has enhanced the accuracy of numerous viability studies prepared for the department. Merv's appointment by the Queensland Government to conduct a national review and prepare a report on Australia's rating valuation systems was largely based on his strong research history with *Construction Innovation.*

David Luxmoore completed his Masters by Research at Queensland University of Technology in 2004. David focused on the *Evaluation of GreenSmart housing* and is currently employed as the Director of Sustainable Development Strategies, a private sector consultancy focussed on residential development, in Sydney.

Courses with *Construction Innovation* project content

Industry, government and research partners are involved in the conduct of research, the outputs from which form the base for curriculum content and delivery. The following courses were added to curricula in 2005–06:

The BRITE project — Building Research, Innovation, Technology and Environment research outcomes have been incorporated into

- Queensland University of Technology MGN 426 — International Trends in Public Sector Management — post graduate course
- Queensland University of Technology CNB 296 Contemporary Issues, Bachelor of Property Economics/Bachelor of Applied Science — Property Economics and Construction Management
- Queensland University of Technology CNB 420 — Current Construction Issues — Bachelor of Applied Science — Construction Management and Quantity Surveying
- UWS 200479.1 Communications for Construction Professionals, a compulsory subject by students in the following three courses:
  - 2607.1 Bachelor of Construction Management
  - 2500.2 Bachelor of Housing
  - 2713.1 Bachelor of Planning

Value in project delivery systems: Facilitating a change in culture. Research outcomes have produced content for a two day industry workshop and one unit of study for Queensland University of Technology's Masters of Project Management and is being integrated into QUT's input to the Shell Project Academy.

Internationalisation of Construction Industry Design Firms

University of Newcastle

- Bachelor of Science (Architecture) (2nd and 3rd year), Professional Practice Design.
- Bachelor of Architecture (5th year), Professional Practice Research methods, Arch 5130A
- Bachelor of Construction Management (4th year), Construction Management 4 Phase 15A Research methods, Bldg 4320.

E-business adoption

- RMIT — presented research outcomes for BUIL 1215 Research Methods
- University of Newcastle — presented research outcomes for undergraduates in Arch 5130A and Building 4320

Supply chain sustainability

University of Newcastle

- ARBE 3101 Research in the Built Environment 1
- ARBE 4120 Research in the Built Environment 2

Regenerating construction to enhance sustainability

Content derived from waste minimisation research has been incorporated into two undergraduate and one post graduate subject at the University of Western Sydney. These are

- BG303A.1 Development Control — Bachelor of Planning
- 200435.1 Property Development Controls — Bachelor of Construction Management, Bachelor of Business (Property)
- BG812A.1 Building Studies — Masters of Building Surveying

Delivering a re-life project

- RMIT — CIVE 1174 Infrastructure Management — Final year in Civil and Infrastructure Engineering and 1131 Sustainable Infrastructure Design delivered in Hong Kong
- University of Western Sydney — BG 812A Building Studies — Masters of Building Surveying
- Queensland University of Technology — CNB 483 Smart and Sustainable Construction

Sustainable infrastructure for aggressive environments

- RMIT — CIVE 1174 Infrastructure Management — research methodology and framework is used as a case study.

Education and training

Education and training milestones and/or outputs

Type of milestone and/or output	Description of all 2005–06 milestones and/or outputs including past milestones which have not been met (and date)	Achieved (yes/no)	If achieved, progress during 05–06 and planned activities in 06–07	Reasons why milestones and/or outputs have not been achieved	Strategies to achieve milestones which have not been met
Review education and training strategy	Strategy reviewed as part of revised Strategic Plan 2005–08	Yes	The education and training strategy will be reviewed six monthly.		
PhD students — recruit, orientation, commercialisation training	Scholars workshop coincided with *Construction Innovation*'s conference (Mar 2006) Theme focussed on teams, leadership and communication. Other events as previously mentioned.	Yes	Three additional scholars will be recruited and inducted into the CRC scholars program.		
Student participation in *Construction Innovation* conference	Students participated in their own stream for presentations at the Second International Conference in March 2006. Wei Peng won the Scholars' Award at this conference.	Yes	The third International *Construction Innovation* Conference will be held in 2008.		
Construction Innovation dissemination workshops	Students are involved in an ongoing basis with their academic and industry supervisors in presentations regarding their research and, where relevant, *Construction Innovation* research projects.	Yes	Dissemination activities will continue in 06–07.		
Industry workshops	Joanne Jakovich International Conference on Intelligent User Interfaces 2006, University of Technology, Sydney Interactive Entertainment 2005, University of Technology, Sydney International Conference on New Interfaces for Musical Expression 2006, IRCAM, Paris Urban Typhoon Workshop 2006, Tokyo Cultural Typhoon Conference 2006, Tokyo Ubiquitous City Symposium 2006, Tokyo	Yes	Scholars will present to industry when appropriate events are identified.		

Performance measures

The Performance Indicators addressed in the Annual Report are those agreed to in the January 2004 Commonwealth Variation.

Quality research

1. Satisfaction of partners and users with research quality and value to industry

2005–06

The CRC for *Construction Innovation's* activities have been significantly broadened in 2005–06 with a strongly emerging education and technology transfer and commercialisation focus in addition to ongoing research management. Concurrently the external communication requirements have enlarged the industry and participant reach of the Centre.

2004–05

Special emphasis continues to be placed on participant relations — with multiple formal and informal opportunities for participants to provide feedback — with the continuing success of the Executive Report Card process in particular being held up across the CRC sector as the model of engaging and reporting to Centre participants. *Construction Innovation*'s partners have again confirmed their ongoing satisfaction with the results from research projects and the developing technology transfer. The steady growth of cash support from fresh project and Centre participants coupled with the consistent in-kind growth we have generated since the establishment to the CRC is testament to the research-user satisfaction.

Pre 1 July 2004*

* Note for a complete overview of all performance measures prior to 1 July 2004 please review the Annual Reports for these years (all can be downloaded from www.construction-innovation.info).

Executive Report Card interviews with *Construction Innovation* stakeholders confirmed the broad satisfaction of participants and users with the results from research projects and technology transfer activities. Some participants provided increased in-kind support in recognition of the value of research to their business activities while others are focussing their efforts to ensure the outcome to their business activities are maximised. Contributions of in-kind from both industry and government research users exceed anticipated commitments, highlighting the value to industry.

2. Increase volume of research contribution to CRC

2005–06

Industry and research sectors are exceeding their in-kind commitments to this CRC with a total excess of 9.5 per cent overall throughout 2005–06. Since the beginning of our CRC the cumulative in-kind contributions to the end of June 2006 exceeds the agreed amount by 3.5 per cent. Close relationships with our research users in the development, management and diffusion of our research outcomes continue to ensure this high level of research contribution.

2004–05

Research users (industry and public participants) and researchers have increased their delivered in-kind by 3 per cent in excess of that anticipated throughout 2004–05 in this our fourth year of operation. In particular, it is worthy to note that the overall in-kind delivered to *Construction Innovation* has increased by 1 per cent over that originally committed in the Commonwealth for the four years.

Fresh contributions have been secured from the private and public sectors for applied research projects. Contributions of cash across the CRC have risen by 2 per cent above expectations with in-kind from research users exceeding anticipated commitments by approximately 9 per cent — a very sound result for the stage of life the CRC is currently in, where other CRC's have experienced a reduction of their user support.

Pre 1 July 2004

Levels of in-kind support from research users (industry and public participants) and researchers increased in each of the first three years of operation. These increases reflected the increased confidence in the research development and management processes as well as the maturation of research user expectations.

3. Adoption of research results/Benefits of result by partners

2005–06

Research project outcomes throughout this year have been trialled extensively by CRC participants and other select partners; or been the subject of industry diffusion through publications, industry breakfast or workshops. *Construction Innovation* is embarking on a formal process of measuring benefits to partner organisations and has employed the services of independent economic analysts to value the CRC's current and planned industry outcomes. Given the sector accounts for 14 per cent of the national economy and significantly contributes to the rest of the economy as an enabler, a one-off construction productivity improvement of 0.3 per cent annually, results in an improvement in GDP of $5 billion and is at least double that of any other sector (ACIL Tasman, 2005).

In particular the BIM suite of analysis tools (*Automated Estimator, Automated Scheduler, DesignCheck* and *LCADesign*) has been trialled either as a complete suite or as a stand-alone package by eight partners. The results of these trials have been generally positive — with a formal process of feedback to the CRC for package upgrades to advance the project prototypes to a higher level.

The *Construction Site Safety Culture Project* will recommend national uniformity of construction safety supervisor roles to allow more appropriate site safety practices wherever construction sites may be located. This project is scheduled to be launched in September 2006. The value to industry can be assessed by understanding the magnitude of the poor safety performance of this industry where workplace deaths and injuries cost the nation $3.6 billion each year. Construction-related injuries are almost double the national industry average. The ongoing practical research delivered by this CRC is expected to improve this poor safety record.

Our project *Value in Project Delivery Systems: facilitating a change in culture* has been developed into a series of learning modules to be delivered to industry and government groups. Given the increased use of relationship-based contracting and the emergence of Public-Private Partnerships (PPPs), the relevance of these learning modules is significant. This *Construction Innovation*-developed learning resource will form part of the Queensland University of Technology's Master of Project Management and be integrated into the international offering of QUT's Project Management Academy with Shell. This progression of applied research carried out through our partner network developed into local, regional and international cutting-edge skill development is an excellent example of this CRC's pragmatic approach to industry development.

Performance measures


news

Culture change project >>

By Dr Keith Hampson, CEO for the Cooperative Research Centre for Construction Innovation

CRC Construction Innovation

BUILDING OUR FUTURE

From Building Australia, *July/August 2005*

2004–05

In addition to the input to national policy development prompted by the CRC's sustainability project 2001-013-B, the QDMR has now estimated that implementation of research outputs from 2001-010-C *Investment Decision Framework for Infrastructure Asset Management* [Kumar, RMIT] will provide them with improvement to Queensland network management valued at almost $4 million on state-wide data collections costs.

The implementation of *eValuBuild* in QDPW has delivered significant benefit to their portfolio management. It is expected that the ongoing refinement of *eValuBuild* in practice will provide further benefits to QDPW. The potential application to other private and public portfolio managers is currently being evaluated.

The implementation of *LCADesign* (2001-006-B [Tucker, CSIRO]), DesignCheck (2004-011-B [Ding CSIRO]) and *Automated Estimator* (2001-006-C [Drogemuller CSIRO]) is being carried out by Bovis Lend Lease, QDPW, Woods Bagot, BCC, NSW Department of Commerce and Arup. Early indications are that the *LCADesign* tool significantly eases the labour-intensive process of calculating the environmental costs of the materials of construction. The automated process of this CRC-developed eco-efficiency assessment tool revolutionises the ability of designers to make earlier and more informed decisions on the environmental impact of commercial buildings. It meets a growing need for designers and regulators to make real-time appraisal of design performance of built assets against an emerging set of sustainability criteria. Negotiations with international developers have confirmed the international value and uniqueness of *LCADesign*, and it is predicted that this tool will provide *Construction Innovation* with a focus for commercialisation in this next period.

DesignCheck, currently validated on the disability access code, has provided clear indications that a broader application across other design codes will provide significant industry benefit — especially in the context of increasingly pressured planning environments at a local and state government level.

Automated Estimator provides the capability to determine the volumes and material quantities of a variety of constructed shapes that underpin the automated quantity capabilities in an advanced software system that has significant potential internationally.

Project Diagnostics (2002-0502-C [Tsoukas, Arup]) has been the subject of commercialisation negotiations with Arup throughout the latter part of 2004–05. Its ongoing development has been made possible by additional support from both CRC and Arup as licence conditions are finalised.

Pre 1 July 2004

Outcomes of *Construction Innovation* projects emerged in 2003–04 with the successful trialling of several technologies and management systems within participant organisations, including the Queensland Departments of Main Roads and Public Works. In particular, the Australian Building Codes Board adopted sustainability as a theme for the future Building Code of Australia, thus shaping national industry practice.

4. Increase national and international collaborations

2005–06

This CRC been provided with significant benefits thanks to the foundation laid throughout it's history in linking closely with industry associations. *Construction Innovation* has continued to provide industry diffusion activities through ACIF partners and others. Throughout this year this CRC's reports to industry have been co-branded and/or launched in conjunction with significant national industry associations. In particular, the relationships with the AIB, PCA, AIPM, UDIA, FMA and RAIA have been enhanced.

International collaborations and repute by international industry development groups has also increased. *Construction Innovation's* Board Chair serves on the international Board of the CIB — the International Council for Research and Innovation in Building and Construction. Our CRC is recognised internationally as a leader in servicing the challenging fragmented construction sector. International researchers from our ICALL partners have added value to our private and public participants through collaborations and personal visits in sustainability, ICT and industry development. This international network provides CRC partners and the Australian industry with direct access to the world's construction research leaders. Additionally, our Development Manager's leadership of the IAI's international group's education and training strategy coupled with our ICT products has provided Australian research with an unparalleled access to global leaders. For example our CRC was invited to present at the annual Bentley Technical Advisory Committee held in Munich in April 2006.

The international collaborations have led to commercial application of CRC products in The Netherlands and ongoing trails in Norway, Finland and USA.

2004–05

National collaborations have continued to grow significantly this past period — with industry associations, particularly those members of ACIF. For example, *Construction Innovation* has convened industry workshops and breakfast sessions with the Facility Management Association, Property Council of Australia, Engineers Australia, Royal Australian Institute of Architects, Master Builders Australia, Air Conditioners and Mechanical Contractor's Association of Australia and Urban Development Institute of Australia. This strategy of linking with existing industry association networks ensures that the CRC investment in the development of research outcomes is readily disseminated to the Australian industry. The relationships underlying this successful partnering with industry associations has largely leveraged from the relationships developed through the *Construction 2020* initiative throughout 2003–04.

International recognition and reference to the CRC by international research and industry development groups has also increased. *Construction Innovation* is highly regarded nationally and internationally among leading industry and research organisations. *Construction Innovation* is represented on the Australasian Board of the International

Alliance for Interoperability (IAI) where our Business Manager now coordinates the international group's education and training strategy.

As *Construction Innovation* develops its commercialisation activities for specific projects, the international collaborations are increasing. The existing international relationships with our ICALL partners have opened the door to targeted potential business associates. For example, negotiations are currently underway for undertaking implementation trials of CRC products in Norway, Finland, Netherlands and Italy.

Pre 1 July 2004

During this period education/training and technology transfer programs were developed, and included collaboration with several industry groups such as Construction Training Queensland, Green Building Council, Master Builders Association and the International Alliance for Interoperability.

National collaboration experienced exponential growth through the *Construction 2020* initiative and Education Reference group. International visitors and reference to the CRC by international research and industry development groups also increased, contributing to international exposure and input to research projects, research management and strategic activities.

5. Increase in industry innovations and shifts in the knowledge base

2005–06

Construction Innovation has unquestionably developed a high profile in our industry. The BRITE project has continued to *lead the way* with industry publications showcasing industry innovations. From a national survey, this project has also estimated the proportion of industry innovators who are aware of our CRC's activities as 30 per cent. This group of innovators may also contribute to the increasing number of *hits* on *Construction Innovation's* website — downloading case studies and reports at a rate that is now almost ten times the monthly hit rate one year ago. Again, industry feedback has confirmed the BRITE project as most valuable for engaging with the SME's that dominate our industry.

Construction Innovation's partnership with the FMA in delivering the Sydney Opera House industry seminars (contributing to the Facilities Management Action Agenda) provide another practical example of this CRC's contribution to enhancing the knowledge base. Already, the digital modelling component of this project has contributed to the ongoing development of the Sydney Opera House's 3D modelling architecture and created significant industry interest in a broader application of this technology — particularly lending value to the integrated design/construction/FM whole-of-life digital model.

2004-05

The BRITE Project (2001-012-A [Manley, QUT]) has extended its innovation case study program and a national innovation survey investigating the industry's innovation performance. The project's activities have demonstrably increased awareness of the benefits of innovation in the industry. Over 7000 case study booklets have been distributed through industry associations and industry events, and over 50 articles have appeared in industry magazines, reaching an estimated 1.8 million readers. This project is a particularly relevant mechanism for engaging with the SME sector that dominates the Australian construction industry.

The *Culture Project* (2002-2022-A [Rowlinson, QUT]) has developed an education toolkit to up skill client, designer and contractor teams for improved integration in delivery through relationship-based contracts. This project outcome will provide CRC participants, the Australian industry and potentially the international project management community with improved approaches to delivering value in the operation of delivery teams.

Team Collaboration in High Bandwidth Environments (2002-024-B [Maher, US]) provides a future context to the project contributions from geographically dispersed participants via the medium of high bandwidth collaboration tools. The industry partners' interest on this project has engendered more appreciation of the significant potential of real-time multi-disciplinary collaboration and complemented our CRC's drive to enhance the knowledge base of our industry in applications of advanced ICT for business improvement.

Pre 1 July 2004

The BRITE project has undertaken a national innovation case study program, and in early 2004, a national innovation survey investigating the industry's innovation performance. The project's activities demonstrability increased awareness of the benefits of innovation in the industry, via the distribution of case study booklets and articles in industry magazines.

6. Increased recognition of the CRC's contribution to improved standards of design and construction

2005–06

Standards Australia has recognised the CRC project *Decision-Support Tools for Concrete Infrastructure Rehabilitation* as providing a necessary set of industry guidelines for practitioners' use. A technical manual is being produced by Standards Australia based on this project outcome to be co-badged, and with sales income to be shared by both organisations.

Construction Innovation's extensive industry collaborations in developing improved functionality of building information modelling have resulted in enhanced industry uptake of this tool. Studies in the United States have indicated building information modelling will allow improved design, team collaboration, construction bidding, planning and execution and real owner value at all stages of the life cycle.

2004–05

Leveraging off earlier work in 3D CAD technology modelling complex building designs, *Construction Innovation*'s tools focus on the objects within 3D CAD models; these encapsulate information about elements. By using *objects*, the 3D CAD model allows packaging of information, relationships to be defined and automated generation of plans, sections etc. from an internal 3D model. *LCADesign, Automatic Estimator, DesignCheck* and *Automatic Scheduler* are now being trialled by designers in their workplace and using industry partner's own building models.

A prototype decision support tool (Project 2002-005-C [Setunge, RMIT] *Decision Support Tools for Concrete Infrastructure*) has been developed to enable asset managers of concrete infrastructure select the most suitable technique for rehabilitating aging concrete structures using Fibre Reinforced Polymer (FRP) composites. The decision support tool assesses the extension of economic life in compliance with the current design philosophy of the Australian Concrete Structures Code. This approach has facilitated the transfer of knowledge from previously fragmented technical research and added a whole-of-life value concept suitable for asset managers. The unique tool developed is suitable for decision making in rehabilitation of structures under different scenarios.

Finally, 2002-063-B *Sustainable Subdivisions: Energy Efficient Design* [Ambrose, CSIRO] has investigated the energy-efficiency demands of dwellings from a subdivision view point as well as that from an individual dwelling. It has highlighted challenges on the national housing industry with release of new energy codes. The project team has produced a report to industry booklet that will be widely dissemination to industry. These research outcomes have the ability to fundamentally influence the standard of design of our subdivisions.

Performance measures

Pre 1 July 2004

The ABCB's adoption of the CRC *Construction Innovation* project recommendations, including sustainability as the theme for the Future Building Code of Australia, is clear indication of the ability of the CRC to directly contribute to improved standards of design. *Construction Innovation* also contributed to the development of the IAI project on Reinforced Concrete Structures and Foundation Structures.

7. Contribution by CRC participants in developing public policy initiatives

2005–06

Construction Innovation continues to make a recognisable contribution in developing public policy initiative — through its participant policy makers in QDPW, QDMR, QDSDTI, ABCB, Building Commission (Victoria) and BCC. Our CRC has made public policy comment to a draft Brisbane Economic Development Plan and the House of Representatives Standing Committee on Environment and Heritage Inquiry into a Sustainability Charter. Additionally the ABCB is moving to more complete adoption of sustainability provisions in the new Building Code of Australia. The study recommended to the ABCB the need to include sustainability requirements in the BCA. It demonstrated the need to control and regulate sustainability along with the methods available to control and regulate it.

The industry-led *Construction Site Safety Culture Project* is delivering a national industry safety management system developed in collaboration with employers and employees and leading firms across the industry. This project has the public support of the Australian Safety and Compensation Council and the Federal Safety Commissioner, and is being launched by the Minister for Employment and Workplace Relations, the Hon Kevin Andrews in September 2006.

2004–05

Public policy makers in QDPW, QDMR, QDSDI, ABCB, Building Commission (Victoria) and BCC continue to actively seek input from Construction Innovation to develop evidence-based policy.

One significant input to developing public policy initiated by this CRC is the formation of the ASBEC. ASBEC is a significant player in the sustainable built environment agenda in this country, through its positioning as the peak organisation dealing with the Australian Government. For example, the AGO negotiated through ASBEC in its substantial support for the development of an integrated internet-based knowledge portal to drive sustainability in commercial building ownership, construction and operation. The CRC's Your Building Project has evolved from this successful relationship between ASBEC, Construction Innovation and the AGO.

2004-032-A [Brown, QUT] Construction Industry Business Environment Project is undertaking a comparative analysis of the context and content of regulations and policies affecting the construction industry in Australia. The analysis will highlight the implications of the CRC for Construction Innovation's research on the regulatory and policy framework. It will conduct five themed case studies in order to explore the regulatory relationships between jurisdictions, and identify barriers and enablers for coherent policy-making and productivity gains. The five themed case studies are in the areas of: training and capability for the construction industry; occupational health and safety; eBusiness (and related ICT implications for construction, including 3D CAD and e-tendering); procurement (including supply chain, risk mitigation, tendering, and contractual arrangements); and environmental sustainability (particularly related to either energy or water).

Finally, the industry-led project team — 2003-050-A [Cipolla, John Holland] Construction Site Safety Culture — is conducting research in safety management in construction sites in each of the metropolitan centres of Australia. The project will produce a national Safety Management System establishing the competencies, skills, knowledge attitudes, behaviours and norms for safety-critical positions that can be applied to all construction organisations, irrespective of size, with the ultimate goal of improving the industry's overall performance and safety culture. The outcomes from this industry-led project will have a direct influence on public policy across Australia.

Pre 1 July 2004

Public Policy makers in QDPW, QDMR, QDSDTI, ABCB, Building Commission (Victoria) and Brisbane City Council actively sought input from *Construction Innovation* projects to develop evidence-based policy. One significant input to developing public policy initiated by this CRC is the formation of the Australian Sustainable Built Environment Council (ASBEC). *Construction Innovation* also worked with the Queensland Government on projects focused on road maintenance and traffic noise management in urban environments.

8. Strength of collaboration achieved in research development between researchers and industry

2005–06

The previous mention of in-kind support clearly indicates strength of collaboration between researchers and industry exceeding that initially projected. The industry leadership of *Construction Innovation's* Research Committee and Board has ensured the direct industry input to this CRC's activities. As in previous years, the bottom-down, top-up approach continues to encourage research engagement.

2004–05

Collaboration remains a hallmark of *Construction Innovation* — from Governing Board to Research Committee to Program and Project Workshops. Construction Innovation research evolves in two ways. Firstly, through a development process between research users and researchers for submission to the Research Committee for their consideration. Typically, this path involves a series of workshops and meetings as the research proposal progresses through the CRC's research management process. Secondly, the industry Board members also identify particular areas for research focus. Subsequently a project team is developed to detail the proposal for consideration at Research Committee level. This bottom-up and top-down approach has a good record of research user engagement with *Construction Innovation*'s researchers.

Prior to 1 July 2004

Collaboration is a hallmark of this CRC — from Governing Board to Research Committee to Program and Project Workshops — and the range of industry and government participants who drive collaboration around the supply chain and nationally exemplifies this. This has been achieved in an industry renowned for its cynicism of research.

9. External recognition of CRC for *Construction Innovation* as a leader in collaborative and innovative research in Australia

2005–06

Industry feedback can be summarised by international conference keynote speaker Professor Peter Brandon, '*the content was some of the best I have heard anywhere. In many ways this was a watershed event with 3D now firmly in the commercial domain and virtual prototyping now poised to take off. The quality of the presentations was tremendous and I heard nothing but excellent reports… To get that balanced representation (between academic and industry) was almost unique…'.*

Our CRC's Board Chair's service on the CIB International Board provides a basis for global comparison of this CRC's leadership in collaborative and innovative research. *'The leadership demonstrated by the CRC for Construction Innovation has represented an exceptional milestone in the global focus of research and development in the built environment … (your) leadership provided in areas including industry development, sustainability and facilities management is without questions a leading contribution from across all CIB members'* (Dr Rodney Milford, CIB President).

Contrary to the trend of other CRC's participation at this mature stage of our life, *Construction Innovation* has been successful in securing additional, core participants. For example, in May 2006 our CRC was launched officially in Western Australia, embracing the Western Australian Government and Curtin University of Technology. The Western Australian Government views our CRC as servicing their Five Year Whole of Government Works Reform Agenda. This provides a practical example of our national industry's recognition of *Construction Innovation* as a national leader in innovation.

2004–05

The known 86 *hits* on the national and regional newspapers, radio and industry magazines confirm the growing acceptance of *Construction Innovation* as a leader of collaborative research in Australia. With over 50 industry association magazine articles being published each year on the BRITE Project, over 1.8 million readers have already been introduced to the industry learnings provided by this project alone, over its life time. Indeed an extensive survey of the Australian industry has confirmed that 20 percent of the industry is aware of the applied research activities of this CRC. These firms are leading industry innovators, and are characterised as being more innovative than firms not familiar with the CRC.

Additionally, the national leadership of Construction Innovation in its sustainability and facilities management activities has been highlighted this past year in two most significant ways. The launch in April at The Sydney Opera House of our CRC's *FM Exemplar Project* by Warren Entsch, assisting the Minister for Industry, and the Your Building Project launched in June in Parliament House by Minister for Environment and Heritage Senator Ian Campbell confirms our CRC's leadership in collaborative and innovative research in Australia.

Prior to 1 July 2004

The increasing number of mentions in national and regional newspapers, radio and industry magazines confirmed the growing acceptance of *Construction Innovation* as a leader of collaborative innovation research in Australia. An extensive survey of the Australian industry also confirmed 20 per cent of leading industry innovators are aware of the applied research activities of this CRC.

L to R John McCarthy (CRC Construction Innovation), Michelle Roberts MP (West Australian Minister for Housing and Works) and Keith Hampson (CRC Construction Innovation) at the West Australian launch in May 2006

Performance measures

Education and Training

1. Uptake of *Construction Innovation* inputs to curriculum

2005–06

A significant number of courses incorporating *Construction Innovation* research were added into university curricula in this reporting period, as evidenced on page 39. Specifically, research outcomes for the BRITE project have been incorporated into courses at QUT, UWS, University of Newcastle, and RMIT. One final example highlights the importance of promoting building information modelling in the university curriculum for future project managers and designers. The *eLearning Modules for Building Construction* and *IT Enabled Business Strategies* will provide current industry case studies for a major international education project with the IAI — as well as forming a component of our universities' undergraduate and graduate curricula.

2004–05

The number of courses incorporating *Construction Innovation* research input has increased markedly in the reporting period, as evidenced on page 38. Each of our University participants has been active in promoting the CRC research outcomes into their curriculum development.

Prior to 1 July 2004

The uptake of *Construction Innovation* inputs into university curricula increased markedly during this period.

2. Co-supervision of students by industry partners

2005–06

The number of research training scholarships across our university network has increased, with 25 scholars being sourced by industry participants to date. With each scholar *Construction Innovation* seeks a complementary industry partner to act as Associate Supervisor for the student's program of study. Additional scholarships in 2005-06 have been funded by Brisbane City Council and John Holland.

2004–05

11 PhD and 3 Masters scholars have industry partner supervisors, with the remaining PhD scholar having supervision from a government department relevant to his area of research. This model is ensuring highly relevant scholar outcomes.

Prior to 1 July 2004

All PhD and Masters scholars had industry supervisors or direct contact with industry in their areas of research.

3. Uptake of *Construction Innovation* Research Scholarships by quality candidates

2005–06

The new scholars we welcomed into the scheme in 2005–06 were all industry experienced candidates with significant understanding of the 'real-world' needs our industry. In one case the industry partner (Brisbane City Council) has provided the research scholarship funds to support the PhD research of Judy Kraatz, an experienced and capable industry consultant.

2004–05

Three new scholars joined *Construction Innovation* in the reporting period; 2 PhD and 1 Masters by Research. These scholars join the 11 other quality candidates currently enjoying the benefits of *Construction Innovation* support. These candidates benefit from significant industry training opportunities in addition to the premium Construction Innovation scholarship stipend and research support. Section 6 details the focus of their endeavours and provides feedback on their experience as *Construction Innovation* scholars.

Prior to 1 July 2004

Nineteen scholarships were made available during the 2001–2004 periods.

4. Growth in numbers of industry users involved in research training

2005–06

Construction Innovation has advanced the number of research training scholarships available across our university network. Each scholar also has an industry partner, sourced by *Construction Innovation*, to act as Associate Supervisor for their program of study. In 2005-06, additional scholarships have been funded by Brisbane City Council (*Critical Success Factors in Delivering Relationship Based Facilities: A Multilevel Perspective*, Judy Kraatz, supervised by Stephen Kajewski, School of Urban Development, QUT and co-supervised by David Stewart, Executive Manager, Major Infrastructure Projects, BCC); and John Holland (*Safety Culture in the Construction Industry*, Brett Mayze, supervised by Lisa Bradley, School of Management, QUT and co-supervised by Dean Cipolla, National Safety Manager, John Holland).

To date ten of our 25 scholars have been sourced by industry participants. One additional scholarship will be made to Curtin University, with an appropriate industry co-supervisor this next period. A developing trend embraced by our industry partners is for the increasing use of embedded researchers — where the student is physically co-located with the industry partners for a substantial duration during their research. This practice encourages stronger linking between the participant and student and fosters long-lasting personal, organisational and industry benefits.

2004–05

Ten additional scholarships will be made available commencing August 2004 through to October 2004. Four of our scholars come from our industry partners, two from QDPW, one from QDMR and one from QDSDI. The new Masters by Research scholar comes from our industry partner Arup.

Prior to 1 July 2004

Scholars came from industry partners and the Queensland Government.

5. Number of alliances delivering *Construction Innovation* research outputs to industry

2005–06

Industry alliances continue to be an important element of our strategy to deliver research outputs to industry. Throughout 2005–06, breakfasts, seminars, in-house training programs and public seminars in partnership with the leading industry associations have been successfully delivered.

2004–05

Project outcomes continue to be delivered to industry via industry seminars and conferences, in-house briefing sessions, curriculum development and industry workshops. Organisations like ACIF and AIPM and the IAI have partnered with the CRC for *Construction Innovation* to deliver these outcomes to industry. Specifically, four industry

breakfasts and three industry forums have been conducted in collaboration with the Environment Institute of Australia and New Zealand, AIPM, Government Asset Management Arena (GAMA), IAI, Brisbane City Council, Queensland University of Technology, Building Designers Association, DEM, ACA, RAIA, Facility Management Association of Australia, Property Council of Australia and Urban Development Institute of Australia.

Prior to 1 July 2004

Project outcomes were delivered to industry via industry seminars and conferences, in-house briefing sessions, curriculum development and industry workshops and partners included the ACIF, AIPM and the IAI.

6. Growth in value of research training sponsorship awarded by government and industry for research and/or study related to CRC projects

2005–06

Four of our scholars now receive top-up funding from government and industry participants. In many cases this allows mature and experienced professionals to undertake advanced study within our participant universities that they may not previously have had the opportunity to do.

2004–05

Two of the scholars receive top-up salaries during the period of their scholarship, with one receiving top-up from an industry partner with the other receiving funding from *Construction Innovation* to complement her University of Sydney Postgraduate Award. Through 2005–06 additional top-up funding from *Construction Innovation* for existing postgraduate students in our university network will be provided. A limitation exists on the availability of appropriate students and supervisory staff for more significant growth of research students in this sector.

Prior to 1 July 2004

Twelve scholarships worth $30,000 a year were granted with some scholars receiving top-up salaries from their employers during the period of the scholarship.

External Communication

1. Press releases raising profile of *Construction Innovation* and its partners in the promotion of collaboration and innovation

2005–06

Nine media releases were distributed to specialist and general media, and one television and one radio interview was conducted. Networking with our partner and industry association communication network has continued to provide significant media coverage in mainstream and specialist media.

2004–05

10 press releases were distributed to specialist and general media, 3 radio interviews were conducted. In addition, the networking with our partner and industry association communication network has provided significant media coverage of the research and industry dissemination activities of our Centre. Throughout early 2005 the marketing of our upcoming *Clients Driving Innovation: Moving Ideas into Practice* International Conference has seen a significant increase in the profiling of our CRC to the world. For example, an internal national/international database of 4,000 contacts, coupled with Construction Network for Building Researchers (CNBR) has provided access to a further 3,000 individuals globally. The CRC's networking with industry associations and other organisations such as CIB have promoted our CRC and upcoming conference to a very large global audience.

Prior to 1 July 2004

Various media activities were undertaken resulting in press articles and radio interviews.

2. Growth in impact of publications recognised as key by industry and academic partners

2005–06

2005–06 has seen a significant growth in impact of our publications with over 20 booklets and/or research reports completed by *Construction Innovation.* Involvement by senior industry leaders at key industry events has been encouraged. For example, Bill Wild, former MD John Holland, launched our CRC's *Clients Driving Construction Innovation: Mapping the Terrain* book (Brown, Hampson and Brandon eds, 2005) at the Australian Institute of Project Management National Conference in Melbourne in October 2005. Additionally our CRC's Research Library readily provides industry with internet access to our completed industry relevant reports. The growth in web hits this past 12 months and the downloading of our industry report confirms the interest in our CRC's outputs. In this next period a number of ministerial launches at major industry events will be realised including the launch of the research outcome booklet, *Construction Safety Framework: Improving OH&S performance by creating and maintaining a safety culture,* by Minister for Employment and Workplace Relations, the Hon. Kevin Andrews.

Bill Wild, former Managing Director John Holland, launching Client's Driving Innovation: Mapping the Terrain *in Melbourne in October 2005.*

Photo by EventPix

Performance measures

2004–05

Leveraging off the *Construction 2020 (C2020)* success through last period, our CRC has been recognised as a leader internationally in its industry development role. Enquiries continue to be received from policy analysts and researchers alike as to the methodology and impact of C2020 on the Australian industry (to be elaborated further this next period as *Construction Innovation* moves down a renewal path strongly supported by the extensive industry consultations underpinning the C2020 initiative). The impressive list of books and refereed journals detailed in Section 9 is testimony to the growth in influential publication through this CRC.

Prior to 1 July 2004

Publications during this time were recognised as international references focusing on innovative futures in construction.

3. Numbers of papers presented to national and international conferences and promotional activities

2005–06

14 refereed papers and 6 conference papers were delivered to international conferences. 20 refereed papers and 28 conference papers were delivered to national conferences.

2004–05

55 refereed papers, 23 conference papers and 4 keynote presentations were delivered to international conferences. 10 refereed papers, 5 conference papers and 4 keynote presentations were delivered to national conferences. This level of international activity highlights *Construction Innovation's* increasingly international profile.

Prior to 1 July 2004

41 refereed papers were presented at international and national conferences.

4. Number of presentations to partners, industry and community groups

2005–06

An extensive national program of presentations to partners, industry and community groups have continued throughout 2005–06, with over 105 presentations conducted. *Construction Innovation* is invited to the major industry association events and contributes regularly to our partners' internal presentations and workshops. Additionally our CRC has contributed a number of formal submissions to government and community groups relating to sustainability, industry skilling and infrastructure development.

CRC is widely recognised throughout industry as being the central R&D service provider in our industry and is sought after by industry associations to deliver informative content to their members at national and international conferences.

2004–05

125 presentations of significance were conducted throughout Australia in 2004–05. These are formal presentations to an audience of a number of individuals.

Prior to 1 July 2004

Over 150 presentations of significance were made.

Commercialisation

1. Diffusion activities undertaken by CRC audience indicated by number of project-initiated seminars and workshops

2005–06

39 project-initiated seminars/workshops throughout Australia were undertaken promoting the outcomes of 12 projects.

2004–05

38 project-initiated seminars/workshops throughout Australia were undertaken promoting the outcomes of 13 projects.

Prior to 1 July 2004

A number of project-initiated seminars and workshops were held by a range of projects.

2. Invitations as keynote speaker to industry conferences, seminars, etc

2005–06

3 keynote presentations were delivered by CRC for *Construction Innovation* researchers nationally and internationally.

2004–05

8 keynote presentations were delivered by CRC for *Construction Innovation* researchers nationally and internationally.

Prior to 1 July 2004

Researchers from numerous *Construction Innovation* projects were invited to present as keynote speakers.

3. Increase in participation in industry, trade and academic conferences

2005–06

Construction Innovation was represented in 15 international and 18 state or national conferences.

2004–05

Construction Innovation was represented in 30 international and 11 state or national conferences.

Prior to 1 July 2004

Construction Innovation was represented in 70 industry and trade conferences.

4. Increase in publications for industry users

2005–06

Construction Innovation has developed 12 industry-focussed project brochures, including the next six in the BRITE Project innovation case studies series. These brochures are all available on the web and are also distributed via industry mail outs, our industry association networks and through personal distribution at conferences and industry meetings.

2004–05

Construction Innovation has developed 15 industry-focussed project brochures (including 6 for the *BRITE* Project) highlighting the major research outcomes and industry benefits from projects that have developed industry tools and management systems. These brochures are distributed via industry mail outs — particularly through our industry association networks and through personal distribution at conferences and industry meetings. This next period will see a dramatic increase in the Reports to Industry — industry-focussed reports developed from the CRC's research outcomes. Additionally, a significant increase in journal and conference papers jointly authors between industry and researchers have provided evidence of the increasing industry user engagement in *Construction Innovation*'s publication record.

Prior to 1 July 2004

CRC members had access to the CRC intranet and project related websites. They also received regular newsletters, bulletins, industry booklets and brochures.

5. Increase in number of media clippings/ appearances

2005–06

Over 50 media hits in the form of magazine, newspaper articles and press releases, radio and television were recorded for 2005–06.

2004–05

86 known media hits in the form of magazine, newspaper articles and press releases (including three radio interviews and international TV coverage) were recorded for 2004–05. ABC Asia–Pacific TV ran a special article on *Project Diagnostics* on the Nexus program screening to more than 20 countries across the region.

Prior to 1 July 2004

The number of media hits in the form of magazine and newspaper articles and press releases significantly increased over each reporting period.

6. Growth in income and industry uptake from commercialisation of IP

2005–06

In the last period this CRC has seen considerable growth and industry update from commercialisation of IP. In particular:

BRITE Project — Stem Partnership concluded its evaluation of BRITE Phase 1 with the results showing a significant and positive impact on industry attitudes. Our partners through QDMR and QDPH have indicated the BRITE project has influenced changes in their business process to include innovation as criteria in the design of procurement systems and the selection of appropriate contractors and consultants.

eBusiness Legal and Security — QDPW and BCC have benefited from an evaluation of their electronic tendering system against the technical and legal guidelines for electronic tendering developed by the CRC. Legal staff at QDPW and BCC have expressed a high interest in the work to date and have considered the findings and the implications on their respective systems. The work is providing a validation, benchmarking and information update for the partners including QDMR in its current phase of scoping an eTender system.

Construction Site Safety Culture — The project has provided a clear cut objective from the results/surveys has helped JHG and BLL to focus on the problems and implement appropriate training and measure improvements. The project has also started a cultural change including at the Australian Constructors Association board level.

Road Asset Management — The research into design of stochastic sampling methods for road data collection has enabled pavement strength data survey to proceed in Queensland over approximately 50 per cent of the National Highway System at a cost of $150,000 million; a saving of approximately $450,000 or saving of 75 per cent of previous costs. The non tangible benefits are we are collecting four times more data for the same amount of money.

Analysis tools for Building Information Models (IFC) — Industry partners have had the opportunity to trial five IFC compliant analysis tools providing insights into the virtual environment of testing design before construction for environmental impact, cost, code compliance, scheduling and specification generation before these technologies are available and used by the mainstream. This has provided the industry partners with valuable knowledge of capability of the tools, and in one case provided the industry partner with a competitive edge in order to win a project.

On-line Collaboration Tools — A series of case studies for John Holland provided for them ten critical success factors for the effective operation of an on-line collaboration tool like inCITE. The ten factors have been progressively been implemented with a positive effect on the usefulness of the tool.

Facilities Management — The *Sydney Opera House Exemplar Project* based on facilities management process has provided Rider Hunt with the ability to apply the knowledge, processes and tools developed during the life of the project to implement new and innovative services for their clients. The Sydney Opera House has been able to employ knowledge, processes and tools developed to increase the effectiveness of their FM Services portfolio, contribute to the development of the new 25 year strategic asset management plan, provided a new model for the on-going procurement of design works to the current refurbishment/upgrade program and insights into the strategic decision making on BIM and the FM tools and systems to be implemented in the future.

'Facilities management impacts on every sector in the Australian economy, yet owing to the breadth and infancy of the industry it can be difficult to demonstrate its contribution. [The Sydney Opera House Facility Management (FM) Exemplar Project] provides the basis under which we can practically articulate the recommendations of the FM Action Agenda and produce tools and road maps for the effective implementation of many of the specific actions.' **Stephen Ballesty**, Chairman of the Facility Management Association of Australia


024

FM Oct/Nov 05 Sydney opera house goes digital (P 24-25)

STRATEGIES IN FM

SYDNEY OPERA HOUSE GOES DIGITAL

Courtesy: ARUP & Johnson Pilton Walker JPW
Copyright: Sydney Opera House

From FM Magazine, *October/November 2005*

Performance measures

2004–05

A number of our partners have had significant financial benefits though the improvement of internal processes. For example, Queensland Department of Main Roads has the opportunity to save almost $4 million on data collections costs on their testing of the extensive Queensland main roads network through the application of the *Infrastructure Asset Management* Project; Queensland Department of Public Works is better able to manage its property portfolio through the application of *eValuBuild*; John Holland is refining its approach to relationship-based contracting through its application of learning outcomes from the *Culture* Project. Negotiations are currently underway on a number of fronts to apply *Construction Innovation* tools and methodologies for commercial application both nationally and internationally.

Prior to 1 July 2004

No income was received directly by the CRC from commercialisation of Intellectual Property, however many of our partners had significant financial benefits though the improvement of internal processes.

Administration

1. Satisfaction of participant and Commonwealth with financial and research management systems

2005–06

The Executive Report Card process and ongoing informal feedback mechanisms continue to demonstrate satisfaction with the CRC's financial and research management systems. The Fifth Year Review was very positive, stating *'(This CRC) has achieved a considerable amount of success in the past four years and it is encouraging to see the level of support from partners and from the industry as a whole. There is a growing sensitivity to research and a recognition that a culture of self improvement through innovation is necessary for property and construction to remain competitive and further address the needs of the range of communities it serves … The CRC CI is well organised and now faces a challenge to manage and drive the research it has commissioned to further meet its objectives and the deliverables it has set.*'

The audit signoff achieved from the 2005–06 accounts also verifies the rigour of *Construction Innovation*'s financial and research management systems.

2004–05

The Executive Report Card process and ongoing informal feedback mechanisms continue to demonstrate satisfaction with the CRC's financial and research management systems. The voluntary Third Year Review was most positive, stating '*The Panel is pleased to report that cost control on research projects appears to be excellent with good discipline engendered across Programs. There also appears to be an acceptable level of tension between research teams and general management over the allocation of monies for research projects, associated payments as well as variations in scope.*'

Additionally, the audit signoff achieved from the 2004–05 accounts verifies the rigour of *Construction Innovation*'s financial and research management systems.

Prior to 1 July 2004

The CRC initiated a formal rigorous reporting and feedback process highlighting areas of particular interest to each participant via the Executive Report Card. This process demonstrated satisfaction with the financial and research management systems.

2. Effective Centre operations across all Commonwealth programs

2005–06

The Governing Board has again expressed confidence in the established systems contributing across all Commonwealth programmes. The CRC community acknowledges that *Construction Innovation* is well managed and successfully engaging with industry partners in an industry environment that has previously had limited interaction with the research fraternity.

2004–05

The Governing Board has expressed confidence in the established systems contributing across all Commonwealth programmes. *Construction Innovation* is acknowledged within the CRC community as being well managed and successfully engaging with industry partners in an industry environment that has limited interaction with the research fraternity.

Prior to 1 July 2004

The Executive Report Card process demonstrated satisfaction with the financial and research management systems. The Governing Board also expressed confidence in the established systems.

3. Collaborative transactions with industry or government partners, including research projects

2005–06

Again, *Construction Innovation* has distinguished itself as being a highly collaborative CRC. Our interfaces with industry and government participants and industry associations (e.g. sourcing of students and scholarship funding, internal training programs, joint presentations at national and international conferences, jointly authored industry and academic journal publications, fresh project support, and the energetic response regarding our rejection of CRC funding in May 2006) stand testimony to *Construction Innovation's* extensive collaborative transactions with industry and government.

2004–05

Construction Innovation has distinguished itself as being a highly collaborative CRC. Its effective transactions with industry and Government partners on research projects, education and training projects, and developing commercialisation activities, together with external communication have facilitated new and valuable relationships that will provide ongoing benefit for industry development. For example, the growing strength of *Construction Innovation* membership evidenced by increasing numbers of research user partners and CRC income demonstrates the value of the collaborative transactions.

Prior to 1 July 2004

A number of projects commenced, including some with business associates such as the Construction Training Queensland, Australian Construction Industry Forum and Queensland Department of Housing. In addition, we engaged further the Property Council of Australia, and the Property Services Training Australia.

4. Growth in number of additional collaborations annually, particularly with industry

2005–06

A number of our projects have produced software that complements existing CAD software. We have been actively seeking interest from the three international CAD developers and have strong interest from two Australian companies to take two of our tools to market. We are also actively engaged with a northern European group who are validating our technology for the purposes of a web-based business model:

- *DesignCheck* and *LCADesign* and the *Life Cycle Inventory* database continue to be of interest to two Australian companies, with discussions developing the terms for a Licence Agreement for *DesignCheck*. The interested companies are proposing to take these two products to the Australian market as a precursor to the international market place.
- *Automated Estimator* is also sparking commercial interest and although no formal commitment has been received by the CRC as yet, industry trials are underway.
- *Automated Scheduler* has been the focus of early discussions with two Australian software companies interested in a commercial arrangement.
- *DesignSpec*, the latest ICT tool is an auto generating specification tool that interfaces with a BIM. While *DesignSpec* is of interest to a number of specification companies it is too early to identify a particular commercial partner to work with.
- *Your Building* is being eagerly anticipated by industry as the web-portal will operate as an actively updated knowledge bank about the ownership, design, construction, occupation, and operation of sustainable commercial buildings. It will consolidate available knowledge on sustainable buildings and provide links to leading organisations and reference material; and through case studies and research findings it will demonstrate the economic, environmental and social benefits of creating sustainable buildings, and provide up-to-date information on ratings systems and performance measurement.

2004–05

As *Construction Innovation* matures and its reputation spreads, the relationships developed with industry affiliates has also strengthened. For example, a number of third party engagements in projects has developed. Throughout 2004–05 where non-partner organisations have recognised the value of collaboration with our CRC. Specifically, engagement by Environment Australia and the Australian Greenhouse Office in our sustainability research; Queensland Building Industry Redundancy Trust and the Office of the Australian Safety and Compensation Council, together with the ACTU on our OH&S Project Reference Group; NSW Department of Commerce in trialling the CRC-developed green calculator *LCADesign*, and Queensland Department of Premier and Trade as part of our Internationalisation of *Construction Industry Design Firms* Project. More recently, the Sydney Opera House and Transfield Services Australia have joined our CRC's *Sydney Opera House FM Exemplar* Project as direct recognition of the value of enduser engagement in our research initiatives. The City of Melbourne is also a fresh industry clients building a productive relationship with our CRC.

Prior to 1 July 2004

Collaborations were undertaken with peak industry and regulatory groups.

5. Growth in repeat collaborations with partners on projects and related activities

2005–06

Again, the growth in repeat collaborations with partners and related activities is strong. Throughout 2005–06 the research user network increased by two core participants and our cash and in kind contributions to our CRC exceeded budget. By any measure our CRC has experienced significant success in its participant collaboration through research, education and training, and communication.

2004–05

Satisfaction level of partners is strong with existing partners confirming their ongoing support and fresh interest from potential new partners. The strength of this interest at this maturing phase of our CRC sends a powerful message to our industry partners and ensures continued enthusiasm for repeat collaborations with partners on projects. Our recent experience in selecting among multiple research proposals has demonstrated that partners remain keen for repeat collaborations with our CRC on research, education and training, and commercialisation activities.

Prior to 1 July 2004

Satisfaction level of participants was strong with existing partners confirming their ongoing support and fresh interest from potential new partners.

Swan Bells, Perth Photo by Peter Brandon

Communication strategy

Construction Innovation's communication strategy is designed to deliver effective and timely information to our researchers as well as our private and public industry stakeholders. Activities are focused on internal and external communication and include workshops, publications and brochures, intranet, website, media and publicity, and sponsorship.

Our **intranet** site is the primary tool supporting *internal* communication. Through this site, project team members are able to quickly and easily access and share essential documents.

Key to external communication is the **website** (www.construction-innovation.info). The site includes a Research Library providing access to a large range of documents produced by our CRC including final and technical reports, refereed conference papers and brochures. It is organised by subject areas within research programs A, B and C and the ICT platform.

The new format **UPDATE Newsletter** is uploaded to the website every month and is also distributed by email to a national and international audience of almost 3000.

By redeveloping our research reports into a series of **industry publications** such as *Sustainable Subdivisions: Energy Efficient Design*, we are able to disseminate to industry the key learnings and benefits emerging from our research in an industry-friendly format. Distribution channels through industry associations, workshops, special events and conferences are exploited to ensure a wide reach of the publications, especially to small- to medium-sized enterprises.

Those industry publications which are for sale can be ordered or downloaded and paid for online. This greater accessibility will enable easier and more rapid distribution to our partners and the industry both in Australia and internationally. At least five additional publications will be available by the end of 2006.

Project brochures available in print or via the website are:

- Guidelines for successful eTendering implementation
- The BRITE project published the next six in its series of innovation case studies:

  Case 7 Managing Stormwater with Storage Gutters and Infiltration

  Case 8 Saving On-site Remediation Costs

  Case 9 Post-tensioned Steel Trusses for Long Span Roofs

  Case 10 Twin-coil Air Conditioning at the Art Gallery of South Australia

  Case 11 Better Project Outcomes with Relationship Management and 3D CAD

  Case 12 Using Recycled Tyres to Construct an Access Road over Saturated Terrain

Executive Report Cards are produced annually and tailored to the interests and needs of each of our participants. The report cards provide a snapshot of the value to the participant of their investment in our CRC. This is an annual process, following the data collection for the Annual Report. Participant feedback continues to reinforce the value of the Executive Report Cards.

Nine **media releases** were distributed throughout the year, resulting in significant coverage across print, electronic and broadcast media. Copies are available on the website at www.construction-innovation.info. **Feature articles** were also specifically written for key media outlets, identified as high priority. Media featuring stories on *Construction Innovation* during 2005–06 include the *Australian Financial Review*, *BRW*, *Building Australia* magazine, *National Building News* magazine, *Solve* (CSIRO) magazine, *Master Builder* magazine, *Property Australia* and Channel 7.


BRW May 2006 - Innovation Mindset under construction P60-61

INNOVATION

EDITED BY SIMON LLOYD

Mindset under construction

Public infrastructure projects are starting to lead change, but the biggest barriers to innovation are still short-term thinking and a lowest-price-is-best mentality. By Jane Searle

BRITE EXAMPLES

Leaders are more likely to:

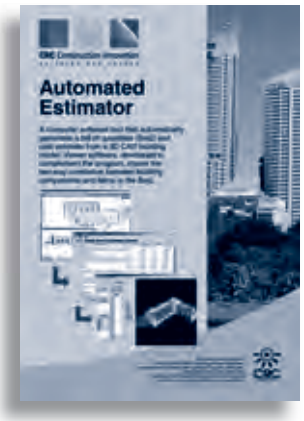
Recruit new graduates

Learn lessons and use them in future projects

Have board

Attitude change needed

Relationship building is ongoing as contact is maintained with partner and CRC communication/marketing officers to foster stronger collaborative relationships, and with editors, journalists and broadcasters in order to develop stronger relationships and propose articles.



International Conference

Construction Innovation's Second International Conference, *Clients Driving Innovation: Moving Ideas into Practice* in March 2006 was an outstanding success. Attended by over 230 delegates representing 12 countries, it was considered by many to be the best conference they had attended and a watershed event.

A considerable amount of positive and constructive feedback was received, particularly focussing on the overall quality of the event, broad selection of topics and the high calibre of presenters. Our third International Conference has been scheduled for March 2008, to build on the substantial national and international success of our 2004 and 2006 conferences.

'[The conference] was an excellent review of the research conducted under the auspices of the CRC and how it is being translated into practical outcomes for the building and construction industry … The Australian Institute of Building would like to support the next Construction Innovation conference and we look forward to exploring options as the opportunities become available.' **Troy Williams**, General Manager, Australian Institute of Building

Steven Bradbury (2002 Winter Olympics Gold Medallist) and Louise Adams (CRC Construction Innovation) at the CRC's 2006 International Conference

Peter Hope (Queensland Building Services Authority) and David Ness (University of South Australia and South Australian Government) at the CRC's 2006 International Conference

Awards

Professional Excellence

In May 2006 Project Diagnostics was awarded the Professional Excellence Award (R&D) at the 2006 Queensland Professional Excellence in Building Awards.

DesignCheck won Professional Excellence Award (R&D) at the 2006 New South Wales Professional Excellence in Building Awards.

These awards are presented by the Australian Institute of Building (AIB). These two projects will now compete for the national award, to be announced during the AIB Professional Excellence in Building Awards Dinner on 29 September 2006.

Project Management

Construction Innovation was awarded three awards during on the Australian Institute of Project Management Awards, on 9 September 2005:

- Peter Scuderi (*Construction Innovation* Development Manager) awarded Individual Project Manager Achievement Award, Project Director Queensland
- Project Diagnostics awarded Product Development Queensland
- Garry Creedy (*Construction Innovation* scholar) awarded Student award Queensland

'Peter's role within the CRC-CI has resulted in the effective management of the research outcomes which will have a long-term benefit to the construction industry.' Australian Institute of Project Management Queensland President **Alan Tupicoff**

'[Project Diagnostics] is a system that works at the grass roots of project delivery and tracks performance through the life of a project … The tool has wide ranging applications across the building and construction industry. The development of this tool also highlighted the benefits of such research, being undertaken by CRC-CI, in meeting the needs of all stakeholders within the construction industry.' Australian Institute of Project Management Queensland President **Alan Tupicoff**

Peter Shears (AIPM), Colleen Foelz (CRC Construction Innovation), Peter Scuderi (CRC Construction Innovation), Carole Green (CRC Construction Innovation), John Tsoukas (Project Leader, Arup Australasia), Daniyal Mian (researcher) and Keith Hampson (CRC Construction Innovation) at the AIPM Awards, 9 September 2005

Communication strategy

Sponsorship

Construction Innovation provided sponsorship to:

- The Australian Institute of Project Management (AIPM) Project Management Achievement Awards, Bronze Sponsorship
- 3rd International Conference on Project Management, 2006 (PROMAC 2006)

Sponsorship was received from:

Organisation providing sponsorship	Sponsorship details
Cliftons	Sponsorship of Lord Mayor's breakfast seminar 22 February 2006
Dell Computer	Sponsorship of Lord Mayor's breakfast seminar 22 February 2006
PRD Realty	Sponsorship of Lord Mayor's breakfast seminar 22 February 2006
Austral Bricks	Exhibition space at *Construction Innovation*'s Second International Conference — *Clients Driving Innovation — Moving Ideas into Practice*, Gold Coast 12–14 March 2006
Australian Greenhouse Office	Bronze sponsorship of *Construction Innovation*'s Second International Conference — *Clients Driving Innovation — Moving Ideas into Practice*, Gold Coast 12–14 March 2006
Australian Institute of Project Management	Bronze sponsorship of *Construction Innovation*'s Second International Conference — *Clients Driving Innovation — Moving Ideas into Practice*, Gold Coast 12–14 March 2006
Australian Institute of Quantity Surveyors	Dinner sponsorship of *Construction Innovation*'s Second International Conference — *Clients Driving Innovation — Moving Ideas into Practice*, Gold Coast 12–14 March 2006
The Australian Performance Based Building (Aus-PeBBu) Network	Gold sponsorship of *Construction Innovation*'s Second International Conference — *Clients Driving Innovation — Moving Ideas into Practice*, Gold Coast 12–14 March 2006
Minter Ellison Lawyers	Dinner sponsorship of *Construction Innovation*'s Second International Conference — *Clients Driving Innovation — Moving Ideas into Practice*, Gold Coast 12–14 March 2006
Office of the Federal Safety Commissioner, Department of Employment and Workplace Relations	Silver sponsorship of *Construction Innovation*'s Second International Conference — *Clients Driving Innovation — Moving Ideas into Practice*, Gold Coast 12–14 March 2006
Queensland Department of Main Roads	Bronze sponsorship of *Construction Innovation*'s Second International Conference — *Clients Driving Innovation — Moving Ideas into Practice*, Gold Coast 12–14 March 2006
Queensland Department of Public Works	Gold sponsorship of *Construction Innovation*'s Second International Conference — *Clients Driving Innovation — Moving Ideas into Practice*, Gold Coast 12–14 March 2006

Photovoltaic array and solar hot water system located on the roof of the Rockhampton "Research House". The solar hot water system provides 90% of the hot water needs and the PV array provides nearly all the power requirements for the house.

Specified personnel

The following table of Specified Personnel reflects the revised list included in the Commonwealth Agreement Contract Variation dated 9 January 2004.

Specified personnel	Their contributing organisation	Their position in the CRC	% time contributed to CRC activities	% Actual time for Yr 05/06
Keith Hampson	CRC for *Construction Innovation*	CEO	100%	100%
Carole Green	CRC for *Construction Innovation*	Business Manager	100%	100%
Peter Scuderi	CRC for *Construction Innovation*	Development Manager	100%	100%
Peter Newton[1]	CSIRO	Program Leader, Research Committee	50%	49%
Neal Ryan	QUT	Program Director, Research Committee, Project Leader	50%	34%
Robin Drogemuller	CSIRO	Platform Director, Research Committee, Project Leader	50%	48%
Don Allan	Queensland Department of Public Works	Deputy Program Director, Research Committee	20%	17%
Gerry Shutt	John Holland	Deputy Program Director, Research Committee	20%	15%
Mary Lou Maher	The University of Sydney	Research Committee, Project Leader	50%	38%
Jeanette Clough	Rider Hunt	Deputy Platform Director, Research Committee	20%	10%
Ron Wakefield	RMIT	Research Committee, Project Leader	50%	21%
John Oliver	Rider Hunt	Rider Hunt Projects Coordinator, Chair, Research Committee	22%	21%
John Spathonis	Queensland Department of Main Roads	QDMR Projects Coordinator, Research Committee	50%	10%
Dale Gilbert	Queensland Department of Public Works	QDPW Projects Coordinator, Research Committee	10%	9%

[1] As per the erratum for the 2004–05 CRC for *Construction Innovation* Annual Report, in 2004–05 Dr Peter Newton's per cent actual time was incorrectly reported as 18 per cent. It should have read 39 per cent.

Appendix 1 — List of publications and presentations

Books and journal articles

Aranda-Mena, G., Sher, W., Gameson, R. and Ward, P., (2005) 'Evolving Trends in nD Modeling: The Construction Planning Workbench', Architectural Engineering and Design Management, Vol 1, Number 2, pp 111–126

Biggs, H.C., Sheahan, V.L. and Dingsdag, D.P., (2005) 'A Study of Construction Site Safety Culture and Implications for Safe and Responsive Workplaces', Australian Journal of Rehabilitation Counselling 11(1), pp 1–8

Biggs, H.C., Sheahan, V.L. and Dingsdag, D.P., (2006) 'Safety Culture, safety attitudes, and market force influences on construction site safety'. K. Brown, K. Hampson and P. Brandon (eds.) Clients Driving Innovation: Moving Ideas into Practice, Cooperative Research Centre for Construction Innovation, Brisbane (at press)

Brown, K., Hampson, K. and Brandon, P. (eds), (2006) *Clients Driving Innovation: Moving Ideas into Practice*, Cooperative Research Centre for Construction Innovation, Brisbane (at press)

Dingsdag, D.P, Biggs, H.C. and Sheahan, V.L., (2006) 'The carrot and the stick: driving safety culture in the construction industry', K. Brown, K. Hampson and P. Brandon (eds.) Clients Driving Innovation: Moving Ideas into Practice, Cooperative Research Centre for Construction Innovation, Brisbane (at press)

Drogemuller, R. and Ding, L., (2006) 'Automated Code Checking and Accessibility', in Aouad, G, Lee, A and Wu, S (eds) Constructing the Future: nD modelling, Taylor & Francis Books Ltd

Hardie, M., Miller, G., Manley, K. and McFallan, S. (2006) 'Innovation performance and its impact on profitability among groups in the Australian construction industry', Australian Journal of Construction Economics and Building, Vol 6, No 1

London, K. and Bavinton, N., 'A Reflexive Capability Model for Sustainable E-business Environments in Construction Supply Chains', (2006) IT Con Special Edition Vol 11, April Edition, 'A Diffusion Theoretic Approach to Analysing eBusiness Uptake in Small Building Enterprises'

Manley, K., Blayse, A. and McFallan, S. (2005) 'Implementing Innovation on Commercial Building Projects in Australia' in Brown, K., Hampson, K. and Brandon, P. (eds) Clients Driving Construction Innovation: Mapping the Terrain. Brisbane: CRC for Construction Innovation

Manley, K. and McFallan, S. (*forthcoming*) 'Exploring the drivers of firm-level innovation in the construction industry', *Journal of Construction Management and Economics*.

Manley, K. and McFallan, S. (*forthcoming*) 'Measuring the technical competence of repeat public-sector clients', in Brown, K., Hampson, K. and Brandon, P. (eds) *Clients Driving Construction Innovation: Moving Ideas into Practice.* Brisbane: CRC for Construction Innovation.

Piyatrapoomi, N., Kumar, A., Weligamage, J. and Robertson, N., (2006) 'Probability Based Data Analysis for Road Asset Management', Journal of Queensland Roads, Queensland Government Department of Main Roads, April

Rose, T. (2005) 'A conceptual framework to investigate the performance of financial incentive mechanisms in construction projects', in Brown, K., Hampson, K. and Brandon, P. (eds) Clients Driving Construction Innovation: Mapping the Terrain. Brisbane: CRC for Construction Innovation

Rowlinson, S., Cheung, F., Simons, R. and Rafferty, A., (2006) 'Alliancing in Australia — No Litigation Contracts; a Tautology?' Journal of Professional Issues in Engineering Education and Practice, ASCE

Conference Papers

Ballesty, S., 'FM Action Agenda', CRC for Construction Innovation Sustainability Conference, Sydney, 9 August 2005

Ballesty, S., 'FM Action Agenda', IIR Annual Building Maintenance Conference, Sydney, 28 September 2005

Ballesty, S., 'FM Action Agenda — the Australian government and industry working together for improvement', CRC for Construction Innovation Second International Conference Clients Driving Innovation, Gold Coast, 14 March 2006

Ballesty, S., 'Sydney Opera House FM Exemplar Project — an integrated collaborative approach', CRC for Construction Innovation Second International Conference Clients Driving Innovation, Gold Coast, 14 March 2006

Ballesty, S., 'FM Action Agenda — the Australian government and industry working together for improvement', Maintenance Engineering Society of Australia, World Congress for Engineering Asset Management, Gold Coast, 11 July 2006

Ballesty, S., 'FM Exemplar Project: Sydney Opera House — an integrated collaborative approach' (Keynote address), Maintenance Engineering Society of Australia, World Congress for Engineering Asset Management, Gold Coast, 12 July 2006

Biggs, H.C., Dingsdag, D.P. and Sheahan, V.L. 'Risk Management and Injury Prevention: Competencies, behaviours and attitudes to safety in the construction industry', Australian Rehabilitation Providers Association Annual Conference, Adelaide, 27 April 2006

Cheung, F. and Rowlinson, S., 'Interrelationships between Organisational Structure, Culture and Commitment — an Australian Case Study', Australian Institute of Project Management, Melbourne, 9-11 October 2005

Cheung, F. and Rowlinson, S., 'Relational Contracting: The way forward or just a brand name?' First ICCEM International Conference, Seoul, Korea 16-18 October 2005

Ding, L., 'FM Exemplar Project: Sydney Opera House', IIR Annual AusFM Conference, Sydney, 23 February 2006

Gillespie, N., and Akhurst, P., 'Sydney Opera House: Facilities Management Exemplar Project', FMA Australia ideaction Conference, Sydney, 1 June 2006

Gladwin, S., Hunt, C., Nakkan, J., and McCormick, J., 'FM Action Agenda: Promoting the FM Industry panel session', IIR Annual AusFM Conference, Sydney, 22 February 2006

Hampson, K., 'Sydney Opera House FM Exemplar Project: Leading change in Australian facilities management', CRC for Construction Innovation Sustainability Conference, Sydney, 9 August 2005

Hampson, K., 'Delivering Sustainable Improvement through Construction Innovation', Urban Development Institute of Australia Queensland State Conference, Port Douglas, 13 August 2005

Hampson, K., 'Sustainability: The future is now' (Keynote address), Air Conditioning and Contractors Association National Conference, Coolum, 26 September 2005

Hampson, K., 'BEE Smart Systems Research Theme — CRC for Construction Innovation', Queensland University of Technology National Conference, Brisbane, 6 October 2005

Hampson, K., 'Projecting Change through Construction Innovation' (Keynote address), Australian Institute of Project Management Conference, Melbourne, 9–11 October 2005

Hampson, K., 'Your Building "Profiting from sustainability"', Built Environment Conference, Sydney, 16 November 2005

Hampson, K., 'CRC for Construction Innovation', CRC for Construction Innovation Second International Conference Clients Driving Innovation, Gold Coast, 14 March 2006

Hampson, K., and Akhurst, P., 'FM Action Agenda', CRC for Construction Innovation Sustainability Conference, Sydney 9 August 2005

McCarthy, J., 'FM Action Agenda Update', FMA Australia ideaction 2006, Sydney, 1 June 2006

Mian, D., 'Innovative tool for Construction Project Health', Queensland University of Technology Research Week, Brisbane, 14–18 July 2005

Mian, D. and Tsoukas, J., 'Project Diagnostics — Assessing the Conditions of Projects and Identifying Poor Health', Australian Institute of Project Management Conference, Melbourne, 9–11 October 2005

Mian, D. and Morey, A., 'Project Diagnostics — A Cure for Poorly Performing Construction Projects', CRC for Construction Innovation Second International Conference Clients Driving Innovation, Gold Coast, 14 March 2006

Moller, S., 'HVAC System Size — Getting it Right', CRC for Construction Innovation Second International Conference Clients Driving Innovation, Gold Coast, 14 March 2006

Morris, J., 'FM Exemplar Project — Sydney Opera House', Marcus Evans' Facilities Management Conference, Kuala Lumpur, 14 November 2005

Peng, W. and Gero, J.S., 'Towards a "loosely-wired" Design Optimization Tool', CRC for Construction Innovation Second International Conference Clients Driving Innovation, Gold Coast, 14 March 2006

Piyatrapoomi, N., Kumar, A., Robertson, N. and Weligamage, J. 'Investment Analysis for Large Road Network Asset Management', CRC for Construction Innovation Second International Conference Clients Driving Innovation, Gold Coast, 14 March 2006

Scuderi, P., 'Demonstration of IFC Tools and Sydney Opera House FM Exemplar Project', Cresme Market Report on Construction, Turin, Italy, 30 November 2005

Scuderi, P., 'Demonstration of DesignCheck', DesignCheck Seminar, Sydney, 23 February 2006

Scuderi, P., 'IFCs in Australia — looking beyond CAD', buildingSMART, Munich, 5 April 2006

Setunge, S.and Kumar, A., 'Re-lifing of Buildings — Decision Support Tools for Maximising Project Efficiency', Australian Institute of Project Management Conference, Melbourne, 9-11 October 2005

Venkatesan, S., Setunge, S., Molyneaux, T., Gravina, R. and Fenwick, J. 'Towards a Rule-based Matrix for Evaluating Distress Mechanisms in Bridges', submitted for review to ACMSM Conference, New Zealand, 2006.

Wu, J., 'Benchmarking Facilities Management in Performing Arts Centres: An Organisational Learning Perspective', Pacific Association of Quantity Surveyor Congress, Singapore, 21–24 May 2006

Refereed Conference Papers

Bellamy, T., Williams, A., Sher, W., Sherratt, S. and Gameson, R., 'Design Communication : Issues Confronting Both Co-located and Virtual Teams', Association of Researchers in Construction Management [ARCOM], Twenty First Annual Conference, London, England 7–9 September, 2005

Bellamy, T., Williams, A., Sher, W., Sherratt, S. and Gameson, R., 'Preliminary Examination of ICT Collaborative Design and Management in the Construction Industry', Queensland University of Technology Research Week International Conference, Brisbane, 4–8 July 2005

Biggs, H.C., Dingsdag, D.P., Sheahan, V.L., Cipolla, D., and Sokolich, L., 'Utilising a Safety Culture Management Approach in the Australian Construction Industry', COBRA Conference, Brisbane, 3–7 July 2005

Biggs, H.C., Dingsdag, D.P., Sheahan, V.L., and Stenson, N.J., 'The Role of Collaboration in Defining and Maintaining a Safety Culture: Australian Perspectives in the Construction Sector', Association of Researchers in Construction Management Annual Conference, London, England, 7–9 September 2005

Biggs, H.C., Dingsdag, D.P., Sheahan, V.L, Cipolla, D., Sokolich, L., and Artuso, W., 'Safety Leadership and the Project Manager: Competencies Required to Positively Affect Site Safety Culture', Australian Institute of Project Management Annual Conference, Melbourne, 9–11 October 2005

Biggs, H.C., Sheahan, V.L., Dingsdag, D.P., 'Improving Industry Safety Culture: The Tasks in Which Safety Critical Positions Holders Must be Competent', CIB99 International Conference on Global Unity for Safety & Health in Construction, Beijing, China, 28–30 June 2006

Cipolla, D., Sheahan, V.L., Biggs, H.C. and Dingsdag, D.P., 'Using Safety Culture to Overcome Market Force Influence on Construction Site Safety', CRC for Construction Innovation Second International Conference Clients Driving Innovation, Gold Coast, 14 March 2006

Cole, I., Corrigan, P., Muster, T., Ganther, W., Paterson, D., Trinidad, G., Chan, W.Y., Liew, P., Maher, M.L., Ball, M. & Carse, A., 'Innovative methods for estimating reference service life: methods for the service life estimation of metal building products', presented to DSM Seminar on Design Life of Building & Constructed Assets in conjunction with ISO/TC 59/SC 14 – International Meeting on Design Life, Kuala Lumpur, Malaysia, 5 April 2005

Cole, I., Corrigan, P., Muster, T., Ganther, W., Paterson, D., Trinidad, G., Chan, W.Y., Liew, P., Maher, M.L., Ball, M. & Carse, A., 'Innovative methods for estimating reference service life: methods for the service life estimation of metal building products', CRC for Construction Innovation Second International Conference Clients Driving Innovation, Gold Coast, 14 March 2006

Ding, L., Drogemuller, R., Rosenman, M., Marchant, D. and Gero, J., 'Automating Code Checking for Building Designs — DesignCheck', CRC for Construction Innovation Second International Conference Clients Driving Innovation, Gold Coast, 14 March 2006

Dingsdag, D.P., Sheahan, V.L. and Biggs, H.C., 'Safety Culture in the Construction Industry: Changing behaviour through enforcement and education?', CRC for Construction Innovation Second International Conference Clients Driving Innovation, Gold Coast, 14 March 2006

Dingsdag, D.P., Sheahan, V.L. and Biggs, H.C., 'Site Worker Perceptions of Safety Critical Roles and Their Actions: Implications for Culture Change in Construction Organisations', CIB99 International Conference

Appendix 1 — List of publications and presentations

on Global Unity for Safety & Health in Construction, Beijing, China, 28–30 June 2006

Dong, A., Maher, M.L. and Daruwala, Y. 'Construction Defect Reporting Using Mobile and digital Workbench Technologies', Joint International Conference on Computing and Decision Making in Civil and Building Engineering, Montreal, Canada, June 14–16, 2006

Furneaux, C., Brown, K., Allan, D., Abel, N., McConville, S., McFallan, S., London, K. and Burgess, J. 'Capital works procurement policies in Australia: Implications for understanding and meeting client needs', CRC for Construction Innovation Second International Conference Clients Driving Innovation, Gold Coast, 14 March 2006

Hardie, M., Miller, G., Manley, K. and McFallan, S., 'Experience with the Management of Technological Innovations within the Australian Construction Industry', PICMET '05 Conference, Portland, Oregon, USA, 31 July–4 August 2005

Hardie, M., Miller, G. and Manley, K., 'Innovative Connecting System for Precast Planks on a Major Sports Stadium', International group for Lean Construction (IGLC) 13 Conference, Sydney, Australia, 18–20 July 2005

Hardie, M., Miller, G., Manley, K. and McFallan, S., 'The Quantity Surveyor's Role in Innovation Generation, Adoption and Diffusion in the Australian Construction Industry', Queensland University of Technology Research Week, Brisbane, Australia, 4–8 July 2005

Khan, S., Hardie, M. and Miller, G., 'Benchmarks for Recycling Practices in Commercial Office Building Refurbishment: Data Collection Challenges', CRC for Construction Innovation Second International Conference Clients Driving Innovation, Gold Coast, 14 March 2006

London, K. and Bavinton, N., 'A Reflexive Capability Model for e-business in Construction Indsutry Supply Chains', CRC for Construction Innovation Second International Conference Clients Driving Innovation, Gold Coast, 14 March 2006

Manley, K., Blayse, A. and McFallan, S., 'Demonstrating the Benefits of Construction Innovation', 'Creating and Entrepreneurial Economy: The Role of Enterprise and Innovation', International Research Conference, Hamilton, New Zealand, 7–8 July 2005

Manley, K. and McFallan, S., 'The Relationship between Business Strategies and Successful Innovation', Australian Sociological Association Conference, Hobart, 5-8 December 2005

Manley, K. and McFallan, S., 'The Impact of Business Strategies and Business Conditions on Innovation', 'Creating and Entrepreneurial Economy: The Role of Enterprise and Innovation', International Research Conference, Hamilton, New Zealand, 7–8 July 2005

Manley, K. and McFallan, S. 'Measuring the technical competence of repeat public-sector clients', CRC for Construction Innovation Second International Conference Clients Driving Innovation, Gold Coast, 14 March 2006

Miller, A., Ambrose, M. and Ball, M. 'Benchmarking Sustainable Residential Dwellings', CRC for Construction Innovation Second International Conference Clients Driving Innovation, Gold Coast, 14 March 2006

Nezamian, A., Setunge, S. and Molyneaux, T., 'A Framework for Predicting the Residual Load Carrying Capacity of Concrete Structures Exposed to Aggressive Environments', ConMat05, 3rd International Conference on Construction Materials: Performance Innovation and Structural Implications, Vancouver, Canada, 22–24 August 2005

Perera, C., Setunge. S. and Molyneaux, T., 'Structural Strengthening for Optimizing Floor Space During Retrofitting of High-rise Office Buildings', CRC for Construction Innovation Second International Conference Clients Driving Innovation, Gold Coast, 14 March 2006

Piyatrapoomi, N., Kumar, A., Weligamage, J. and Robertson, N., 'Identification of Critical Input Variables for Risk-based Cost Estimates for Road Maintenance and Rehabilitation' 4th International Conference on Maintenance and Rehabilitation of Pavements and Technological Control, Ulster, Northern Ireland, 18–20 August 2005

Piyatrapoomi, N., Kumar, A., Robertson, N. and Weligamage, J., 'Investment Analysis for Large Road Network Asset Management' CRC for Construction Innovation Second International Conference Clients Driving Innovation, Gold Coast, 14 March 2006

Piyatrapoomi, N., Kumar, A., Robertson, N. and Weligamage, J., 'Framework for risk-based analysis for large road networks maintenance and rehabilitation investment' Joint International Conference on Computing and Decision Making in Civil and Building Engineering, Montreal, Canada, 14–16 June 2006

Sherratt, S., Bellamy, T., Gameson, R., Sher, W. and Williams, T., 'Information Exchange in High Bandwidth Design Team Activities', International Systemic Functional Congress 32: 'Discourses of Hope — Peace, Reconciliation, Learning, Change', Sydney, 17–22 July 2005

Venkatesan, S., Kumar, A. and Setunge, S., 'Assessment and Integration of Residual Service Life Models', 1st Californian Conference on Recent Advances in Engineering Mechanics, Fullerton, USA, 12–14 January 2006

Venkatesan, S., Setunge, S., Molyneaux, T. and Fenwick, J., 'Evaluation of distress mechanisms in bridges exposed to aggressive environments', CRC for Construction Innovation Second International Conference Clients Driving Innovation, Gold Coast, 14 March 2006

Williams, A., Sher, W., Bellamy, T., Sherratt, S. and Gameson, R., 'Contributing to the Virtual Design Team: Considerations and Requirements', International Design Congress IASDR 2005, Yunlin, Taiwan, 1–4 November 2005

Williams, A., Bellamy, T., Gameson, R., Sherratt, S. and Sher, W., 'Virtual Environments: Lessons from Industry Transferred to Distance-learning Education', Queensland University of Technology Research Week International Conference, Brisbane, 4–8 July 2005

Industry and academic presentations by CRC for *Construction Innovation*

Presentations by project personnel listed by project

2003-003-A, London

- 19 June 2006, Senior Management Team, Department of Commerce, Newcastle

2003-050-A, Cipolla

- 7 July 2005, Industry Day QUT Research Week, Brisbane
- 29 July 2005, QUT School Seminar series, Brisbane
- 23 August 2005, University of Queensland School of Psychology Seminar Series, Brisbane
- 19 September 2005, Leighton Contractors Safety Leaders Summit , Sydney
- 21 November 2005, Office of the Australian Safety and Compensation Council, Canberra
- 26 June 2006, Hong Kong Polytechnic University, Hong Kong
- 26 June 2006, Hong Kong Institute of Occupational Safety & Health, Hong Kong

2004-016-A, London

- 8 December 2005, C&DW working group, Brisbane
- 19 June 2006, Senior Management Team, Department of Commerce, Newcastle

2004-032-A, Brown

- 16 February 2005, Construction Induction Training Work Group, Sydney

2002-059-B, Cole

- 19 September 2005, Leighton Contractors Safety Leaders Summit , Sydney

2002-063-B, Ambrose

- 9 August 2005, 'Sustainable Subdivisions: the Future of Energy Efficient Design' Sustainability and Facility Management Forum, Sydney
- 25 October 2005, Rider Hunt Project Implementation Workshop, Brisbane

2002-077-B, Miller

- 4 April 2006, Planning for Air Movement Workshop, Brisbane

2004-011-B, Ding

- 7 July 2005, David Marchant, Woods Bagot, QUT Industry Day, Brisbane
- 28 July 2005, John Mitchell and Lan Ding, CRC CI tools, Arup
- 8 November 2005, Peter Scuderi, Robin Drogemuller and Lan Ding, DesignCheck, Building Commission, Melbourne
- 23 February 2006, Peter Scuderi, Robin Drogemuller and Lan Ding, DesignCheck, presentation to architects, designers, surveyors, engineers and council managers, Sydney

2005-015-B, Stapledon

- 15 September 2005, ABCB Building Australia's Future Conference, Gold Coast
- 13 March 2006, Construction Innovation Conference, Gold Coast
- 4 April 2006, PIA & NZPI Conference, Gold Coast
- 23 May 2006, Western Australian industry, Perth

2003-029-C, Kumar

- April 2005, Victorian Roads Conference
- April 2005, Innovation in FM
- May 2005, Asian Pavement Management Conference
- February 2006, Road Asset Management Branch, QDMR
- May 2006, Highway Department of Thailand
- 23 May 2006, Workshop Western Australian industry, Perth

2004-018-C, Setunge

- 11 April 2006, Workshop and technical presentation

2005-001-C, Ballesty

- 25 October 2005, 'Global FM' panel session, IFMA World Workplace 2005, Philadelphia
- 28 October 2005, 'FM Downunder' presentation, IFMA Boston Chapter
- 28 October 2005, 'FM as a global career' presentation to students, Wentworth Institute, Boston
- 28 October 2005, 'FM Downunder' presentation to academic and FM staff, Harvard School of Public Health, Boston
- 31 October 2005, 'FM Action Agenda' briefing to chapter President IFMA, New York
- 11 November 2005, 'FM Action Agenda', FMA, Melbourne
- 8 February 2006, 'Facilities Management at the Sydney Opera House', FMA, Sydney
- 13 April 2006, 'Managing the Built Environment — the FM Action Agenda & Sydney Opera House' University of NSW, Faculty of the Built Environment post graduate students, Sydney
- 20 April 2006, 'FM Action Agenda — our industry moving forward', FMA, Perth
- 21 June 2006, 'Building Information Modelling' presentation to NSW Government Architect's Office, Sydney

Appendix 2 — Acronym list and definitions

American Society of Civil Engineers	ASCE
Architecture Engineering and Construction	AEC
Association of Consulting Engineers Australia	ACEA
Association of Researchers in Construction Management	ARCOM
Australian Building Codes Board	ABCB
Australian Construction Industry Forum	ACIF
Australian Constructors Association	ACA
Australian Council for Infrastructure Development	AusCID
Australian Greenhouse Office	AGO
Australian Institute of Builders	AIB
Australian Institute of Management	AIM
Australian Institute of Project Management	AIPM
Australian Performance Based Building Initiative	AusPeBBu
Australian Procurement and Construction Council	APCC
Australian Sustainable Built Environment Council	ASBEC
Australian Universities Building Educators Association	AUBEA
Bill of Quantities	BoQ
Brisbane City Council	BCC
Brisbane Water Enviro Alliance	BWEA
Building Code of Australia	BCA
Building Commission (Victoria)	BC
Building Industry Redundancy Trust (Queensland)	BIRT
building information modelling	BIM
Building Products Innovation Council	BPIC
Building Research, Innovation, Technology and Environment	BRITE
Building Services Research and Information Association	BSRIA
carbon fibre-reinforced polymer	CFRP
Centre for Integrated Engineering Asset Management	CIEAM
Commonwealth Scientific and Industrial Research Organisation	CSIRO
computer-assisted design	CAD
Cooperative Research Centre	CRC
Construction and Property Services Industry Skills Council	CPSISC
corporate social responsibility	CSR
Environmental Protection Agency	EPA
environmentally sustainable development	ESD
executive support systems	ESS
Facilities Management Association	FMA
facility management	FM
Fibre-reinforced composite	FRC
fibre-reinforced polymer	FRP
Forest and Wood Products Research and Development Corporation	FWPRDC
Government Asset Management Arena	GAMA
Housing Industry Association	HIA
heating, ventilation and air-conditioning	HVAC
human–computer interfaces	HCI
industry foundation classes	IFC
information and communication technology	ICT
Institution of Engineers Australia	IEAust
intellectual property	IP
International Alliance for Interoperability	IAI
International Construction Research Alliance	ICALL
International Council for Research and Innovation in Building and Construction	CIB
noise-induced hearing threshold shifts	NITS
Occupational Health and Safety	OHS
Office of the Australian Safety and Compensation Council	OASCC
Property Council of Australia	PCA
Public-Private Partnership	PPP
Queensland Department of Main Roads	QDMR
Queensland Department of Public Works	QDPW
Queensland Department of State Development, Trade and Innovation	QDSDTI
Queensland University of Technology	QUT
research and development	R&D
Royal Australian Institute of Architects	RAIA
Royal Melbourne Institute of Technology	RMIT
small-to-medium size enterprise	SME
Smart and Sustainable Built Environment	SASBE
soft systems methodology	SSM
strategic asset maintenance	SAM
Technical and Further Education	TAFE
University of New South Wales	UNSW
Urban Development Institute of Australia	UDIA

A **building information model** (BIM) is coordinated, consistent, computable information about a building project in design that yields reliable digital representations of the building — representations that can be used for design decision-making, production of high-quality construction documents, performance predictions, cost-estimating and construction planning, and, eventually, for managing and operating the facility. It allows different disciplines — the structural engineer, the architect — to link into a shared, distributed BIM — to work on a single shared model.

The **Industry Foundation Classes (IFC)** is an object oriented file format with a data model developed by the International Alliance for Interoperability (IAI) to facilitate interoperability in the building industry. IFCs are data elements that represent the parts of buildings, or elements of the process, and contain the relevant information about those parts. They are used by computer applications to assemble a computer readable model of the facility that contains all the information of the parts and their relationships to be shared among project participants. Interoperability is defined as the seamless sharing of building data between multiple applications (or disciplines) over any or all life cycle phases of a building development project. The IFC is a standard (ISO PAS 16739) that is published by the International Organization for Standardization.

Appendix 3 — Staff in-kind tables

Main activity: A = Administration R = Research Research total includes Research Administration in some cases

Arup Australasia										
Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
Stuart Bull	R	0.4%	–	0.4%	–	0.4%	–	–	–	–
John Hainsworth	R	0.2%	–	0.2%	–	0.2%	–	–	–	–
Colin Henson	A	0.4%	–	–	–	0.4%	–	–	–	–
Richard Hough	R	3.7%	0.1%	0.5%	–	3.7%	–	–	–	–
Steve Pennel	R	0.1%	–	–	–	0.1%	–	–	–	–
Ken Stickland	R	0.9%	–	0.8%	–	0.9%	–	–	–	–
PC Thomas	R	0.9%	–	0.9%	–	0.9%	–	–	–	–
John Tsoukas	R	0.3%	–	–	0.1%	0.3%	–	–	–	–
TOTAL CONTRIBUTED (% of PERSON YEARS)		6.9%	0.1%	2.8%	0.1%	6.9%	0.0%	0.0%	0.0%	0.0%
Bovis Lend Lease										
Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
Graham Carter	R	0.5%	–	0.5%	–	0.5%	–	–	–	–
Mary Casey	R	0.6%	–	0.6%	–	0.6%	–	–	–	–
Murray Coleman	R	0.8%	0.8%	–	–	0.8%	–	–	–	–
Guy Gibson	R	0.9%	–	0.9%	–	0.9%	–	–	–	–
Daniel Grunbaum	R	0.3%	–	0.3%	–	0.3%	–	–	–	–
Bob Johnston	R	0.8%	–	0.8%	–	0.8%	–	–	–	–
Daniel Labbad	R	0.5%	–	0.5%	–	0.5%	–	–	–	–
Tom McFadyen	R	1.0%	1.0%	–	–	1.0%	–	–	–	–
Danny Potocki	R	0.5%	0.5%	–	–	0.5%	–	–	–	–
Linda Sokolich	R	3.3%	3.3%	–	–	3.3%	–	–	–	–
TOTAL CONTRIBUTED (% of PERSON YEARS)		9.0%	5.5%	3.5%	0.0%	9.0%	0.0%	0.0%	0.0%	0.0%
Brookwater JV										
Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
Dayan Jayasekera	R	1.0%	–	0.5%	–	1.0%	–	–	–	–
Michael Ryan	R	0.2%	–	–	–	0.2%	–	–	–	–
TOTAL CONTRIBUTED (% of PERSON YEARS)		1.2%	0.0%	0.5%	0.0%	1.2%	0.0%	0.0%	0.0%	0.0%
DEM										
Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
Marina Cheung	R	1.0%	–	1.0%	–	1.0%	–	–	–	–
TOTAL CONTRIBUTED (% of PERSON YEARS)		1.0%	0.0%	1.0%	0.0%	1.0%	0.0%	0.0%	0.0%	0.0%

John Holland

Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
Bruce Carlyle	R	0.5%	–	–	0.2%	0.2%	–	–	–	0.3%
Dean Cipolla	R	17.2%	14.2%	–	–	17.2%	–	–	–	–
Chris Evans	R	0.2%	–	–	–	0.2%	–	–	–	–
Tim Fleming	R	4.5%	3.5%	–	–	4.5%	–	–	–	–
Geoff Gannon	R	2.2%	0.7%	–	–	0.7%	1.5%	–	–	–
David Golightly	R	3.3%	–	–	–	0.0%	–	–	–	3.3%
Justin Lee	R	1.3%	–	–	1.0%	1.3%	–	–	–	–
Brad Marriot	R	1.5%	1.5%	–	–	1.5%	–	–	–	–
Glenn Palin	A	1.0%	–	–	–	0.0%	–	–	–	1.0%
Stephen Sasse	R	5.9%	3.3%	–	–	5.9%	–	–	–	–
Gerry Shutt	R	15.2%	1.8%	–	–	9.3%	0.8%	–	–	5.1%
Claudelle Taylor	R	0.3%	0.3%	–	–	0.3%	–	–	–	–
TOTAL CONTRIBUTED (% of PERSON YEARS)		53.0%	25.2%	0.0%	1.2%	41.1%	2.3%	0.0%	0.0%	9.6%

Rider Hunt

Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
Stephen Ballesty	R	14.1%	–	–	14.1%	14.1%	–	–	–	–
Peter Cass	R	0.7%	–	0.7%	–	0.7%	–	–	–	–
Jeanette Clough	R	9.9%	–	1.6%	3.3%	9.9%	–	–	–	–
Michael Gilligan	R	1.1%	–	–	1.1%	1.1%	–	–	–	–
Roger Hogg	R	0.4%	–	–	–	0.4%	–	–	–	–
Jason Morris	R	16.9%	–	–	16.9%	16.9%	–	–	–	–
Jason Motadi	R	1.2%	–	1.2%	–	1.2%	–	–	–	–
Greg Nowak	R	5.1%	–	5.1%	–	5.1%	–	–	–	–
John Oliver	R	20.9%	1.1%	0.8%	6.1%	18.0%	–	–	–	2.9%
Stuart Rayner	R	0.4%	0.4%	–	–	0.4%	–	–	–	–
Reginald Streifler	R	1.0%	–	–	1.0%	1.0%	–	–	–	–
David Van Der Stall	R	0.5%	–	0.5%	–	0.5%	–	–	–	–
Jonathan Wilson	R	2.1%	–	2.1%	–	2.1%	–	–	–	–
TOTAL CONTRIBUTED (% of PERSON YEARS)		74.1%	1.5%	11.9%	42.3%	71.2%	0.0%	0.0%	0.0%	2.9%

Woods Bagot

Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
Michelle Addley	R	0.6%	–	0.6%	–	0.6%	–	–	–	–
Esther Dickins	R	0.5%	–	0.5%	–	0.5%	–	–	–	–
John Flynn	R	0.5%	–	0.5%	–	0.5%	–	–	–	–
Kate Frear	R	0.3%	–	0.3%	–	0.3%	–	–	–	–
Scott Henderson	R	0.5%	–	0.5%	–	0.5%	–	–	–	–
Fergus Hohnen	R	0.2%	–	0.2%	–	0.2%	–	–	–	–
Trudy-Ann King	A	0.1%	–	0.1%	–	0.1%	–	–	–	–
David Marchant	R	17.5%	–	7.2%	3.9%	13.3%	–	3.5%	0.5%	0.2%
Bruno Mendes	R	0.2%	–	0.2%	–	0.2%	–	–	–	–
Kanyarat Namprempree	R	2.2%	–	2.0%	0.2%	2.2%	–	–	–	–
Kyle Paine	R	1.4%	–	1.4%	–	1.4%	–	–	–	–
Nicholas Rogers	R	0.2%	–	0.2%	–	0.2%	–	–	–	–
Ivan Ross	R	0.8%	–	–	–	0.4%	–	–	–	0.4%
TOTAL CONTRIBUTED (% of PERSON YEARS)		24.9%	0.0%	13.6%	4.1%	20.3%	0.0%	3.5%	0.5%	0.6%

Australian Building Codes Board										
Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
Ken Aspinall	R	0.8%	–	–	–	0.8%	–	–	–	–
Ed Knight	R	1.3%	–	–	–	1.3%	–	–	–	–
Matthew McDonald	R	1.3%	–	–	1.3%	1.3%	–	–	–	–
Margaret McKinnon	R	1.3%	–	–	–	1.3%	–	–	–	–
TOTAL CONTRIBUTED (% of PERSON YEARS)		4.5%	0.0%	0.0%	1.3%	4.5%	0.0%	0.0%	0.0%	0.0%
Brisbane City Council										
Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
Neil Abel	R	2.5%	2.3%	–	–	2.3%	–	–	–	0.2%
Heidi Astin	A	1.3%	–	0.4%	–	0.4%	–	–	–	0.9%
David Bell	A	0.4%	–	–	–	0.0%	–	–	–	0.4%
Michael Bobrowicz	R	0.2%	–	–	–	0.0%	0.2%	–	–	–
John Campbell	R	0.2%	–	–	–	0.0%	0.2%	–	–	–
Helen Caswell	R	1.6%	–	1.6%	–	1.6%	–	–	–	–
Paul Champtaloup	R	1.3%	1.2%	–	–	1.2%	0.2%	–	–	–
Nick Clarke	R	0.2%	–	–	–	0.0%	0.2%	–	–	–
Harry Copeland	R	39.8%	33.4%	–	–	33.4%	1.0%	5.3%	0.1%	–
Damien Dewar	R	0.1%	–	0.1%	–	0.1%	–	–	–	–
Noel Faulkner	R	5.5%	–	–	–	0.0%	0.9%	–	–	4.6%
Medha Gokhale	R	45.8%	–	45.8%	–	45.8%	–	–	–	–
Elly Goodair	A	1.6%	–	–	–	0.0%	–	–	–	1.6%
Terry Hogan	R	0.2%	–	–	–	0.0%	0.2%	–	–	–
Kirsten Holden	R	0.9%	–	–	–	0.0%	–	–	–	0.9%
Russell Hoskins	R	2.9%	–	–	2.9%	2.9%	–	–	–	–
David Kerr	R	0.2%	–	–	–	0.0%	0.2%	–	–	–
Joyce Law	R	0.8%	–	0.8%	–	0.8%	–	–	–	–
Karen Lear	A	1.0%	–	–	–	0.0%	–	–	–	1.0%
Phillip Lord	R	0.2%	–	–	–	0.0%	0.2%	–	–	–
Sunil Madan	A	1.1%	–	–	1.1%	1.1%	–	–	–	–
Dean Morse	R	2.9%	–	–	–	0.0%	0.2%	–	–	2.7%
Ken Moschner	R	13.3%	–	1.1%	–	1.1%	0.9%	–	–	11.3%
Campbell Newman	R	0.2%	–	–	–	0.0%	0.2%	–	–	–
Terry O'Sullivan	R	0.2%	–	–	–	0.0%	0.2%	–	–	–
George Papageorgiou	R	0.2%	–	–	–	0.0%	0.2%	–	–	–
Marita Parker	A	2.4%	–	–	–	0.0%	–	–	–	2.4%
Mark Pattemore	R	0.2%	–	–	–	0.0%	0.2%	–	–	–
Jane Prentice	R	0.2%	–	–	–	0.0%	0.2%	–	–	–
George Pund	R	0.2%	–	–	–	0.0%	0.2%	–	–	–
Frank Riley	R	1.0%	–	–	–	0.0%	1.0%	–	–	–
Nelson Ross	R	3.5%	–	3.5%	–	3.5%	–	–	–	–
Margaret Rowe	A	0.9%	–	–	–	0.0%	–	–	–	0.9%
Mary Shortland	R	0.2%	–	–	–	0.0%	0.2%	–	–	–
David Stewart	R	0.1%	–	–	–	0.1%	–	–	–	–
TOTAL CONTRIBUTED (% of PERSON YEARS)		132.7%	36.8%	53.4%	3.9%	94.3%	6.2%	5.3%	0.1%	26.9%

Building Commission										
Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
Paul Crapper	R	2.2%	1.7%	–	–	2.2%	–	–	–	–
Roger Frith	R	1.8%	1.3%	–	–	1.8%	–	–	–	–
Moshe Gilovitz	R	0.9%	–	–	–	0.9%	–	–	–	–
Dennis Hogan	R	10.4%	–	–	8.6%	10.4%	–	–	–	–
Peter Nassau	R	2.9%	–	–	–	2.3%	–	–	–	0.6%
TOTAL CONTRIBUTED (% of PERSON YEARS)		18.2%	3.0%	0.0%	8.6%	17.6%	0.0%	0.0%	0.0%	0.6%
Queensland Building Services Authority										
Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
Dianne Clift	R	0.1%	0.1%	–	–	0.1%	–	–	–	–
Natasha Dennis	R	0.1%	0.1%	–	–	0.1%	–	–	–	–
Carolyn Gilvear	R	0.1%	0.1%	–	–	0.1%	–	–	–	–
Anthony Healy	R	0.9%	0.9%	–	–	0.9%	–	–	–	–
Peter Hope	R	3.9%	–	0.4%	–	3.3%	–	0.6%	–	–
Ian Jennings	R	4.9%	–	–	–	2.0%	–	–	–	2.9%
Bob Johnson	R	0.2%	0.2%	–	–	0.2%	–	–	–	–
Cheryl Livingstone	R	0.1%	0.1%	–	–	0.1%	–	–	–	–
Shelley Lockton	R	0.2%	0.2%	–	–	0.2%	–	–	–	–
Olivia McMahon	R	0.1%	0.1%	–	–	0.1%	–	–	–	–
Cameron Murphy	R	1.2%	0.5%	–	–	1.1%	–	–	–	0.1%
Diane Russell	A	2.7%	–	–	–	0.0%	–	–	–	2.7%
Dale Rylko	R	0.5%	0.5%	–	–	0.5%	–	–	–	–
Daniel Saunders	R	0.1%	0.1%	–	–	0.1%	–	–	–	–
Jason Smith	R	11.3%	0.9%	–	–	5.2%	–	–	–	6.2%
Tony Townsend	R	0.2%	0.1%	–	–	0.1%	–	–	–	0.1%
Debbie White	R	0.1%	0.0%	0.0%	–	0.1%	–	–	–	–
Ian White	R	2.2%	–	–	–	0.7%	–	–	–	1.5%
Rebecca Wilkins	A	0.2%	–	–	–	0.0%	–	–	–	0.2%
TOTAL CONTRIBUTED (% of PERSON YEARS)		29.1%	4.0%	0.4%	0.0%	14.9%	0.0%	0.6%	0.0%	13.7%
Queensland Department of Main Roads										
Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
Paul Adams	R	0.1%	0.1%	–	–	0.1%	–	–	–	–
Narelle Dobson	R	0.1%	0.1%	–	–	0.1%	–	–	–	–
John Fenwick	R	0.2%	–	–	0.2%	0.2%	–	–	–	–
Ian Fletcher	R	0.1%	0.1%	–	–	0.1%	–	–	–	–
Ken Fong	R	0.1%	0.1%	–	–	0.1%	–	–	–	–
Ross Guppy	R	2.5%	2.5%	–	–	2.5%	–	–	–	–
Steve Hogan	R	3.6%	3.6%	–	–	3.6%	–	–	–	–
Martin Kendall	R	0.1%	0.1%	–	–	0.1%	–	–	–	–
Mano Manoharan	R	3.3%	–	–	3.3%	3.3%	–	–	–	–
Wayne Muller	R	2.1%	0.5%	1.1%	0.5%	2.1%	–	–	–	–
Alan Murray	R	0.1%	0.1%	–	–	0.1%	–	–	–	–
Daniel Naish	R	0.7%	–	0.7%	–	0.7%	–	–	–	–
Julie Peters	R	0.1%	–	0.1%	–	0.1%	–	–	–	–
Ross Pritchard	R	0.1%	0.1%	–	–	0.1%	–	–	–	–
Cedric Roberts	R	0.7%	–	0.1%	–	0.1%	–	–	0.7%	–
Wayne Roberts	R	1.2%	0.4%	–	0.8%	1.2%	–	–	–	–

Queensland Department of Main Roads cont.										
Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
Neil Robertson	A	2.7%	–	–	2.7%	2.7%	–	–	–	–
John Spathonis	R	10.0%	1.2%	0.5%	0.2%	10.0%	–	–	–	–
Mike Swainston	R	4.5%	3.6%	–	–	3.9%	–	–	–	0.5%
Lex Vanderstaay	R	0.2%	0.1%	0.1%	–	0.2%	–	–	–	–
Justin Weligamage	R	36.7%	–	–	34.5%	36.7%	–	–	–	–
Col Williams	R	0.1%	0.1%	–	–	0.1%	–	–	–	–
Dennis Wogan	R	3.2%	–	–	–	3.2%	–	–	–	–
TOTAL CONTRIBUTED (% of PERSON YEARS)		72.5%	12.7%	2.7%	42.3%	71.4%	0.0%	0.0%	0.7%	0.5%
Queensland Department of Public Works										
Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
Don Allan	R	16.7%	3.0%	–	–	5.4%	0.2%	–	–	11.1%
Ron Apelt	R	42.9%	–	17.4%	25.5%	42.9%	–	–	–	–
Michael Ball	R	2.4%	–	1.5%	–	2.4%	–	–	0.0%	–
Dayv Carter	R	2.3%	2.3%	–	–	2.3%	–	–	–	–
John Coglan	R	12.9%	–	12.9%	–	12.9%	–	–	–	–
Thomas Fussell	R	3.8%	–	1.6%	0.8%	2.4%	0.8%	–	0.1%	0.5%
Dale Gilbert	R	8.5%	0.1%	–	0.8%	5.2%	–	1.4%	0.1%	1.8%
John Gray	R	3.2%	–	3.2%	–	3.2%	–	–	–	–
Stuart Grierson	R	0.5%	–	–	0.5%	0.5%	–	–	–	–
Kevin Hoffman	A	0.6%	–	0.6%	–	0.6%	–	–	–	–
Delwyn Jones	R	54.9%	–	30.5%	–	33.7%	2.9%	5.6%	12.6%	0.3%
Cindy Lee	R	2.2%	–	2.2%	–	2.2%	–	–	–	–
Kelly Lindsay	A	5.6%	0.3%	–	–	0.3%	–	–	–	5.3%
Wendy May-Taylor	R	2.0%	1.6%	–	–	1.6%	–	–	–	0.4%
Sheena McConville	R	1.2%	0.7%	–	–	0.9%	–	–	–	0.3%
Lee Rapley	A	0.4%	–	–	–	0.0%	–	–	–	0.4%
Frank Turvey	R	0.3%	–	0.3%	–	0.3%	–	–	–	–
Teng Hee Tan	R	0.1%	–	–	–	0.0%	0.1%	–	–	–
Lee Wade	R	4.3%	–	4.3%	–	4.3%	–	–	–	–
Julia Willis	A	4.4%	–	–	–	0.0%	–	–	–	4.4%
TOTAL CONTRIBUTED (% of PERSON YEARS)		169.0%	7.9%	74.5%	27.6%	121.0%	3.9%	7.0%	12.8%	24.3%
Queensland Department of State Development, Trade and Innovation										
Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
Sue Mackenzie-Smith	R	2.5%	2.5%	–	–	2.5%	–	–	–	–
TOTAL CONTRIBUTED (% of PERSON YEARS)		2.5%	2.5%	0.0%	0.0%	2.5%	0.0%	0.0%	0.0%	0.0%
Western Australia Department of Housing and Works										
Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
Karyn Ash	R	1.5%	–	–	0.2%	0.2%	–	–	–	1.3%
Chris Bagley	R	2.2%	–	–	0.4%	0.4%	–	–	–	1.9%
Greg Fraser	R	0.3%	–	–	0.2%	0.2%	–	–	–	0.1%
Peter Tilley	R	0.2%	–	–	0.2%	0.2%	–	–	–	–
TOTAL CONTRIBUTED (% of PERSON YEARS)		4.1%	0.0%	0.0%	0.9%	0.9%	0.0%	0.0%	0.0%	3.2%

CSIRO

Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
Michael Ambrose	R	11.0%	–	11.0%	–	11.0%	–	–	–	–
Fanny Boulaire	R	22.0%	–	22.0%	–	22.0%	–	–	–	–
Steven Brown	R	17.6%	–	17.6%	–	17.6%	–	–	–	–
Ivan Cole	R	5.5%	–	5.5%	–	5.5%	–	–	–	–
Penny Corrigan	R	0.5%	–	–	–	0.5%	–	–	–	–
John Crawford	R	4.5%	–	4.5%	–	4.5%	–	–	–	–
Angelo Delsante	R	16.2%	–	16.2%	–	16.2%	–	–	–	–
Lan Ding	R	62.3%	–	10.0%	52.3%	62.3%	–	–	–	–
Robin Drogemuller	R	47.7%	–	35.0%	12.7%	47.7%	–	–	–	–
Stephen Egan	R	2.3%	–	2.3%	–	2.3%	–	–	–	–
Greg Foliente	R	3.8%	3.8%	–	–	3.8%	–	–	–	–
David Johnston	R	21.7%	–	21.7%	–	21.7%	–	–	–	–
Steven Kenway	R	4.8%	–	4.8%	–	4.8%	–	–	–	–
Loretta Kivlighon	R	11.4%	–	5.0%	6.4%	11.4%	–	–	–	–
John Mahoney	R	9.5%	–	9.5%	–	9.5%	–	–	–	–
John Mashford	R	14.0%	–	14.0%	–	14.0%	–	–	–	–
Kevin McDonald	R	3.6%	–	3.6%	–	3.6%	–	–	–	–
Stephen McFallen	R	9.0%	9.0%	–	–	9.0%	–	–	–	–
Cheryl McNamara	R	64.8%	–	64.8%	–	64.8%	–	–	–	–
Anne Miller	R	24.9%	–	24.9%	–	24.9%	–	–	–	–
Steve Moller	R	15.9%	–	15.9%	–	15.9%	–	–	–	–
Peter Newton[1]	R	48.8%	–	20.0%	–	20.0%	–	–	6.8%	22.0%
Phillip Paevere	R	13.9%	–	13.9%	–	13.9%	–	–	–	–
David Paterson	R	27.5%	–	27.5%	–	27.5%	–	–	–	–
Hans Schevers	R	19.3%	–	–	19.3%	19.3%	–	–	–	–
Michael Syme	R	7.5%	–	7.5%	–	7.5%	–	–	–	–
Grace Tjandraatmadja	R	2.9%	–	2.9%	–	2.9%	–	–	–	–
Gerry Trinidad	R	16.1%	–	16.1%	–	16.1%	–	–	–	–
Selwyn Tucker	R	13.1%	–	13.1%	–	13.1%	–	–	–	–
Angela Williams	R	0.3%	–	0.3%	–	0.3%	–	–	–	–
Kwok-Keung Yum	R	13.8%	–	13.8%	–	13.8%	–	–	–	–
TOTAL CONTRIBUTED (% of PERSON YEARS)		535.9%	12.7%	403.3%	90.7%	507.1%	0.0%	0.0%	6.8%	22.0%

[1]As per the erratum for the 2004–05 CRC for Construction Innovation Annual Report, in 2004–05 Dr Peter Newton's % actual time was incorrectly reported as 18%. It should have read 39%.

Curtin University of Technology

Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
Peter Davis	R	4.5%	–	–	–	4.5%	–	–	–	–
Peter Galvin	R	4.5%	–	–	–	4.5%	–	–	–	–
David Hedgcock	R	4.0%	–	–	–	4.0%	–	–	–	–
TOTAL CONTRIBUTED (% of PERSON YEARS)		12.9%	0.0%	0.0%	0.0%	12.9%	0.0%	0.0%	0.0%	0.0%

The University of Newcastle

Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
Graham Brewer	R	3.8%	3.8%	–	–	3.8%	–	–	–	–
John Burgess	R	11.3%	11.3%	–	–	11.3%	–	–	–	–
Rod Halligan	R	10.0%	10.0%	–	–	10.0%	–	–	–	–
Marcus Jeffries	R	7.2%	7.2%	–	–	7.2%	–	–	–	–
Anton Kriz	R	2.5%	2.5%	–	–	2.5%	–	–	–	–

The University of Newcastle cont.										
Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
Kerry London	R	82.1%	69.3%	–	–	75.5%	3.8%	0.1%	1.5%	1.3%
Amir Mahmood	R	5.0%	5.0%	–	–	5.0%	–	–	–	–
Adrian Page	R	0.7%	–	–	–	0.0%	–	–	0.7%	–
Willy Sher	R	4.9%	–	4.9%	–	4.9%	–	–	–	–
Tony Williams	R	7.3%	–	6.0%	–	6.0%	1.3%	–	–	–
Loong Wong	R	2.5%	2.5%	–	–	2.5%	–	–	–	–
TOTAL CONTRIBUTED (% of PERSON YEARS)		137.2%	111.5%	10.9%	0.0%	128.7%	5.0%	0.1%	2.2%	1.3%
QUT										
Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
John Bell	R	1.3%	–	–	–	1.3%	–	–	–	–
Martin Betts	R	16.5%	7.5%	–	0.5%	8.0%	8.5%	–	–	–
Bert Biggs	R	25.0%	25.0%	–	–	25.0%	–	–	–	–
Peter Black	R	3.7%	3.7%	–	–	3.7%	–	–	–	–
Terry Boyd	R	0.6%	–	–	–	0.6%	–	–	–	–
Kerry Brown	R	22.5%	22.5%	–	–	22.5%	–	–	–	–
Michael Charles	A	40.0%	2.5%	–	–	40.0%	–	–	–	–
Sharon Christensen	R	16.3%	16.3%	–	–	16.3%	–	–	–	–
Andrew Colin	R	1.3%	1.3%	–	–	1.3%	–	–	–	–
Chris Cook	A	0.3%	–	–	–	0.3%	–	–	–	–
Ian Cowling	R	1.3%	–	1.3%	–	1.3%	–	–	–	–
Steve Coyne	R	4.4%	–	4.4%	–	4.4%	–	–	–	–
Phil Crowther	R	2.5%	–	2.5%	–	2.5%	–	–	–	–
Ed Dawson	R	1.8%	1.8%	–	–	1.8%	–	–	–	–
Nur Demirbilek	R	7.5%	–	7.5%	–	7.5%	–	–	–	–
Bill Duncan	R	2.5%	2.5%	–	–	2.5%	–	–	–	–
Ernest Foo	R	24.7%	24.7%	–	–	24.7%	–	–	–	–
Ian Foote	A	1.1%	–	–	–	1.1%	–	–	–	–
Andrew Frowd	R	3.4%	–	–	3.0%	3.4%	–	–	–	–
Natalie Gallery	R	10.0%	10.0%	–	–	10.0%	–	–	–	–
Sue Gay	A	3.7%	–	–	–	3.7%	–	–	–	–
Malcolm Goddard	A	0.3%	–	–	–	0.3%	–	–	–	–
Jan Harrington	A	3.1%	–	–	–	0.0%	–	–	–	3.1%
John Hayes	R	2.9%	–	2.9%	–	2.9%	–	–	–	–
Mark Haynes	A	19.8%	–	14.0%	–	19.8%	–	–	–	–
Ross Hayward	R	10.0%	–	10.0%	–	10.0%	–	–	–	–
Matthew Humphreys	R	2.5%	–	–	2.5%	2.5%	–	–	–	–
Audun Josang	R	1.3%	1.3%	–	–	1.3%	–	–	–	–
Stephen Kajewski	R	15.0%	–	–	15.0%	15.0%	–	–	–	–
Norm Katter	R	5.8%	5.8%	–	–	5.8%	–	–	–	–
Robyn Keast	R	5.5%	5.5%	–	–	5.5%	–	–	–	–
Rosemary Kennedy	R	4.8%	–	4.8%	–	4.8%	–	–	–	–
Simon Kohlhardt	A	0.3%	–	–	–	0.3%	–	–	–	–
Anne Krupa	A	9.1%	–	–	–	8.5%	–	–	–	0.6%
Arun Kumar	R	16.3%	1.3%	–	2.5%	3.8%	12.5%	–	–	–
Donald Lam	A	1.7%	–	–	–	1.7%	–	–	–	–
Yuefeng Li	R	0.3%	–	0.3%	–	0.3%	–	–	–	–
Karen Manley	R	15.0%	15.0%	–	–	15.0%	–	–	–	–
Paula McDonald	R	1.3%	1.3%	–	–	1.3%	–	–	–	–

QUT cont.										
Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
Lidia Morawska	R	1.3%	–	1.3%	–	1.3%	–	–	–	–
Andreas Nata-atmadja	R	6.3%	–	–	6.3%	6.3%	–	–	–	–
Richi Nayak	R	6.8%	–	6.8%	–	6.8%	–	–	–	–
Danny O'Hare	R	0.6%	–	0.6%	–	0.6%	–	–	–	–
Alannah Rafferty	R	2.5%	2.5%	–	–	2.5%	–	–	–	–
Steve Rowlinson	R	15.6%	15.6%	–	–	15.6%	–	–	–	–
Neal Ryan	R	33.5%	8.5%	–	–	21.0%	–	–	–	12.5%
Mark Seydel	A	0.4%	–	–	–	0.4%	–	–	–	–
Abdul Sharif	A	0.3%	–	–	–	0.3%	–	–	–	–
Roland Simons	R	0.8%	0.8%	–	–	0.8%	–	–	–	–
Debbie Smit	R	81.3%	21.3%	–	30.0%	51.3%	30.0%	–	–	–
Steve Su	R	12.5%	12.5%	–	–	12.5%	–	–	–	–
Andrew Townsend	A	10.0%	–	–	–	10.0%	–	–	–	–
Roger Willett	R	6.9%	6.9%	–	–	6.9%	–	–	–	–
Craig Windell	A	0.8%	–	–	–	0.8%	–	–	–	–
Yue Xu	R	1.5%	–	1.5%	–	1.5%	–	–	–	–
Jay Yang	R	21.3%	–	–	21.3%	21.3%	–	–	–	–
Jinglan Zhang	R	2.0%	–	2.0%	–	2.0%	–	–	–	–
TOTAL CONTRIBUTED (% of PERSON YEARS)		508.9%	215.8%	59.7%	81.0%	441.7%	51.0%	0.0%	0.0%	16.2%

RMIT										
Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
Guillermo Aranda-Mena	R	15.9%	6.8%	–	9.2%	15.9%	–	–	–	–
Nick Blismas	R	7.5%	7.5%	–	–	7.5%	–	–	–	–
Tim Grant	R	2.5%	–	2.5%	–	2.5%	–	–	–	–
Rebecca Gravina	R	7.5%	–	–	7.5%	7.5%	–	–	–	–
Carolyn Hayles	A	4.5%	4.5%	–	–	4.5%	–	–	–	–
Arun Kumar	R	30.0%	–	–	30.0%	30.0%	–	–	–	–
Helen Lewis	R	2.1%	–	2.1%	–	2.1%	–	–	–	–
Helen Lingard	R	5.0%	5.0%	–	–	5.0%	–	–	–	–
Tom Molyneaux	R	30.0%	–	–	30.0%	30.0%	–	–	–	–
Sujeeva Setunge	R	40.0%	–	–	40.0%	40.0%	–	–	–	–
Ron Wakefield	R	20.8%	19.0%	–	1.8%	20.8%	–	–	–	–
Derek Walker	R	7.5%	2.5%	–	–	2.5%	5.0%	–	–	–
TOTAL CONTRIBUTED (% of PERSON YEARS)		173.3%	45.3%	4.6%	118.4%	168.3%	5.0%	0.0%	0.0%	0.0%

The University of Sydney										
Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
Kirsty Beilharz	R	2.5%	–	–	–	0.0%	2.5%	–	–	–
Robert Czernkowski	R	0.3%	0.3%	–	–	0.3%	–	–	–	–
Andy Dong	R	22.5%	–	2.5%	18.8%	22.5%	–	–	–	–
Natalie Gallery	R	2.5%	2.5%	–	–	2.5%	–	–	–	–
Leslie George	A	5.5%	–	–	–	4.6%	–	–	–	1.0%
John Gero	R	7.5%	–	3.8%	–	3.8%	3.8%	–	–	–
Philip Granger	A	1.3%	–	–	–	0.8%	–	–	–	0.5%
Megan Haig	A	3.0%	–	–	–	0.0%	–	–	–	3.0%
Mary-Louise Huppatz	A	3.0%	–	–	–	0.0%	–	–	–	3.0%
Stewart Jones	R	0.3%	0.3%	–	–	0.3%	–	–	–	–

The University of Sydney cont.										
Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
Thomas Kvan	A	2.5%	–	–	–	0.0%	–	–	–	2.5%
Ai Lin Lee	A	1.6%	–	–	–	0.0%	–	–	–	1.6%
David Leifer	R	13.2%	–	–	13.2%	13.2%	–	–	–	–
Mary Lou Maher	R	37.5%	–	15.0%	13.8%	30.0%	3.8%	–	–	3.8%
Mercedes Paulini	A	2.0%	–	–	–	0.6%	–	–	–	1.4%
Gary Moore	A	2.5%	–	–	–	0.0%	–	–	–	2.5%
Rick Moss	A	2.8%	–	–	–	2.0%	–	–	–	0.8%
Joe Nappa	A	3.1%	–	–	–	2.0%	–	–	–	1.1%
Suzanne Roberts	A	16.3%	–	–	–	0.0%	–	–	–	16.3%
Michael Rosenman	R	13.8%	–	13.8%	–	13.8%	–	–	–	–
Julian Tam	A	13.0%	–	–	–	9.1%	–	–	–	3.9%
Lisette Tennant	A	1.3%	–	–	–	0.0%	–	–	–	1.3%
Fiona Thomas	A	2.2%	–	–	–	0.0%	–	–	–	2.2%
Jason Thorne	A	8.6%	–	–	–	4.0%	–	–	–	4.6%
Alan Tracey	R	2.1%	–	–	2.1%	2.1%	–	–	–	–
TOTAL CONTRIBUTED (% of PERSON YEARS)		170.5%	3.0%	35.0%	47.8%	111.3%	10.0%	0.0%	0.0%	49.2%
University of Western Sydney										
Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
Don Dingsdag	R	27.5%	27.5%	–	–	27.5%	–	–	–	–
Rosemary Dorrough	A	3.0%	–	–	–	0.0%	–	–	–	3.0%
Mary Hardie	R	36.3%	25.0%	11.3%	–	36.3%	–	–	–	–
Lesley Hayes	A	3.0%	0.5%	0.8%	0.8%	3.0%	–	–	–	–
Shahed Khan	A	5.5%	–	5.5%	–	5.5%	–	–	–	–
Graham Miller	R	27.2%	2.5%	12.5%	10.0%	26.0%	0.4%	0.1%	0.5%	0.3%
TOTAL CONTRIBUTED (% of PERSON YEARS)		102.5%	55.5%	30.0%	10.8%	98.3%	0.4%	0.1%	0.5%	3.3%

* Research total includes Research Administration in some cases

Staff Table 2

CRC Paid Program Staff

Name	Employing organisation	Main activity	Total % of time	% spent on Research Program				% spent on Education Program	% spent on External Comm.	% spent on Commer-cialisation	% spent on CRC Adminis-tration
				Subprogram			Total on Research				
				A	B	C					
Adel Fadhi Noor Ahmed	USYD	R	37%	–	37%	–	37%	–	–	–	–
Sugiharto Alwi	QUT	R	100%	–	–	100%	100%	–	–	–	–
Guillermo Aranda-Mena	RMIT	R	75%	75%	–	–	75%	–	–	–	–
Mohammed Babsail	USYD	R	5%	–	–	5%	5%	–	–	–	–
Graham Bailey	QUT	R	4%	–	4%	–	4%	–	–	–	–
Nathan Bavinton	UN	R	45%	45%	–	–	45%	–	–	–	–
Thomas Bellamy	UN	R	79%	9%	70%	–	79%	–	–	–	–
Zafer Bilda	USYD	R	43%	–	43%	–	43%	–	–	–	–
Brian Bing Yan Lee	USYD	R	10%	–	–	10%	10%	–	–	–	–
Peter Black	QUT	R	7%	7%	–	–	7%	–	–	–	–
Fanny Boulaire	CSIRO	R	57%	–	57%	–	57%	–	–	–	–
Peter Boxhall	CSIRO	R	18%	–	18%	–	18%	–	–	–	–
Angela Bradbury	CSIRO	R	3%	–	3%	–	3%	–	–	–	–
Steven Brown	CSIRO	R	4%	–	4%	–	4%	–	–	–	–
Gillian Bullock	CSIRO	R	7%	–	7%	–	7%	–	–	–	–
Michael Charles	QUT	R	7%	7%	–	–	7%	–	–	–	–
Wan Yee Chan	CSIRO	R	35%	–	35%	–	35%	–	–	–	–
Giang Chau	USYD	R	14%	–	14%	–	14%	–	–	–	–
Jessica Chen	UN	R	100%	100%	–	–	100%	–	–	–	–
Fiona Cheung	QUT	R	80%	80%	–	–	80%	–	–	–	–
Lawrence Cheung	CSIRO	R	3%	–	3%	–	3%	–	–	–	–
Sharon Christensen	QUT	R	9%	9%	–	–	9%	–	–	–	–
Penny Corrigan	CSIRO	R	10%	–	10%	–	10%	–	–	–	–
Nicola Croce	UN	R	14%	14%	–	–	14%	–	–	–	–
Phil Crowther	QUT	R	1%	–	1%	–	1%	–	–	–	–
Yohann Daruwala	USYD	R	57%	–	–	57%	57%	–	–	–	–
Clare Diaper	CSIRO	R	15%	–	15%	–	15%	–	–	–	–
Lan Ding	CSIRO	R	37%	–	–	37%	37%	–	–	–	–
Rong Du	QUT	R	14%	14%	–	–	14%	–	–	–	–
Bill Duncan	QUT	R	2%	2%	–	–	2%	–	–	–	–
Ben Egan	UN	R	12%	12%	–	–	12%	–	–	–	–
Stephen Egan	CSIRO	R	75%	–	75%	–	75%	–	–	–	–
Phoebe Everingham	UN	R	20%	20%	–	–	20%	–	–	–	–
Deborah Fayers	QUT	R	8%	8%	–	–	8%	–	–	–	–
Susan Fower	UN	R	9%	9%	–	–	9%	–	–	–	–
Craig Furneaux	QUT	R	100%	100%	–	–	100%	–	–	–	–
Praveen Gauravaram	QUT	R	22%	22%	–	–	22%	–	–	–	–
Juanma Gonzelez-Nieto	QUT	R	25%	25%	–	–	25%	–	–	–	–
Carole Green	CRC HQ	A	100%	3.3%	3.3%	3.3%	10%	10%	10%	15%	55%
Leman Gul	USYD	R	35%	–	35%	–	35%	–	–	–	–
Murray Hall	CSIRO	R	15%	–	15%	–	15%	–	–	–	–
Andrew Hampson	UN	R	25%	25%	–	–	25%	–	–	–	–
Keith Hampson	CRC HQ	R	100%	8.3%	8.3%	8.3%	25%	10%	20%	20%	25%
Mary Hardie	UWS	R	85%	7%	28%	50%	85%	–	–	–	–
Janet Henriksen	USYD	R	20%	–	–	20%	20%	–	–	–	–
Ying-Hsiu Huang	USYD	R	40%	–	40%	–	40%	–	–	–	–
Melissa James	CSIRO	R	60%	–	–	60%	60%	–	–	–	–

Staff Table 2 cont.

CRC Paid Program Staff

Name	Employing organisation	Main activity	Total % of time	% spent on Research Program				% spent on Education Program	% spent on External Comm.	% spent on Commer-cialisation	% spent on CRC Adminis-tration
				Subprogram			Total on Research				
				A	B	C					
Selva Jeyachandran	QUT	R	85%	–	–	85%	85%	–	–	–	–
David Johnson	CSIRO	R	1%	–	–	–	–	–	–	1%	–
Renae Jones	QUT	R	27%	27%	–	–	27%	–	–	–	–
Julie Jupp	USYD	R	13%	–	13%	–	13%	–	–	–	–
Kathryn Kasmarik Merrick	USYD	R	43%	–	43%	–	43%	–	–	–	–
Robyn Keast	QUT	R	9%	9%	–	–	9%	–	–	–	–
Steven Kenway	CSIRO	R	5%	–	5%	–	5%	–	–	–	–
Mi Jeong Kim	USYD	R	20%	–	20%	–	20%	–	–	–	–
Loretta Kivlighon	CSIRO	R	89%	–	89%	–	89%	–	–	–	–
Lisa Kunert	RMIT	R	25%	–	–	25%	25%	–	–	–	–
Soon Kam Lim	QUT	R	25%	–	–	25%	25%	–	–	–	–
Frank Lin	QUT	R	60%	–	–	–	–	60%	–	–	–
Owen Macindoe	USYD	R	22%	–	22%	–	22%	–	–	–	–
Mary Lou Maher	USYD	R	25%	–	25%	–	25%	–	–	–	–
Karen Manley	QUT	R	85%	85%	–	–	85%	–	–	–	–
Katherine Martindale	USYD	R	10%	–	–	10%	10%	–	–	–	–
John Mashford	CSIRO	R	6%	–	6%	–	6%	–	–	–	–
Brendan McCarthy	QUT	R	6%	–	6%	–	6%	–	–	–	–
Kevin McDonald	CSIRO	R	84%	–	84%	–	84%	–	–	–	–
Stephen McFallan	CSIRO	R	4%	4%	–	–	4%	–	–	–	–
Cheryl McNamara	CSIRO	R	17%	–	17%	–	17%	–	–	–	–
Jonathan Mentink	UN	R	15%	15%	–	–	15%	–	–	–	–
Paulini Mercedes	USYD	R	40%	–	40%	–	40%	–	–	–	–
Daniyal Mian	QUT	R	5%	–	–	5%	5%	–	–	–	–
Anne Miller	CSIRO	R	43%	–	43%	–	43%	–	–	–	–
Tim Muster	RMIT	R	5%	–	5%	–	5%	–	–	–	–
Anthony Nguyen	QUT	R	70%	–	70%	–	70%	–	–	–	–
Gu Ning	USYD	R	8%	–	8%	–	8%	–	–	–	–
Angela O'Donnell	CSIRO	R	75%	–	75%	–	75%	–	–	–	–
David Paterson	CSIRO	R	4%	–	4%	–	4%	–	–	–	–
Wei Peng	USYD	R	10%	–	10%	–	10%	–	–	–	–
Chintha Perera	RMIT	R	50%	–	–	50%	50%	–	–	–	–
Janet Pillay	QUT	R	54%	54%	–	–	54%	–	–	–	–
Anthony Piyatrapoomi	RMIT	R	100%	–	–	100%	100%	–	–	–	–
Margaret Pope	USYD	R	5%	–	–	5%	5%	–	–	–	–
Nicholas Preema	USYD	R	14%	–	14%	–	14%	–	–	–	–
Shaun Purcell	UN	R	16%	16%	–	–	16%	–	–	–	–
Rachel Ryan	QUT	R	20%	20%	–	–	20%	–	–	–	–
Dirk Schwede	USYD	R	35%	–	–	35%	35%	–	–	–	–
Peter Scuderi	CRC HQ	R	100%	20%	20%	20%	60%	10%	10%	10%	10%
Vaughn Sheahan	UWS	R	100%	100%	–	–	100%	–	–	–	–
Xiaobin Shen	USYD	R	43%	–	43%	–	43%	–	–	–	–
Susan Sheratt	UN	R	18%	–	18%	–	18%	–	–	–	–
Nicholas Shields	UN	R	5%	–	–	–	–	5%	–	–	–
Roland Simons	QUT	R	20%	20%	–	–	20%	–	–	–	–
Paul Smith	QUT	R	48%	–	–	48%	48%	–	–	–	–
Linden Spindler	QUT	R	11%	11%	–	–	11%	–	–	–	–

Staff Table 2 cont.

CRC Paid Program Staff

Name	Employing organisation	Main activity	Total % of time	% spent on Research Program				% spent on Education Program	% spent on External Comm.	% spent on Commer-cialisation	% spent on CRC Adminis-tration
				Subprogram			Total on Research				
				A	B	C					
Tony Stapeldon	CSIRO	R	80%	–	80%	–	80%	–	–	–	–
Nicholas Stenson	QUT	R	5%	5%	–	–	5%	–	–	–	–
Glenda Strong	QUT	R	4%	–	4%	–	4%	–	–	–	–
Denise Sweeney	UN	R	15%	–	–	–	–	15%	–	–	–
Emma Thompson	QUT	R	31%	–	–	31%	31%	–	–	–	–
Grace Tjandramadja	CSIRO	R	8%	–	8%	–	8%	–	–	–	–
Gerardo Trinidad	CSIRO	R	4%	–	4%	–	4%	–	–	–	–
Selwyn Tucker	CSIRO	R	1%	–	–	–	–	–	–	1%	–
Srikanth Venkatesan	RMIT	R	100%	–	–	100%	100%	–	–	–	–
Darren Wishart	QUT	R	7%	7%	–	–	7%	–	–	–	–
Jeremy Wu	USYD	R	50%	–	–	50%	50%	–	–	–	–
Emily Yip	CSIRO	R	9%	–	9%	–	9%	–	–	–	–
Kwok–Keung Yum	CSIRO	R	65%	–	65%	–	65%	–	–	–	–
Ji Soo Yoon	USYD	R	20%	–	20%	–	20%	–	–	–	–
Guomin Zhang	QUT	R	25%	–	–	25%	25%	–	–	–	–
Beth Zshornack	CSIRO	R	50%	–	50%	–	50%	–	–	–	–
TOTAL CRC			3555%	995%	1409%	865%	3268%	110%	40%	47%	90%

Staff Table 3

Summary of contribution in Person Years

	Total equiv. Person Years	Person Years Spent on Research Program				Person Years spent on Education	Person Years spent on External Comm.	Person Years spent on Comm-ercialisation	Person Years spent on CRC Admin.
		Subprogram			Total on Research				
		A	B	C					
TOTAL CONTRIBUTED	22.4	5.4	7.1	4.8	19.5	0.8	0.2	0.2	1.7
TOTAL FUNDED BY CRC	35.5	9.9	14.1	8.6	32.7	1.1	0.4	0.5	0.9
GRAND TOTAL	58.0	15.4	21.2	13.5	52.1	1.9	0.6	0.7	2.6
Proportion of total professional staff resources	100%	27%	36%	23%	90%	3%	1%	1%	5%

CRC Construction Innovation

BUILDING OUR FUTURE

Cooperative Research Centre for *Construction Innovation*
9th Floor, L Block, QUT Gardens Point, 2 George Street, Brisbane QLD 4000 Australia
Telephone: (07) 3864 1393 Email: enquiries@construction-innovation.info Web: www.construction-innovation.info