

ANNUAL REPORT 2004-05



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



CRC Construction Innovation
BUILDING OUR FUTURE

Partners in progress

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Industry

ARUP



dem



Government



Queensland Government
Department of Main Roads



Queensland Government
Department of Public Works



Queensland Government
State Development and Innovation

Research



The University of Sydney



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CRC objectives

CRC for Construction Innovation — Building our future

Leaders in property and construction research

With 19 industry, government and research partners, the Cooperative Research Centre (CRC) for *Construction Innovation* is well positioned to achieve its vision to lead the Australian property and construction industry in innovation and collaboration. Our vision takes us across Australia and around the globe.

We value:

collaboration
respect for people
integrity
research excellence
innovation and sustainability
leadership responsibility.

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.

Participants

Industry

Arup Australasia
Bovis Lend Lease
Brookwater
DEM
John Holland
Rider Hunt
Woods Bagot

Government

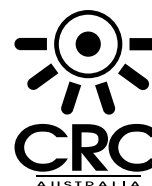
Australian Building Codes Board
Brisbane City Council
Building Commission
Queensland Department of Main Roads
Queensland Department of Public Works
Queensland Department of State Development and Innovation

Research

Commonwealth Scientific and Industrial Research Organisation (CSIRO)
Queensland University of Technology
RMIT University
The University of Newcastle
The University of Sydney
University of Western Sydney

The CRC for *Construction Innovation* is a national collaboration involving 19 industry, government and research partners and has been made possible through a \$14 million Federal Government grant through the CRC Program complemented by \$50 million of cash and in-kind support from industry, research and other government partners. This CRC commenced in July 2001. *Construction Innovation's* headquarters is based at Queensland University of Technology in Brisbane.

CRCs bring together researchers from universities, CSIRO, and private industry or public sector agencies, in long-term collaborative arrangements which support research and development and education activities that achieve real outcomes of national economic and social significance.



Executive summary

Chair's insight — John McCarthy



With half of our first life completed as a CRC, *Construction Innovation* is 'hitting the mark'! Our CRC is changing the landscape in how our industry members, partners and participants relate with one another. In this industry, renowned for its fragmented and adversarial traditions, *Construction Innovation* is being embraced as the model to bring industry, government and research participants together to advance our industry. Leading-edge research, focussed education and training activities, and business benefits through uptake of research outcomes and commercialisation have changed the way our industry operates. This is evident through our increasing core participant network, our increased external income, the clear majority of our existing partners committed to our renewal bid in 2006, and our international reputation as the applied research leader in this region of the world.

The fundamental support that the Queensland University of Technology has provided as the Australian headquarters of the CRC and the early commitment it has shown to further strengthen this role in our CRC's next life must be roundly commended. QUT's support from the beginning has been a hallmark to the success of this industry research initiative.

My ongoing role as Director of the International Council for Research and Innovation in Building and Construction (CIB) Board has highlighted the value our CRC is delivering to Australia. The CRC for *Construction Innovation* stands as a model for applied research collaboration. It is recognised as a leader in bringing benefits of research to industry, and upskilling our industry and research community to deliver mutually beneficial outcomes. In my experience, this symbiotic relationship developed through *Construction Innovation* is unique globally.

I acknowledge the contribution the Australian Government has made to advancing our industry through the CRC Programme and the insight and commitment of our CRC partner group. Our industry has benefited from the investment of intellect, commitment and cash. I also acknowledge the Australian Government's support through the Minister for Industry, Tourism and Resources, Ian McFarlane, MP; the Minister for Environment and Heritage, Senator Ian Campbell; and the Minister for Education, Brendan Nelson, MP. Their support of our ongoing initiatives has assisted in galvanising industry support for our CRC.

The Governing Board of our CRC continues to operate as a coherent, powerful and strategically focussed team of advisors. We are fortunate to benefit from such a highly competent and motivated Board committed to the long-term performance of our CRC.

There is no more compelling reason for our CRC participants to commit to our renewal bid in 2006 than the recognition that our job of transforming the Australian construction industry has begun in earnest. Our CRC is making inroads in advanced IT research to improve productivity, site safety projects to protect the health and welfare of our workers, changing the culture of teams and the way individuals work together in relationship contracting, and skilling up a new breed of industry-savvy PhD and Master's graduates to serve our industry in the decades to come. We are well positioned for renewal next year to build on existing industry investment and support so needed in this vital industry sector.

I look forward to continuing to work closely and productively with our Chief Executive Officer, Dr Keith Hampson, and the dedicated and professional staff that comprise *Construction Innovation*.

CEO's report — Keith Hampson

This past year has been symbolised by achievement and challenge.

Our achievements have been significant — for this report I have selected just five to outline.

Inaugural Clients Driving Innovation International Conference

Our CRC's first International Conference brought together 210 people across 12 countries to explore international leading research and industry practice. The Gold Coast conference provided a powerful context for industry, government and research partners to exchange ideas and establish or renew important personal relationships. This Conference established our CRC on the global scene and reinforced the leadership of our partner network. Feedback from attendees was most enthusiastic with commitments for ongoing participation from sponsors and attendees that will ensure our Second Conference themed *Moving Ideas into Practice* scheduled for 12–14 March 2006 will be a resounding success. This Second Conference will focus more explicitly on implementing applied research outcomes to industry practice, and examine and evaluate the business outcomes.

Delivering high-impact research and commercialisation

Moving ideas into practice by applying high-impact research outcomes to industry is a current challenge for which I am pleased to confirm significant success.

Nine projects were completed during 2004–05. For example, the *Noise Management in Urban Environment Project* [DeSilva, RMIT] 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 3D CAD model, 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. This CRC tool is being trialled across CRC partners and associates in Australia and in Europe. I am confident that the next period will see commercialisation of *LCADesign* as a valuable industry tool.

The focus of our CRC for *Construction Innovation's* research outcomes in improving industry practice has already delivered significant benefits for our participants, our industry and the Australian community. For example, the reappraisal of Queensland Main Road Department's testing regime has demonstrated almost \$4 million in savings on road pavement testing for the Queensland roads network. Our BRITE Project continues to encourage SMEs from the construction materials, consulting, construction and facility 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. Finally, the suite of projects developing advanced IT solutions in sustainability and construction planning are already *making waves* in the national and international arena, with detailed commercialisation discussions continuing into this next period.

Education and training

Throughout this last year our CRC has implemented a targeted education and training program across our participant group and the industry. We have successfully convened industry breakfasts, partner and industry workshops and the uptake of CRC applied research outcomes into the curriculum of our university partners. As we move into this next period, the development of e-learning modules taking CRC for *Construction Innovation* content and shaping it for the national and international market will be advanced, together with the integration of a number of our project outcomes into global programs. The publication of our *Reports to Industry* has been initiated with industry-focussed booklets providing ready access for the property, design, construction and facility management sectors to leading-edge industry research.

New partners

Our CRC has successfully captured the ongoing engagement of our major partners in addition to securing fresh core partnership of the Queensland Building Services Authority (QBSA). The QBSA has the integrated responsibility for licensing and regulatory enforcement of the Queensland building and construction industry. Additionally, discussions with the Western Australian Government continue to be positive with a decision expected soon on their whole-of-government engagement with our CRC. The Curtin University of Technology is also expected to join in the next period. The growing support of our CRC at this mature stage of our life is indeed gratifying, providing enthusiasm for our existing and future potential partners to continue to partner with us for the future.

Your Building Project

A significant 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 on 15 June 2005. This web-based portal called *Your Building* will provide Australian industry with an integrated resource promoting business and the technical case for sustainability in commercial buildings. It will provide owners, designers, constructors, and property managers with a *one stop shop* that provides business and technical guidelines to enhance the environmental sustainability of new and existing commercial building stock. In particular, more sustainable use of energy and water will be promoted. This CRC for *Construction Innovation* project consolidates our CRC's relationship with ASBEC and provides a clear national and international leadership position for our CRC partners.



Our goal to make a real and lasting difference to our industry drives us to our strategic pathway to renewal. Our Board and partner network are committed to a second round CRC application in early 2006. The strength of our existing partner commitments to our renewal, together with fresh industry partner interest, is indeed gratifying. The fresh partners in QBSA and our developing relationship with Western Australia through WA Government and Curtin University provide confidence that membership of our CRC is a valued industry leadership position. Our focus in this next period in preparing a winning renewal bid is a priority. I am delighted to confirm our Chair's commitment to working with us through the renewal process and into our new CRC's life.

Delivering real outcomes for the Australian property, design, construction and facility management industry remains one of the most satisfying challenges for the future. We have a highly effective and well functioning Board providing strategic direction, supported by almost 400 individuals across Australia committed to making a difference. I am confident that these industry leaders together with our close-knit and motivated headquarters team are well equipped for the future challenges in this next stage of our life. I remain committed to working with our untiring Board Chair, John McCarthy, in continuing to deliver real benefits for our partners, the industry and our community.

Governance, structure and management

The CRC for *Construction Innovation* is an unincorporated joint venture governed by a Board comprising ten nominees from the 19 CRC Participants and an independent industry Chair.

Icon.Net Pty Ltd has been established to hold all CRC intellectual property. It acts as a trustee on behalf of *Construction Innovation* participants. The Chair of the Governing Board also chairs meetings of the directors of Icon.Net Pty Ltd.

The Governing Board's committee structure as shown in the organisational structure below supports the Board by facilitating informed decision-making.

Leading *Construction Innovation* is Dr Keith Hampson in the role of CEO. He is assisted in the Senior Management Team by Carole Green, Business Manager, and Peter Scuderi, Development Manager. The Senior Management Team is supported by the Research Leadership Team which consists of the Chair — Research Committee, three Program and three Deputy Program Directors, and the ICT Platform Director and Deputy. The Research Leadership Team meets fortnightly with the CEO, Business Manager and Development Manager in leading and managing the Research Program.

Six additional positions located in our Queensland University of Technology (QUT) headquarters support the activities of *Construction Innovation*. They are:

- Administration Officer
— Catrina Waterson
- Finance Officer
— Sue Hunt/Chantelle Beers
- Communication Officer
— Colleen Foelz
- Administration Officer, Research
— Lauren Gubbin
- Administration Officer, Education
— Yvonne Gilbert
- Administration Support Officer
— Winnie Ngai.

Other than the Research Committee described on pages 8–9, other committees include:

- The Remuneration Committee, which meets in concert with the quarterly Board meetings. It provides advice regarding the remuneration levels for the Senior Management Team. The members of this committee are John McCarthy (Chair); Larry Little, CSIRO; John Oliver, Rider Hunt; Glenn Palin, John Holland; and Arun Sharma, Queensland University of Technology.

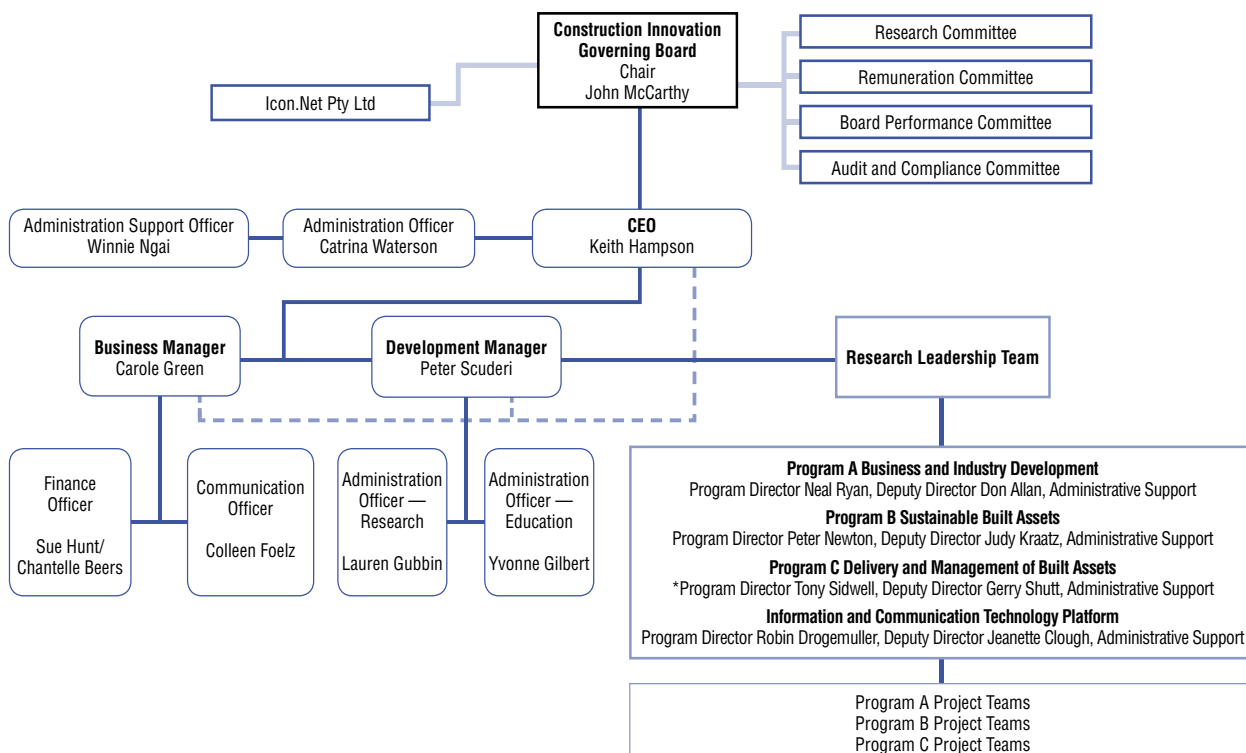
- The members of the Board Performance Committee are Don Allan, Queensland Department of Public Works (Chair); Gary Moore, The University of Sydney; John Oliver, Rider Hunt Sydney; and Carole Green, Business Manager CRC for *Construction Innovation*.

- The Audit and Compliance Committee, newly formed this year, has met twice. The objectives of this committee are to:

- assist the board in fulfilling its responsibilities relating to accounting and reporting practices
- improve the credibility and objectivity of the Centre's financial and other reports
- strengthen the systems of internal controls, risk management and compliance with the Centre Agreement, and applicable laws and regulations.

The 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, Business Manager CRC for *Construction Innovation*.

CRC for *Construction Innovation* Organisation Structure



*Tony Sidwell resigned from the position effective Jan '05

The CRC headquarters team for *Construction Innovation*

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

1 Dr Keith Hampson

Chief Executive Officer of CRC for *Construction Innovation* responsible for overall management and reporting to the Governing Board.

2 Carole Green

Business Manager responsible for the financial and contractual management of this CRC and its relationship with partners and the Commonwealth and for commercialisation.

3 Peter Scuderi

Development Manager responsible for our research programs and maximising the value of research outputs, education and training strategies, implementation and commercialisation.

4 Colleen Foelz

Communication Officer responsible for publications, media coverage, website and corporate image.

5 Sue Hunt/Chantelle Beers

Finance Officer responsible for financial administration and reporting of Centre activities and projects.

6 Yvonne Gilbert

Administration Officer — Education, provides support to education and training, and technology diffusion activities.

7 Lauren Gubbin

Administration Officer — Research, responsible for providing support to the research program.

8 Catrina Waterson

Administration Officer responsible for office support, personal assistance to CEO and first point of contact for the CRC.

9 Winnie Ngai

Administration Support Officer responsible for office support.



Governance, structure and management

Governing Board

The CRC for *Construction Innovation*'s Governing Board met four times in 2004–05, in Sydney, Brisbane, Melbourne and Canberra. The Governing Board is responsible for determining *Construction Innovation* strategy and policy on all matters relating to its objectives and activities and for ensuring these are carried out in accordance with the provisions of the Commonwealth and Centre Agreements. Our independent industry Chair, John McCarthy, has continued to chair the Governing Board most effectively.

During the year Sheila Shaver replaced Chung-Tong Wu as University of Western Sydney's representative. The three Queensland State Government representatives continued to rotate their attendance at Board meetings so that at any one meeting there were two in attendance until Mike Hefferan left his position at Queensland Department of State Development and Innovation in July 2004. The Queensland Government agencies have chosen to continue with only two representatives. Our Board members bring a wealth of experience and industry networks to *Construction Innovation*. The effectiveness of the Board is further enhanced by the dedication and continuity of the members.

1 Governing Board Chair, John McCarthy is recognised as one of the industry's leaders. 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) and Director of the International Council for Research and Innovation in Building and Construction (CIB). He is also an Adjunct Professor of QUT's School of Urban Development in the Faculty of Built Environment and Engineering. He is an Honorary Life Member and former Chairman/National President of the Property Council of Australia (PCA), founding Chairman of the Australian Sustainable Built Environment Council (ASBEC), and former Chairman of the Australian Construction Industry Forum (ACIF). 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 Building 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 Noel Faulkner is Divisional Manager of City Business Division, Brisbane City Council. City Business Division provides a broad range of services to Council including architectural, engineering, urban design, traffic and transport engineering as well as environmental and water management. Noel, a former Chief Executive Officer of a number of public and private utilities, holds tertiary qualifications in electrical engineering and postgraduate qualifications in management.

4 Mike Hefferan, during the period with the CRC, was the Executive Director of Industry Development Queensland, Department of State Development and Innovation, and responsible for government involvement in and support for Queensland industry, both in existing mainstream and new, high-growth sectors. He is Director of several companies and on the Board of three Cooperative Research Centres and several inter-government groups in industry development and applied research.

5 Larry Little has participated in industry groups including the Construction Industry Development Agency and the Joint Building Standards Policy Board. Larry was the Chief of CSIRO Manufacturing and Infrastructure Technology during 2004–05.

6 Gary Moore holds the Foundation Chair of Environment-Behaviour Studies and is the Dean of the Faculty of Architecture at The University of Sydney. Before coming to Australia, he was Director of the NASA Wisconsin Space Grant Consortium and Director of Architectural and Urban Planning Research at the University of Wisconsin. He is a past President of the Association of Architecture Schools of Australasia and current Chair of the Council of Deans of Architecture and the Built Environment.

7 John Oliver is Managing 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 projects with the smallest of budgets through to those in the hundreds of millions. His experience covers projects within the major cities of Australia, isolated civil projects and projects overseas. He has lectured in cost planning and economics to undergraduate and postgraduate courses and provided expert witness advice in legal disputes. John's skills lie in a hands-on approach, bringing his experience in contractual and cost planning matters together to provide risk-averse strategies.

8 Glenn Palin holds the position of General Manager, Northern Region and, as a Director of John Holland Pty Ltd, is responsible for all John Holland's building and engineering projects throughout Queensland and the Northern Territory.

9 Arun Sharma is the Deputy Vice-Chancellor (Research and Commercialisation) at the Queensland University of Technology. He was co-founder of National ICT Australia Limited (NICTA) and of the Cooperative Research Centre for Smart Internet Technology. Prior to establishing NICTA, he was the Head of the School of Computer Science and Engineering at UNSW. He is on the ICT Sector Advisory Committee of CSIRO and a member of the Queensland Premier's Smart State Council.

10 Sheila Shaver is Pro Vice-Chancellor (Research) at the University of Western Sydney. In this position she leads the strategic development and management of the University's research and research higher degree education. She was previously Professor of Sociology and Social Policy and Deputy Director of the Social Policy Research Centre at the University of New South Wales. Her main research interests are in comparative social policy and studies of the welfare state, poverty and social inequality, gender and social policy, and social and political theory. She holds a Bachelor of Arts from Stanford University and PhD from La Trobe University, and is a Fellow of the Academy of Social Sciences in Australia.

11 David Singleton is a Director of Arup Group Ltd (previously CEO of the Australasia Division of Arup), a member of the Global Board, Chairman of the Global Infrastructure Business and holds the Group Board portfolio for the firm's Corporate Sustainability. He is a Fellow of the Australian Academy of Technological Sciences and Engineering and an Honorary Fellow of Engineers Australia. He chairs the Building Standards Sector Board of Standards Australia and is a Past President of the Association of Consulting Engineers Australia.

12 Dennis Wogan is Executive Director of the Capability and Delivery Division in the Queensland Department of Main Roads. His area of responsibility covers 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.

13 Chung-Tong Wu was appointed to the position of Deputy Vice-Chancellor, Development and International at the University of Western Sydney in April 2002. A specialist in regional development planning, he has extensive research and professional involvement with international planning projects, especially in China, Indonesia, Malaysia, Taiwan and Vietnam.

14 Carole Green is Business Manager with the CRC for *Construction Innovation* responsible for the overall financial, contractual, reporting, promotional and human resources management and is also secretary to the Governing Board and Company Secretary to Icon Net Pty Ltd. Having previously worked in the commercial arm of a university she has a strong background and interest in the development of commercially focussed 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.

15 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's career has spanned these three sectors, where he has developed a reputation as an energetic leader with a strong blend of technical and management skills and formal qualifications gained through international experience and scholarship. Keith's engineering and business qualifications are capped by a PhD focussed on technology strategy and competitive performance in construction. Keith attends the Board meetings by invitation.



Attendance at CRC for *Construction Innovation* Governing Board meetings 2004-05

Board member	No. of meetings attended	No. attended by alternates
John McCarthy	4	
Don Allan	3	1
Noel Faulkner	4	
Larry Little	4	
Gary Moore	3	1
John Oliver	4	
Glenn Palin	4	
Arun Sharma	1	2
Sheila Shaver	3	
David Singleton	1	3
Chung-Tong Wu		1
Dennis Wogan	3	1
Keith Hampson (CEO)	4	
Carole Green (Board Secretary)	4	

Attendance at Icon.Net Pty Ltd Meetings 2004-05

Company officers	No. of meetings attended	No. attended by alternates
John McCarthy	2	
John Oliver	2	
Glenn Palin	2	
Arun Sharma	1	1
Sheila Shaver	2	
David Singleton	1	1
Keith Hampson (CEO)	2	
Carole Green (Company Secretary)	2	

Governance, structure and management

Research Committee

The Research Committee met four times during 2004–05 and continues to be effectively chaired by John Oliver, Managing Director of Rider Hunt, Sydney. The Research Committee 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



1 Research Committee Chair — John Oliver

John is Managing 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 projects with the smallest of budgets through to those in the hundreds of millions. His experience covers projects within the major cities of Australia, isolated civil projects and projects overseas. He has lectured in cost planning and economics to undergraduate and postgraduate courses and provided expert witness advice in legal disputes. John's skills lie in a hands-on approach, bringing his experience in contractual and cost planning matters together to provide risk-averse strategies.

Program A: Business and industry development



2 Director — Neal Ryan

Professor and Head, School of Management, QUT



3 Deputy Director — Don Allan

Director, Industry Policy Unit, Queensland Department of Public Works

Program B: Sustainable built assets



4 Director — Peter Newton

Chief Research Scientist, CSIRO Manufacturing and Infrastructure Technology



5 Deputy Director — Judy Kraatz

Group Manager, The Architecture Group, Brisbane City Council

Program C: Delivery and management of built assets



6 Director — Tony Sidwell

Professor of Construction Management, Queensland University of Technology (Resigned from the position effective at January 2005)



7 Deputy Director — Gerry Shutt

Group Manager, Knowledge Management, John Holland

ICT Platform



8 Director — Robin Drogemuller

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



9 Deputy Director — Jeanette Clough

IT Manager, Rider Hunt, Melbourne

Other Committee Members



10 Brian Ashe
Manager – Research, Australian Building Codes Board



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



12 Richard Hough
Principal, Arup Australasia



13 Arun Kumar
Associate Dean (Research & Development), Professor of Highway Engineering, Royal Melbourne Institute of Technology (replaced during the year by John Dalrymple)



14 Kerry London
Senior Lecturer, Postgraduate Director (Architecture and Industrial Design), The University of Newcastle



15 Mary Lou Maher
Professor of Design Computing, The University of Sydney



16 Peter Nassau
Director, Building Quality, Building Commission, Victoria



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



18 Yang Xiang
Associate Professor in Structural Engineering, School of Engineering and Industrial Design, University of Western Sydney

Secretary



19 Peter Scuderi
Development Manager, CRC for Construction Innovation

Headquarters Staff

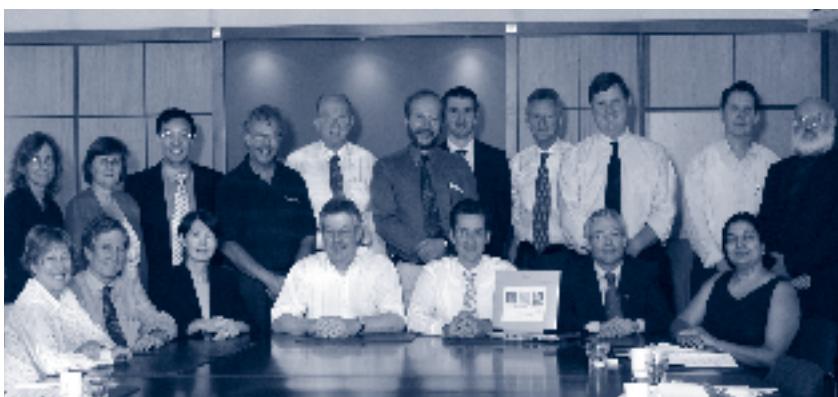


20 Keith Hampson
CEO, CRC for Construction Innovation



21 Carole Green
Business Manager, CRC for Construction Innovation

(below) *The Research Committee meeting in Brisbane, April 2005*



Commercialisation/technology transfer/utilisation

4.1 Commercialisation/utilisation strategies and activities

ICT Analysis tools

2001-006-B

Environmental assessment systems for commercial buildings
[Tucker, CSIRO] – (LCADesign)

2001-014-B

Automated code checking
[Drogemuller, CSIRO] – (DesignCheck)

2002-056-C

Contract planning workbench
[Drogemuller, CSIRO] – (Automated Scheduler)

2003-037-C

Stage 2 – Managing information flows with models and virtual environments [Drogemuller, CSIRO] – (Automatic Estimator)

Trials with four industry partners are being undertaken on five 3D CAD building information models to ensure user interfaces and software capabilities are in line with industry needs.

A market analysis has been undertaken as background for a business plan for the commercialisation of the ICT products suite. Three options have been identified as pathways to commercialisation:

- partner with organisation to distribute the (finished) CRC product
- sell CRC product to software vendor or other third party, who takes responsibility for ongoing development, or
- license product to software vendor or other third party while the CRC continues research and development and core product enhancement.

To provide more rigour to the market analysis and to flesh-out prospect opportunities, in May–June 2005 the Development Manager visited a number of major European CAD and software companies that are present in the global market. Specific action is planned early in this next period.

Decision-support tools

2001-011-C

Evaluation of functional performance in commercial buildings
[Boyd, QUT] – (*eValuBuild*)

eValuBuild has been successfully trialled with the Queensland Department of Public Works and has profitably informed decision-making processes within the organisation.

Our project leader has also been working with a major commercial property owner to develop a model of one of their buildings using *eValuBuild*. The result of this evaluation will determine the building owner's further interest in *eValuBuild*.

2001-010-C

Investment decision framework for infrastructure asset management
[Kumar, RMIT] – (OPTDATA)

OPTDATA has been trialled by the Queensland Department of Main Roads and has enabled the Department to collect four times as much data for road maintenance for the same level of expenditure. This equates to approximately \$4 million of savings for the government on state-wide data collection costs.

2002-010-B

Component life – Delphi approach to life prediction of building material components [Cole, CSIRO]

2002-059-B

Case-based reasoning in construction infrastructure projects [Cole, CSIRO]

Two databases of metal building components have been developed providing designers of the Queensland Department of Public Works and the Queensland Department of Main Roads with better information on the life prediction of materials in salt-air environments. The downstream effect of this is being examined, but the effect of reducing the cost of maintenance on school buildings and bridges in particular is substantiated.

2002-052-C

Value in project delivery systems – project diagnostics [Tsoukas, Arup]

This project assesses the health of construction projects and recommends remedial measures for poorly performing projects, and has been of great interest to Arup Australasia. Discussions during the second half of the financial year have increased the possibility of a licence arrangement with Arup. Different models and a draft licence agreement have been submitted to the Governing Board.

Technology Transfer program

The Technology Transfer program was guided from January to December 2004 by six-monthly meetings of a reference group comprising over 40 representatives from our partners, industry associations and training organisations. It was agreed in December 2004 that the strategy for guiding the Technology Transfer program would be revised, with meetings being replaced by a six-monthly communiqué detailing research program updates and resultant opportunities for reference group member organisations in dissemination of outcomes via seminars, workshops, short courses for continuous professional development, course curriculum development and/or online delivery.

Construction Innovation conducted the following significant events:

International conference

Construction Innovation's first international conference *Clients Driving Innovation* in October 2004 was as outstanding success. Two-hundred and ten people from 12 countries contributed to the vibrant mix of industry professionals and researchers. The positive feedback reinforced the valuable blend of the leading industry and research keynote speakers and the conference dinner address provided by the chair of John Holland Pty Ltd, Janet Holmes á Court.

Ninety-four papers were presented – 48 refereed papers and 46 industry case studies.

The benefit of exposing *Construction Innovation* to Australian and international industry researchers has been significant, providing the opportunity for knowledge-sharing and enhancing the profile of our CRC and its partners. This process will be leveraged into our second international conference scheduled for March 2006 themed *Moving Ideas into Practice*.

(at right)

*The Hon. Robert Swarten,
Minister for Public Works,
Housing and Racing
speaking at an industry
information breakfast.*

Industry information breakfasts

As part of *Construction Innovation's* commitment to disseminate research outcomes to industry and the broader community, several breakfast information sessions were conducted:

- *Differing 'Mindsets' Collaborating on Infrastructure*, Brisbane, August 2004 — The theme for presentations was about fostering the right culture for project success, particularly alliancing projects, predicated on developing a collaborative project culture.
- *The BRITE Construction Innovation Showcase*, Melbourne, September 2004 — Delegates were informed how the BRITE Project assists building and construction industry organisation in creating more positive attitudes towards innovation, expands perceived possibilities and reduces risks by demonstrating successful implementation strategies.
- *Seamless Web of Communication: A Client's Perspective*, Brisbane, October 2004 — Local and international presenters talked about the need for communication and data transfer in the building and construction industry to be seamless and embedded within construction products and processes to improve efficiency and effectiveness.
- *Queensland Budget Impact on Construction*, Brisbane, June 2005 — The Honourable Robert Schwarten, MP, Minister for Public Works, Housing and Racing, discussed highlights from the South-East Queensland Infrastructure Plan and the Queensland Budget impact on the construction industry.



4.2 Intellectual property management

Intellectual Property (IP) is managed according to the terms and conditions of the Centre Agreement and in the specific project agreements at the project level. Background IP is recorded in project agreements in the first instance and there is the opportunity during the life of the project to identify new IP through the rigorous research management process, in particular the six-monthly project review.

IP management is initially undertaken in association with the project team and then specifically by the senior management team in the implementation and commercialisation stages. All partners are obliged to ensure that staff working on projects maintain strict confidentiality. All project material is stored on the CRC intranet with secure access to ensure protection. The senior management team controls a central IP register to keep track of the IP generated by the CRC and the background IP used for specific projects.

The Centre Agreement also requires all staff of partners to assign all IP to the CRC and waive moral rights to the CRC. The Development Manager directs an induction program to ensure that all project participants are aware of their obligations and to exclude any participant who does not wish to operate under these conditions.

4.3 End-user involvement

A full listing of the 'research users' and their involvement is provided in Section 5 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.

Description of activity	Organisations	Basis of interaction	Principal researchers
Trialling of ICT analysis tools	QDPW, Rider Hunt, Woods Bagot, BCC	Commercialisation and utilisation	Robin Drogemuller (CSIRO) Selwyn Tucker (CSIRO)
Development and trialling of Project Diagnostics	Arup Australasia	Commercialisation	Daniyal Mian (Arup, previously QUT)

4.4 Progress against contractual targets/milestones

Progress against the milestones provided in the Commonwealth Agreement are shown in the following table.

Description of all milestones	Milestone date as per Commonwealth Agreement	Achievement date (or proposed achievement date if milestone not met)
IP register and IP valuation	Ongoing	Undertaken as specific commercialisation strategies are developed.
Commercialisation strategies — review and development	Ongoing	Ongoing for the projects identified in this section.
Partner/student development on commercialisation	Annual retreat — Sept '04	Annual retreat held 23–24 Nov '04
Industry workshops	2005	25 Aug '04, Brisbane 9 Sep '04, Melbourne 28 Oct '04, Brisbane 15 Jun '05, Brisbane
Venture capital linkages	Ongoing	Discussions commenced 12 Jul '04 with Starfish Ventures regarding the ICT analysis tools, and these are continuing.

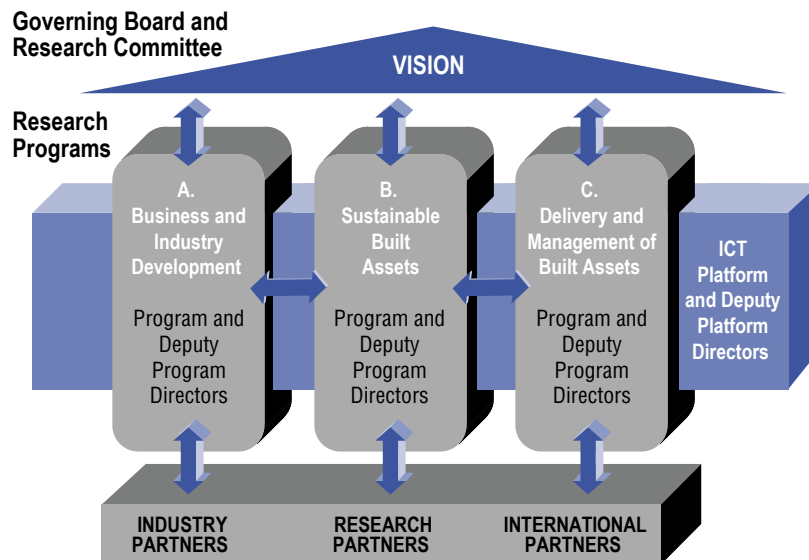
Research

5.1 Research planning and activities

The research program remains *Construction Innovation's* core activity with 47 projects either in progress or completed. The core goal of *Construction Innovation* is the development and delivery of a high-quality, industry-led research program.

Construction Innovation's research structure is shown in the diagram below, and supported by the program objectives that follow. The three core programs of research are 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.

Construction Innovation also collaborates with leaders in construction research globally. In addition to being the founding member of the International Construction Research Alliance (ICALL) between the CRC for *Construction Innovation* and leading international research organisations in North America and Europe, *Construction Innovation* has collaborated with researchers from the University of Hong Kong, the University of Liverpool, and the University of Reading.



A. Business and industry development

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

- greater innovation in business processes
- strengthened human relations and ethical practices
- more effective interactions between industry and its clients.

Program A has seen an increase in activity over the past 12 months from industry-led research projects which have had a positive influence on *Construction Innovation's* partners. Industry-directed projects include 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.

B. Sustainable built assets

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

- a sound conceptual basis for economic, social and environmental accounting of the built environment
- virtual building technology to examine design performance prior to documentation, construction and use
- 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 calculator), *DesignCheck* (a code-checking software), life prediction of materials in coastal environments, and energy-efficient design principles in sustainable subdivision contexts.

C. Delivery and management of built assets

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

- improved communication and use of knowledge
- increased productivity and value
- effective delivery and management of whole-of-life assets.

Construction Innovation's first commercialisation opportunity has arisen from Program C. Negotiations are under way to finalise the licence agreement that will see Project Diagnostics available on the open market. This diagnostic tool provides clients and contractors with the ability to monitor and remedy critical success factors.

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 most recent project is the Sydney Opera House FM Exemplar project which will provide the facility management industry with best-practice guidelines and benchmarking data.

Program A: Business and industry development

Program Director: **Neal Ryan**

Deputy Program Director: **Don Allan**

Innovation potential, directions and implementation in the building and construction product system

Research Project 2001-012-A

Project duration: 1 January 2003 – 31 December 2005

Research focus

The focus of this project has been on the incidence and quality of innovation in the property and construction sector by generating and disseminating knowledge about the rate of innovation over time, what makes one business a better innovator than another, implementation processes, and the need to innovate and share innovations with others. A survey has been undertaken of 1,000 companies, and six industry-focussed case studies have been broadly distributed to the Australian property and construction industry through the Australian Construction Industry Forum (ACIF) network.

Impact

Industry has been told about innovation particularly in the SME sector. An innovation checklist and six case studies help users understand how they might innovate.

Future directions

Six more case studies will be launched in Brisbane, Sydney and Melbourne. Additional case studies and surveys will be completed through 2006–07.



Project Leader:

Karen Manley
Queensland University of Technology

Project members

Arup Australasia
Richard Hough

Queensland Department
of Main Roads
Michael Swainston

Queensland Department
of Public Works
Don Allan

Queensland Department of State
Development and Innovation
Rob Wilcox

CSIRO

Stephen McFallan

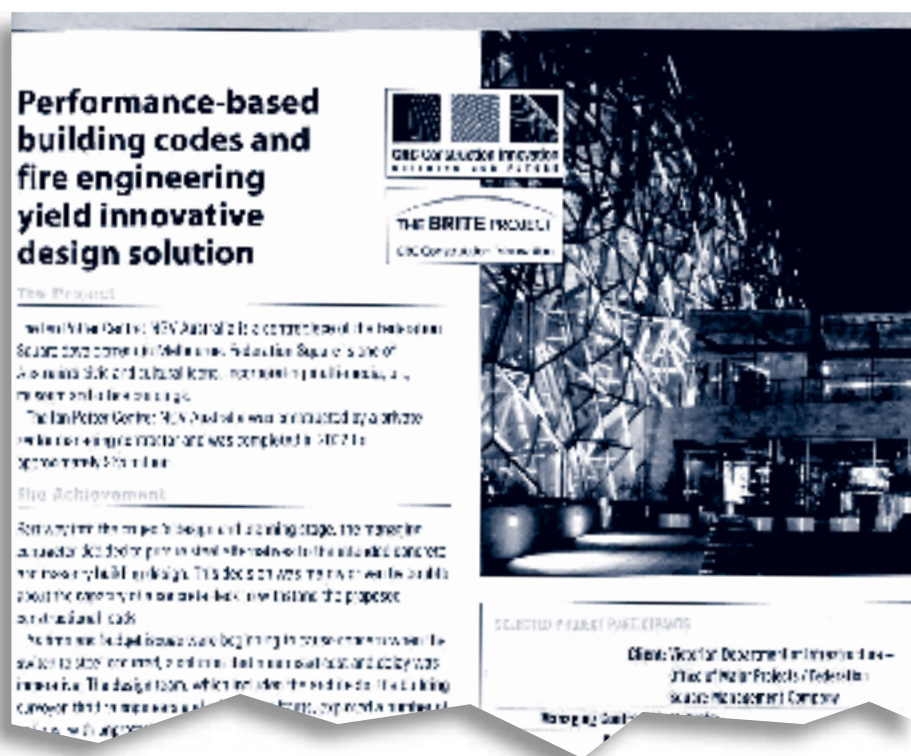
Queensland University of Technology
Aletha Blayse, Robyn Keast

University of Western Sydney
Michelle Coillet, Mary Hardie,
Graham Miller

'To create innovation that benefits everyone, it is important for government, industry and universities to collaborate. One without the others only produces part of the puzzle. You need all the pieces to create the whole picture.' from *Innovation Case Study no 5*

— Australia's First Fibre-reinforced Polymer Bridge Deck on the Road Network.

Louise Chandler, Engineer, Bridge Design, Queensland Department of Main Roads



Research



Project Leader:

Steve Rowlinson
Queensland University of Technology

Project members

Brisbane City Council: Jim Reeves

John Holland: Terry Jones

Queensland Department of Main Roads: Mark Rogers

Queensland Department of Public Works

Steve Hobson, Paul Krautz,
Roy Sargent, Mat Tiley

CSIRO

Greg Foliente

Queensland University of Technology

Fiona Cheung, Renae Jones, Alannah Rafferty, Tony Sidwell, Roland Simons

RMIT: Derek Walker

University of Newcastle:
Marcus Jefferies

Value in project delivery systems: Facilitating a change in culture

Research Project 2002-022-A

Project duration: 1 September 2002 – 1 July 2005

Research focus

This project addresses a specific need identified by industry partners. Most organisations, although conceptually in favour of relationship management, do not have the necessary culture and tools within their organisation to make it fully effective. The project team has developed a toolkit which includes success factors for teams operating within this environment. A case study is evolving on an alliance between Brisbane City Council and John Holland known as the Brisbane Water Enviro Alliance (BWEA). This alliance is delivering upgrades to the Sandgate, Oxley Creek and Wacol waste-water treatment plants in design, construction and maintenance to better service Brisbane's sewage collection and treatment needs.

Impact

Industry partners have received an audit of their organisation with a report highlighting gaps in their skills and culture. The organisations also have a toolkit that can be tailored to their own needs.

Future directions

The toolkit will soon be completed and is being expanded to address 'Client Management' in relationship contracts. *Construction Innovation* will develop a continuing professional development (CPD) course on 'Culture in relationship management' to be delivered to our partners and the industry.

'Fully developed and implemented, the toolkit will be of invaluable assistance to alliance contracting. It will assist in creating better organisational commitment to relationship contracting, and provide a more productive and satisfying working environment for participants.'

Terry Jones, Construction Manager for John Holland



Project Leader:

John Oliver
Rider Hunt

Project members

Building Commission: Roger Frith

John Holland: Gerry Shutt, Jeff Horsley

Queensland Department of Public Works: Don Allan

Queensland University of Technology
Debbie Smit, Paul Smith

University of Newcastle:

Marcus Jefferies, Kerry London,
Jamie Mackee, Judith McCann

Ethical construction procurement

Research Project 2002-062-A

Project duration: 1 June 2003 – 31 March 2005

Research focus

It has become apparent through a series of industry workshops that ethical behaviour in the construction industry is ill-defined. It has also been highlighted that existing protocol and practices developed by clients for industry behaviour are not working effectively. This project focusses on the design of a protocol for uptake by major procurers, including government clients and contractors, on innovative ethical procurement. The outcome of the project will be an industry protocol published in pamphlet format.

Impact

Provide industry with a protocol to be used by clients in developing procurement policies to create a more ethical climate for consultants and contractors.

Future directions

The procedure will be published as a pamphlet to industry and widely distributed through government and industry bodies.

Internationalisation of construction industry design firms

Research Project 2002-066-A

Project duration: 17 December 2003 – 17 December 2004

Research focus

Three case studies (UK, Asia and Middle East) have been produced highlighting the extent of economic sustainability of the Australian construction industry's SMEs who export design-related products and/or services. This investigation has also identified barriers and success factors experienced by SMEs which increase or reduce their exposure to financial risk. This project provides SMEs in the construction sector with information on export design expertise and business models to strengthen their ability to achieve long-term economic sustainability.

Impact

Lessons learned are provided to CRC partners through an internal presentation and will be included in a CPD program for SMEs considering exporting their services. The lessons learned are focussed on how SMEs can establish sustainable business not adversely impacted by the challenges of international business.

Future directions

Training material and a published industry booklet is planned during financial year 2005–06 for distribution through industry associations and their continuing professional education programs.



Project Leader:

Kerry London
University of Newcastle

Project members

Arup Australasia: Richard Hough

DEM: Peter Droege, David Slinn

Woods Bagot: David Marchant

Queensland Department of State Development and Innovation
Terry Gibson

Queensland University of Technology
Steve Rowlinson

University of Newcastle
Nathaniel Bavington, Jessica Chen

eBusiness: security and legal issues

Research Project 2002-067-A

Project duration: 2 August 2004 – 1 February 2005

Research focus

This project has defined construction industry contract requirements for electronic information exchange and provides guidelines to facilitate online trading which conforms to legal standards. Legal standards are not clear due to the electronic tendering laws being Commonwealth-based and subject to interpretation by each jurisdiction. This report will enable construction organisations and their clients to be confident of the legal basis for their electronic business transactions such as eTendering.

Impact

Recommendations will be provided to government agencies on appropriate legal and security structures that will provide increased confidence for construction firms advancing in an eBusiness environment.

Future directions

A proposal has been approved to continue this research to include current case studies and guidelines for eContracting.



Project Leader:

Martin Betts
Queensland University of Technology

Project members

Queensland Department of Main Roads: Ross Guppy

Queensland Department of Public Works: Michelle Porter, Rob Williams

Queensland University of Technology
Peter Black, Colin Boyd,
Adrian Burgess, Sharon Christensen,
Ed Dawson, Bill Duncan,
Brian Fitzgerald, Ernest Foo,
Debbie Smit, Paul Smith

University of Newcastle: Kerry London

Research



Project Leader:

Kerry London
University of Newcastle

Project members

John Holland
Brad Marriott, Gerry Shutt

Building Commission
Paul Crapper

**Queensland Department of
Main Roads**
Ross Guppy, John Spathonis

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

RMIT
Guillermo Aranda-Mena,
Peter Stewart, Ron Wakefield

University of Newcastle
Nathaniel Bavington, Jessica Chen,
Nic Croce, Anton Kriz, Loong Wong

eBusiness adoption

Research Project 2003-003-A

Project duration: 1 August 2004 – 31 December 2005

Research focus

The project aims to develop a greater awareness in the construction industry of the value of eBusiness to organisations and to increase participation in various eBusiness technologies for business benefit.

Impact

Industry will be provided with an analysis of the nature of constraints to eBusiness adoption through theory and practice and ways to go forward. When industry associations access this material, they will be able to identify strategies and techniques to raise awareness and increase adoption based on four case studies of various levels of eBusiness adoption environments.

Future directions

The eBusiness Adoption website, book and case studies will be available to industry through industry associations and government agencies. They will act as a trigger and provide SMEs with access to tools needed to embrace eBusiness within their own business activities.



Project Leader:

Dean Cipolla
John Holland

Project members

Bovis Lend Lease
Tom McFadyen, Linda Sokolich

Queensland University of Technology
Herbert Biggs

University of Western Sydney
Don Dingsdag, Vaughn Sheahan

Non-CRC participant

**Office of the Australian Safety and
Compensation Council**
Wayne Artuso

Construction site safety culture

Research Project 2003-050-A

Project duration: 1 June 2003 – 31 March 2005

Research focus

The industry-led project team is conducting research in three key areas of safety management in construction sites in each of the metropolitan centres of Australia: (1) Which management and supervisory positions within a construction company/project are critical to safety performance; (2) What types of competencies/skills/knowledge/behaviours are required to shape the understanding, attitudes, behavioural competencies, norms and ultimate commitment of line management and supervision to site/project safety and culture; and (3) What type of training packages and learning tools are in place, and how to link their effectiveness to individual site and industry occupational health and safety outcomes and safety performance.

Impact

The goal of this work is to improve the industry's overall performance and safety culture through training packages and learning tools.

Future directions

The project will produce a 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. In addition, the research outcomes will be offered to the Technical and Further Education (TAFE) and vocational education and training (VET) sectors as well as in-house training material. Dissemination will also occur through trade publications, conferences and seminars.

Program B: Sustainable built assets

Program Director: **Peter Newton**

Deputy Program Director: **Judy Kraatz**

Noise management in urban environments

Research Project 2002-004-B

Project duration: 1 July 2003 – 31 December 2004

Research focus

This research recognised that noise management is about protection of community health and wellbeing. Research into traffic noise impact on community health shows that noise pollution can cause elevated physiological stress and Noise-Induced Hearing Threshold Shifts (NITS). These findings could make sustainable noise management in urban environments a mandatory requirement and a professional indemnity issue in the near future.

The project team developed a cost-benefit simulation model of alternative treatments and early calibration of a decision-support tool. The software tool and user guide for improved noise management decisions have been produced.

Impact

This tool will provide road designers with the ability to improve noise management decisions with consideration given to potential pricing arrangements for property potentially affected by noise. The research has also provided innovative approaches to sustainable urban living environments in noise corridors.

Future directions

This tool is being developed into a beta version for trialling by industry partners. It is planned that the Queensland Department of Main Roads will lead the update of this tool as a prelude to broader industry application.



Project Leader:

Saman de Silva
RMIT

Project members

Arup Australasia
Peter Bowtell

Queensland Department of Main Roads

Arthur Hall, Julie Peters,
John Spathonis

Queensland Department of Public Works
Dale Gilbert

Queensland University of Technology
Ned Wales

RMIT
Li Chen, Philip Douglas, Arun Kumar,
Sujeeva Setunge

Team collaboration in high bandwidth virtual environments

Research Project 2002-024-B

Project duration: 15 May 2003 – 31 December 2005

Research focus

Recent developments in networked 3D virtual worlds and the proliferation of high bandwidth communications technology have the potential to dramatically improve collaboration in the construction industry. There have been numerous studies of collaboration in Europe and North America that have resulted in systems to support data transfer and information sharing. This project focusses on how these systems and the associated tools can be used in a high bandwidth environment, particularly in the early stages of a project.

Impact

The project examines four aspects of collaboration in virtual environments, including processes that enable collaboration using high bandwidth information and communication technology (ICT), the models that allow for multiple disciplines to share their views in a synchronous virtual environment, the generic skills required by individuals and teams in high bandwidth ICT, and the extent to which people contribute to the effectiveness of virtual teams within the industry.

Future directions

Upon project completion at the end of 2005, outcomes will be presented to industry through workshops. A report in brochure format will be available and distributed through industry associations providing industry with up-to-date information and options regarding working within high bandwidth environments.



Project Leader:

Mary Lou Maher
University of Sydney

Project members

Arup Australasia
Richard Hough, Steve Pennell

Woods Bagot
David Marchant,
Kanyarat Nemprepree

CSIRO
Wan Yee Chan, John Crawford,
Lan Ding, Robin Drogemuller,
Stephen Egan, Loretta Kivlighon

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

University of Sydney
Adel Ahmed, Kirsty Beilharz, Zafer Bilda, Andy Dong, John Gero, Figen Gul, Jeff Kan, Mi Jeong Kim, Owen Macindoe, Kathryn Merrick, Mike Rosenman, Robert Shen, Ji Soo Yoon

'The practical value of this research is that it provides a means of bringing together a multidisciplinary team from multiple locations around the world without them being physically in the same place to advance our business activities.'

David Marchant, IT Manager Global for Woods Bagot architects in *Master Builders Queensland* May 2005.

Research



Project Leader:

Steven Moller
CSIRO

Project members

Arup Australasia
PC Thomas

Rider Hunt
Gregory Nowak

RMIT
Helen Lewis

Right-sizing airconditioning systems

Research Project 2002-051-B

Project duration: 1 October 2004 – 30 September 2005

Research focus

The major objective of this research project is to collect and disseminate information to help reduce over-specification of heating, ventilation and airconditioning systems. It will also help to deliver efficient environmental control systems that are more effective at providing better thermal environments in buildings. The project will also quantify the economic and environmental penalty incurred due to over-specification.

Impact

The project has already influenced the design of some heating, ventilation and airconditioning systems by the industry partners.

Future directions

A 'lessons-learned' document produced in consultation with industry associations will be distributed to the design and engineering segments of the industry. The document is likely to be used to influence engineers and developers in their approach to briefing and specifying HVAC systems.



Project Leader:

Ivan Cole
CSIRO

Project members

Queensland Department of
Main Roads
Alan Carse, John Spathonis

Queensland Department of
Public Works
Michael Ball, Dale Gilbert,
David Harrison

CSIRO
Wan Yee Chan, Penny Corrigan,
Wayne Ganther, Tim Muster,
David Paterson, Gerardo Trinidad

University of Sydney
Paksan Liew, Mary Lou Maher

Case-based reasoning in construction and infrastructure projects

Research Project 2002-059-B

Project duration: 1 October 2003 – 15 May 2005

Research focus

The project achieved two major objectives: (1) to develop an 'engine' that uses case-based logic (CBL) to link process modules to form tailored models for specific applications; (2) to apply this approach to estimate the life of components in construction and infrastructure projects. The results predict the life of metallic construction materials and components, and assess how the technique might apply to materials like concrete and timber.

Impact

This decision-support tool helps bridge and building designers select appropriate materials to enable better life expectancy of metal building components. The Queensland Government spends \$1.2 million per year on replacing metal components in schools alone. The application of this decision-support tool will reduce this cost and allow application to timber and concrete component.

Future directions

The database will be made available to the QDPW and QDMR for trialling in 2005–06.

Parametric building development during early design

Research Project 2002-060-B

Project duration: 1 July 2003 – 31 August 2004

Research focus

This research investigated software tools and developed interfaces to optimise architectural layout and structure based on parametric models. 'Parametric' in this context means the relationships between elements of the model. Model relationships were based on parameters such as 'building usage mix', 'respective floor areas' and so on, while structural parameters such as structure type and minimum column centres are all crucial to the early design phase. Researchers from Stanford University Centre for Integrated Facility Engineering (CIFE) collaborated with *Construction Innovation* on the project.

Impact

This project allowed industry partners to examine methods for defining parametric models within three architecture, engineering and construction CAD systems (AutoCAD Architectural Desktop – ADT, ArchiCAD, and Microstation Triforma) plus CATIA (a leading parametric modeller), and to analyse and implement mixed-use commercial/residential multistorey developments. A workshop was held with industry partners to promote the outcome of the project.

Future directions

No further work is expected in this area of research.

Sustainable subdivisions: Energy-efficient design

Research Project 2002-063-B

Project duration: 1 October 2003 – 30 September 2004

Research focus

This research has investigated the energy-efficiency demands of dwellings from a subdivision viewpoint as well as that from an individual dwelling. It has highlighted challenges in the national housing industry with the release of new energy codes, and canvases the technologies available to housing for on-site electricity generation as a basis for the development of solar suburbs.

Impact

The findings for this project provide dwelling and subdivision designers with lessons learned on the relationship between lot size, orientation, prevailing breezes and the design of an energy-efficient house.

Future directions

The Report to Industry will be widely distributed to industry by *Construction Innovation* and Urban Development Institute of Australia (UDIA) with co-badging endorsement by the Environmental Protection Agency (EPA).

'Brookwater is committed to helping builders and purchasers arrive at cost-effective and sustainable solutions to building at Brookwater, while at the same time taking on the stewardship of looking after the environment for generations to come. Their partnership with the Sustainable Subdivisions Project will help them meet that commitment.'

Dayan Jayasekera, Project Manager of Springfield Land Corporation in *Master Builders Queensland* Feb–Mar 2005.



Project Leader:

John Crawford
CSIRO

Project members

Arup Australasia
Peter Bowtell, John Legge-Wilkinson

Woods Bagot

Fergus Hohnen, Stephan Langella,
David Marchant

CSIRO

Miles Anderson, Fanny Boulaire,
Robin Drogemuller, Cheryl McNamara,
Gerardo Trinidad

RMIT

Mark Burry, Julian Canterbury,
Alison Fairley

Non-CRC participant

Stanford University

Martin Fischer, John Haymaker



Project Leader:

Michael Ambrose
CSIRO

Project members

Brookwater

Dayan Jayasekera

DEM

Peter Droege

Brisbane City Council

Andrew Aitken, Damian Dewar

Queensland Department of Public Works

Michael Ball

CSIRO

Angelo Delsante, Anne Miller

Queensland University of Technology

John Bell, Elspeth Mead, Ned Wales

Research



Project Leader:

Peter Newton
CSIRO

Project members

Arup Australasia
Ken Stickland, P C Thomas

Queensland Department of Public Works
Dale Gilbert, Del Jones

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

Queensland University of Technology
Philip Crowther

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

Non-CRC participants

City of Melbourne
Rob Adams, Adam Leggett,
Mick Pearce

Regenerating construction to enhance sustainability

Research Project 2003-028-B

Project duration: 1 January 2005 – 30 June 2006

Research focus

This project is designed to assist in the delivery of demonstrably superior 'green' buildings in respect of eco-efficient redesign: achieving a smaller ecological footprint within budget; enhanced indoor environment quality and performance, reflected in improved health, wellbeing and productivity of building occupants; and waste minimisation (through redesign for disassembly).

Impact

Results of this project will be relevant to existing building stock which comprises 98 per cent of the total number of buildings. This accounts for most of the greenhouse emissions from the building sector.

Future directions

Lessons learned will be distributed through the media and industry associations to illustrate the value of regenerating existing building stock. The outcomes of this project will also provide input to the industry *Your Building* project through 2005–07.



Project Leader:

Judy Kraatz
Brisbane City Council

Project members

Brisbane City Council
Medha Gokhale, Heidi Illert,
Nelson Ross

Queensland Department of Public Works
Dale Gilbert

CSIRO
Angelo Delsante, Robin Drogemuller,
Steven Moller, David Paterson,
Gerardo Trinidad

Queensland University of Technology
Ian Cowling, Steve Coyne,
Nur Demirbilek, Ross Hayward,
Rosie Kennedy, Jinglan Zhang

Microclimatic impacts on the built environment

Research Project 2004-003-B

Project duration: 1 February 2005 – 30 March 2006

Research focus

This project is designed to quantify and model the potential microclimatic influences and impacts of a building within an urban precinct of buildings, through assessment of a 3D CAD model. This would enable planners/developers/designers to model this interaction at a conceptual level, and potentially provide authorities with a tool to rapidly quantify impacts of building designs within a precinct or region of buildings.

Impact

The beta-tested parametric analysis interface software will have the capacity to provide options regarding the impact on the key microclimate criteria: wind, rainfall, air temperature, radiation, humidity, solar access and day-lighting.

Outcomes of this modelling will be to undertake assessment of microclimatic impacts of the design in relation to operational energy (greenhouse gases) performance of the proposed new building design, based on its surrounding microclimate impact, as well as building boundary conditions for wind and rainfall. The model will have the ability to rapidly compare alternative (parametric) sketch designs for microclimatic impacts including operating energy performance (and potentially indoor and external air quality impacts).

Future directions

The project is in its early stages, though findings are expected by early 2006. It is expected that the beta-tested tool will be used by the Brisbane City Council and Queensland Department of Public Works in their design assessment of commercial buildings in Brisbane's city centre. It is also expected that Brisbane's research outcomes will be channelled directly into QUT work curriculum and will be featured at national and international conferences. Applications to other centres will also be examined.

Code checking — Phase 2

Research Project 2004-011-B

Project duration: 1 August 2004 – 30 June 2005

Research focus

The aim of this project was to take the successful work completed in 2001-014-B, *Automated code checking: feasibility study* [Drogemuller, CSIRO] and expand it to cover the new provisions for disabled-person access to buildings that are expected to be implemented by the Building Code of Australia. The work consisted of two components: (1) Improving the robustness of the system, and (2) modifying the existing rules to incorporate the changes to the access provisions of the Australian code of practice.

Impact

When amendments to the Building Code of Australia are introduced these will increase the complexity of checking for compliance with the new provisions, and a software tool that eases this task is of significant value. A task that can take from several hours to several months depending on the complexity and size of the building can now be automated.

Future directions

Feedback resulting from trials by industry partners will be used to determine the most appropriate commercialisation strategy to be implemented in this next period.



Project Leader:

Lan Ding
CSIRO

Project members

Building Commission
Moshe Gilovitz

Woods Bagot

Fergus Hohnen, David Marchant

CSIRO

Fanny Boulaire, Robin Drogemuller,
Shawn Foo, John Mashford,
Kevin McDonald, Cheryl McNamara

University of Sydney

John Gero, Chau Giang, Julie Jupp,
Mike Rosenman, Wei Peng,
Nicholas Preema, Ji Soo Yoon

South Australian Builder June/July 2005 P.37 - New Software for code compliance

New software for code compliance

Does your new office or house design comply?

DesignCheck will tell you

Australia's building codes are many and complex and non-compliance can be expensive.

For one high-residential building the wrong answer cost \$5 million in design and construction changes.

For house builders, getting the details right can mean many visits to the local council to negotiate approval.

Dr Lan Ding has the solution — an automated design checking system — DesignCheck — that quickly assesses if a building design meets the requirements of Australia's new building disabled access

innovation. Lan has turned the codes into a readable format and then automated the checking process.

"It's a stunning achievement that dramatically streamlines the design process," says the Director of Victoria's Building Commission.

"The DesignCheck system assesses building design for complex building code identification of potential non-compliance. The software overcomes the complexity of both time and cost. It's a game-changer for the construction industry," says Dr Lan Ding, CSIRO. Lan says, "For example, designers load a sketch of a building into the DesignCheck system and it

"If designers would like to check more details such as fittings in a disabled toilet, they can check through the DesignCheck system."

Marchant, IT national architects the tool will benefit us to analyse a

code requirements of the design right from the start. It's the same ongoing use and building in being various changes to with the codes." also be useful to consultants, building and specification

"An advanced computer software tool that provides automated checking of designs against building codes"

Key feature for future development of DesignCheck

design check

Automated Code Checking

Industry, government and research partners collaborating on this Construction Innovation project are: Woods Bagot, Australian Building Codes Board, Building Commission, Victorian Building Authority, University of Sydney

For further information contact Dr Lan Ding on (02) 9439 5481 or (04) 5 285 584 or email: lan.ding@csiro.au

The Cooperative Research Centre for Construction Innovation is a national research and development organisation that is a partnership between the Australian Government, the construction industry and the research community. The CRC for Construction Innovation is a national research and development organisation that is a partnership between the Australian Government, the construction industry and the research community.

CRC Construction Innovation
Building the future

Program C: Delivery and management of built assets

Program Director: **Tony Sidwell** (until 1 Jan 2005)

Deputy Program Director: **Gerry Shutt**



Project Leader:

Sujeeva Setunge
RMIT

Project members

Arup Australasia: Bruce Johnson

Queensland Department of Main Roads

Alan Carse, Louise Chandler,
John Spathonis

Queensland Department of Public Works: Dale Gilbert

CSIRO: Lam Pham

RMIT

Saman de Silva, Arun Kumar,
Weena Lokuge, Abe Nezamian

University of Western Sydney
Alan Jeary

Decision-support tools for concrete infrastructure rehabilitation

Research Project 2002-005-C

Project duration: 1 April 2003 – 1 January 2005

Research focus

A prototype decision-support tool has been developed to enable asset managers of concrete infrastructure to select the most suitable technique for rehabilitating ageing 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.

The team reviewed current national and international research and practice (particularly research in the USA and Japan) to identify established and emerging rehabilitation techniques using FRP composites in reinforced concrete structures, with particular relevance to Australian conditions.

Impact

The tool allows designers to consider innovative and refined methods of structural strength calculation and simple evaluation techniques. This integrated 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.

Future directions

Discussions with a major FRP supplier in Australia shows that they are considering the decision-support tool and its guidelines as material that could be distributed widely to enhance industry uptake of this advanced construction material.



Project Leader:

John Dalrymple
RMIT

Project members

John Holland
Gerry Shutt

Rider Hunt
John Oliver

Building Commission
Roger Frith

Queensland Department of Main Roads
John Spathonis, Michael Swainston

Queensland Department of Public Works
John Collin

Queensland University of Technology
Tony Sidwell

RMIT

Lionel Boxer, Peter Bryar,
Warren Staples, Derek Walker

Linking best-value procurement assessment to outcome performance indicators

Research Project 2002-035-C

Project duration: 1 October 2003 – 30 September 2004

Research focus

This study looks at developing a standard set of tender-evaluation criteria based on best-value criteria (clients can attach their own weightings) with definition of Outcomes Performance Indicators (OPIs) that must be reported on at the completion of projects. This study linked the selection criteria and the need to evaluate how the project succeeded on a broader set of success criteria. This linkage could provide direct cause-and-effect indicators to be used in an improved post-project evaluation process to help assemble the lessons learned.

Impact

The research brought best value and OPIs to the attention of industry partners.

Future directions

No further research is planned in this area.

Value in project delivery systems — project diagnostics

Research Project 2002-052-C

Project duration: 1 March 2003 – 31 August 2004

Research focus

Construction projects have a number of critical factors that can facilitate a broad evaluation of project health. In order to use these factors as an indication of health, they need to be assessed. This assessment can help to achieve desired outcomes for the project. A prototype diagnostic technique has been developed on the basis of assessing critical success factors using key performance indicators (KPIs) to ascertain the immediate health of a construction project. The technique is applicable to all phases of construction projects and many construction procurement methods. KPIs have been benchmarked on the basis of industry standards and extensive historical data. The robustness of the KPIs to assess the immediate health of a project has been validated using Australian and international case studies. The diagnostic technique is being trialled by industry partners as a prelude to commercialisation.

Impact

Project diagnostics will provide industry with a 'health check' and remedial action for construction KPIs highlighting problems before they become critical.

Future directions

Commercialisation negotiations are currently being undertaken.

'The value of this project is that it gives the client and the project manager the ability to reach an understanding of the current status of a project — through a series of comparisons with recognised industry norms — and then be in a position to take remedial action if required.'

John Tsoukas, Project Director of global engineering firm Arup Australasia
in *Building Product News*, April 2005



Project Leader:

John Tsoukas
Arup Australasia

Project members

Arup Australasia
Melissa Cogzell, Sheldon Sherman

John Holland
Chris Evans

Queensland Department of
Main Roads
Michael Swainston

Queensland Department of
Public Works
John Collin

CSIRO
Paul Tilley

Queensland University of Technology
Matthew Humphreys, Daniyal Mian,
Tony Sidwell

Wayfinding in the built environment

Research Project 2002-053-C

Project duration: 1 September 2003 – 30 June 2005

Research focus

This project identified technologies and systems that will make it easier and safer for people who have a sensory impairment to find their way around large public areas. The project is primarily aimed at people who are vision impaired, but will also consider other groups. People who are blind or vision impaired often have difficulty negotiating public spaces such as university campuses, public squares or sporting venues, especially when the area is crowded or noisy. This has a significant impact on their capacity to independently and confidently use public resources.

The team has identified two sites where technologies will be trialled: a complex government office building in Brisbane, and the Commonwealth Games site in Melbourne.

Impact

The outcomes of this project will show how the selected technology can assist the vision impaired to navigate large public spaces more independently.

Future directions

Funding has been approved to case study a trial in Victoria and one in Queensland throughout 2005–06.



Project Leader:

Dennis Hogan
Building Commission

Project members

Australian Building Codes Board
Brian Ashe

Queensland Department of
Public Works
Ron Apelt, Dale Gilbert

CSIRO
John Crawford

Queensland University of Technology
Debbie Smit

Research



Project Leader:

Robin Drogemuller
CSIRO

Project members

John Holland
Nick Windmeyer

Woods Bagot
Peter Hoskins, David Marchant

CSIRO
John Crawford, Cheryl McNamara,
Gerardo Trinidad

RMIT
Guillermo Aranda-Mena

University of Newcastle
Rod Gameson, Willy Sher, Peter Ward

Non-CRC participant

Stanford University
Martin Fischer, John Haymaker

Contract planning workbench (Automatic Scheduler)

Research Project 2002-056-C

Project duration: 1 August 2003 – 1 August 2004

Research focus

A prototype software tool has been developed that automatically prepares construction schedules together with a 4D simulation of the construction process from a 3D CAD model. Information contained in the 3D CAD building information model is exported to a database. The Automatic Scheduler uses this data together with a set of knowledge rules to determine construction sequences, relationships, resources and timing to generate a simple building plan. The 4D simulation software used is Common Point, a Stanford University spin-off. Researchers from the Stanford University Centre for Integrated Facility Engineering (CIFE) collaborated with the *Construction Innovation* team on this project.

Impact

Industry partners are trialling the proof of concept and providing insights as to what is most relevant for more substantial industry uptake.

Future directions

The proof of concept is in the initial phase and limited to structural elements, beams, columns, slabs, walls and footing systems. Once the market viability of such a tool is determined, the project may be extended to cover a wider range of building elements.



Project Leader:

Stephen Kajewski
Queensland University of Technology

Project members

John Holland
Justin Lee

Woods Bagot
David Marchant

Queensland University of Technology
Sugiharto Alwi

University of Sydney
Yohann Daruwala, Andy Dong,
Brian Lee, Mary Lou Maher

Enabling team collaboration with pervasive and mobile computing

Research Project 2002-057-C

Project duration: 28 September 2004 – 1 March 2007

Research focus

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) for collaboration in the design office. This project will enable mobility with constant access to construction information, augment digital interaction with softwares used for collaboration, and facilitate the intangible human factor that is still the bedrock of effective collaboration.

Impact

This project will provide industry with an update on the types of technologies that are available in the market place, and which may provide a seamless flow of information from the site to the design office.

Future directions

Information dissemination will occur through collaborating with industry associations.

Delivering a re-life project

Research Project 2003-026-C

Project duration: 1 August 2004 – 30 June 2006

Research focus

This project is investigating the characteristics of re-life building projects that impact upon the effective management of the construction process, such as the identification and mitigation of risks, issues of decanting existing tenants, identification of existing structure and services, work scheduling, occupational health and safety issues for construction personnel and tenants, demolition, waste and recycling, quality and workmanship, cost-planning and cost-modelling methodologies.

Impact

Lessons learned from this project will provide insights into efficient design and construction techniques that can be deployed on the regeneration of existing building stock. Major contractors and developers have expressed support for this project as the existing building stock is considered a major opportunity for ongoing work.

Future directions

Dissemination of findings will be through industry associations and in conjunction with project 2003-028-B, Regenerating construction to enhance sustainability [Newton, CSIRO].



Project Leader:

Jay Yang
Queensland University of Technology

Project members

John Holland
Bruce Carlyle

Rider Hunt
Michael Gilligan, John Oliver

Queensland Department of
Public Works
Selwyn Clark

Queensland University of Technology
Matthew Humphreys,
Guomin (Kevin) Zhang

RMIT
Arun Kumar, Tom Molyneaux, Chintha
Perera, Sujeeva Setunge, Ashish Shah

University of Western Sydney
Mary Hardie, Graham Miller

Maintenance cost prediction for roads

Research Project 2003-029-C

Project duration: 1 August 2004 – 30 June 2006

Research focus

Currently lifecycle budget predictions (primarily maintenance and rehabilitation) are generally 'representative' or 'average' estimates of many input variables. The budget predictions therefore, approximate to a 50 per cent probability of being exceeded. This project will develop a method for determining the budget prediction (having an estimated probability of not being exceeded) for managing the maintenance and rehabilitation of a chosen road network over a chosen analysis period (say 10, 20 or 30 years).

Impact

The impact of this project will build on that already achieved by the previous project 2001-010-C Investment decision framework for infrastructure asset management [Kumar, RMIT University] where considerable savings are expected by the QDMR through implementing the findings. With this research outcome, the lifecycle budget estimates can be refined to 80 to 90 per cent certainty.

Future directions

Trials will be undertaken with QDMR for potential broader dissemination to industry



Project Leader:

Arun Kumar
RMIT

Project members

Queensland Department of
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Neil Robertson, John Spathonis,
Justin Weligamage

Queensland Department of
Public Works
Dale Gilbert

Queensland University of Technology
Selvaraj Jeyachandran,
Andreas Nata-Atmadja

RMIT
Saman de Silva, Richard Heaney,
Noppadol Piyatrapoomi

Research



Project Leader:

Robin Drogemuller
CSIRO

Project members

Rider Hunt
John Oliver

Woods Bagot
David Marchant

Queensland Department of Public Works
Thomas Fussell

CSIRO
Shawn Foo, Steven Shaw

Stage 2 — Managing information flows with models and virtual environments

Research Project 2003-037-C

Project duration: 5 January 2004 – 30 June 2004

Research focus

Completion of the deliverables for Project 2001-007-C, Managing information flows with models and virtual environments [Drogemuller, CSIRO] has demonstrated the feasibility of generating bills of quantities and estimates from 3D models of buildings for reinforced concrete and formwork. Stage 2 focussed on extending the quantity take-off and estimating process to cover other trades and to ensure that the prototype tool is more robust.

Impact

When completed and available to the building industry, this tool will revolutionise cost planning by automating time-consuming tasks and providing more time for value-adding activities like strategic cost planning.

Future directions

Trials are being undertaken and a market analysis is under way to identify the most appropriate route to commercialisation.



Project Leader:

Jason Morris
Rider Hunt

Project members

Rider Hunt: Stephen Ballesty

Woods Bagot
Peter Hoskins, David Marchant

Brisbane City Council: Sunil Madan

Queensland Department of Public Works: Selwyn Clark, Frank Seed

CSIRO
Lan Ding, Robin Drogemuller,
John Mitchell, Hans Schevers

Queensland University of Technology
Andrew Frowd

University of Sydney
David Leifer, Dirk Schwede, Margaret Pope, Alan Tracey, Jeremy Wu

Non-CRC participants

Sydney Opera House
Paul Akhurst, Chris Lining, Gary Singh,
Anthony Williams

Transfield Services Australia
Alex Dontas, George Spink

Facility Management Association
Karen Hill

Sydney Opera House — FM exemplar project

Research Project 2005-001-C

Project duration: 28 February 2005 – 24 November 2006

Research focus

This project is intended to lift the Facility Management (FM) industry's performance and identity. It will provide a tangible basis to showcase innovative methods for measuring and managing the economic, social and environmental impacts of FM across many of the 20 industry recommendations contained within the Australian FM Action Agenda. The research will be carried out under the umbrella of the strategic asset maintenance (SAM) plan and will feature three key research themes: (1) digital interface of FM documentation and services; (2) procurement; and (3) benchmarking. Each theme will be mapped to the Sydney Opera House's SAM Plan and business objectives, and then the FM Action Agenda's platforms.

Impact

The project has the ability to showcase not only best-practice FM on an iconic project, but it will also highlight the need for skills development and FM benchmarking within Australian and international contexts. It will act as a focal point to lift the FM industry's performance and identity.

Future directions

Promotion of findings will occur throughout Australia in conjunction with the Facility Management Association and other industry groups.

The Director, Facilities, Sydney Opera House, **Paul Akhurst**, said the project would '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'.

'Facilities management yearns for centre stage' **Tina Perinotto** in *Australian Financial Review*, Thursday 28 April, 2005

5.2 Research collaboration

Industry collaboration is a hallmark of *Construction Innovation*. Each research project requires a minimum of two researchers and two 'research-user' organisations. A full listing of the 'research users' and their involvement is provided in Section 5.1 which lists all organisations involved in each project. This drives collaboration among the CRC partner group, across the supply chain and nationally. Publications arising from CRC projects often have joint authorship by researchers and research users. Research and industry are both represented on the Research Committee, the Board and in Program and Project workshops with leadership from industry partners.

Construction Innovation liaises with a range of industry associations which often provide an additional forum for industry collaboration on CRC projects.

Construction Innovation's collaborative environment provides significant opportunities to increase the exposure of industry participants to the demands of a robust research approach in a business or industry environment.

The range of research skills imparted includes:

- research design methodologies
- research methods
- data validation and analysis
- beta testing of software
- assessment of critical success factors and key performance indicators
- best-practice benchmarking
- diagnostic tools.

As completed projects move into implementation and/or commercialisation stages, industry and government organisations are encouraged to trial the outcomes and gauge the impact of the systems or technology on their business processes. Industry trials have taken place with four 3D CAD analysis tools (environmental analysis, estimating, scheduling, and code checking), a performance evaluation tool for commercial buildings and a diagnostic tool used to assess project health.

5.3 Progress against milestones

Program A Milestones

Construction Innovation did not identify milestones for achievement during 2004–05. However, a number of achievements were made in Program A as follows:

- Two projects were established on the use of eBusiness in the property and construction industry. Legal, security and cultural barriers to adoption have been examined and guides provided for government agencies and SMEs on overcoming the uptake issues. Refer to projects 2002-067-A *eBusiness – legal and security* [Betts, QUT] and 2003-003-A *eBusiness adoption* [London, UN].
- A set of best-practice guidelines have been developed for clients, contractors, subcontractors and consultants to provide lessons learned regarding successful use of information and communication technologies in supply chains. Refer to 2001-016-A *ICT-mediated supply chains* [Brewer, UN].
- A framework has been developed to assist design firms and specialist subcontractors establish and maintain a sustainable business while engaging in international business. Refer to project 2002-066-A *Internationalisation of construction industry design firms* [London, UN].
- A key initiative is being undertaken involving the nation's major construction contractors. The project seeks to identify an organisation's key roles that are in a position to drive a positive site-safety culture, as well as the core skills, behaviour and competencies required for each of these safety-critical roles. The project will make recommendations regarding appropriate training for each of the roles.

Program B

Program B Milestones

Description	Milestone date as per Commonwealth Agreement	Achievement date
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1 Informing policy

Sustainability principles operating in BCA		The <i>Construction Innovation</i> report 'Sustainability and the future BCA' was a key document for the new ABCB policy on sustainability.
50% increase in water recycling and re-use in greenfield subdivisions	June 2005	Extension to 2002-063-B <i>Sustainable subdivisions – energy efficiency</i> [Ambrose, CSIRO] project to develop baseline statistics on urban water use. A new tool for sustainable subdivision ventilation design (solar access, wind flow/ventilation) under development.
30% increase in energy-efficient housing design in new housing	December 2004	2002-063-B <i>Sustainable subdivisions – energy efficiency</i> [Ambrose, CSIRO] project completed with routes to 20+% energy efficiencies identified for different categories of housing.
20% improvement in noise management in urban environments	December 2004	2002-004-B <i>Noise management in urban environments</i> [de Silva, RMIT] Project on noise abatement from roads extended to develop software to assist design process.

2 New products and services

Improved lifecycle modelling of buildings via data mining, Service life prediction, Case-based reasoning		2001-002-B <i>Life cycle modelling and design knowledge development in virtual environments</i> [Gero, US] developed a data mining tool that interfaces with a 3D CAD building information model. 2002-010-B <i>Component life: Delphi approach to life prediction of building material components</i> [Cole, CSIRO] and 2002-059-B <i>Case-based reasoning in construction and infrastructure projects</i> [Cole, CSIRO] produced a database and search engine developed to predict the service life of selected metal building components.
LCADesign accepted as eco-efficiency design assessment tool nationally	June 2004	2001-006-B <i>Environmental assessment system for commercial buildings</i> [Tucker, CSIRO] – LCADesign prototype completed; now being applied to seven commercial office designs.
New parameter for LCADesign (early sketch) design process	June 2005	LCADesign not yet extended to sketch phase. Additional source of funds are being investigated to continue this work during 2005–06.

3 Improved human and environment health

Legionella eliminated as a public health risk	June 2005	Workshop undertaken with industry. <i>Construction Innovation</i> elected not to pursue this area of research.
Identified areas of research to deliver on enhanced indoor ecology and quantifiable benefits of high-quality indoor environments	December 2003	2001-005-B <i>Indoor environment: design, productivity and health</i> [Bell, QUT] which scoped the links between productivity and health of indoor environments is completed. 2002-051-B <i>Right-sizing airconditioning systems</i> [Moller, CSIRO] is a project identifying lessons learned between the design and installation of airconditioning systems, and the needs of the building occupants. 2003-028-B <i>Regenerating construction to enhance sustainability</i> is a project quantifying the benefits of indoor environmental quality and the productivity of its occupants.

Program C

Program C Milestones

Description	Milestone date as per Commonwealth Agreement	Achievement date
User survey shows 25% higher satisfaction	June 2004	<i>Construction 2020</i> was undertaken surveying 600 individuals from the property and construction sector. Survey identified eight visions that would contribute to a higher satisfaction in the industry.
50% reduction in time, quality and budget failures	June 2005	2003-037-C <i>Managing information flows with models and virtual environments</i> [Drogemuller, CSIRO] and 2002-056-C <i>Contract planning workbench</i> [Trinidad, CSIRO] have produced prototype tools that are being tested by CRC partners for automatic generation of bills of quantities and development of schedules.
10% increase in project profitability for participants	June 2005	2003-037-C <i>Managing information flows with models and virtual environments</i> [Drogemuller, CSIRO] has produced a prototype estimating tool (Automatic Estimator) allowing early, fast and accurate cost planning.
10% increase in stakeholder satisfaction	June 2004	<i>Construction 2020</i> was undertaken surveying individuals from the property and construction sector. Survey identified eight visions that would contribute to a higher satisfaction in the industry.
10% less design rework	June 2005	Prototype estimating tool (Automatic Estimator) allows early, fast and accurate cost planning.

Orientation, orientation, orientation

Cooling Queensland's suburbs



As building regulations tend to set the bar even higher in order to have our homes constructed more sustainably, builders are given more increasing pressure to undertake the complex interactions between natural vision, design and building design. At the Cooperative Research Centre (CRC) for Construction Innovation, the Sustainable Suburbs research team is examining planning issues in south-east Queens and to help builders meet regulations, stay competitive, and to deliver new sustainable more energy efficient, such as in the 40 pages to live.

Industry interviews

To gain an insight into the current state of play in the design of residential subdivisions, the project team interviewed individual site controllers in subdivision development.

The survey found that plots are determined by topographic contour, site location, climate, site, density, orientation, construction and landscaping was clearly the bottom line when configuring subdivisions.

Even though, architects, developers and others then entered in subdividing areas to make more sustainable subdivisions to all builders in subdivisions available to all.

However, they don't find a range of homes that are suitable in progress towards the meaning difficulties with defining and measuring sustainability measures to building planning.

Master Builder Queensland, Feb-Mar 2005

Education and training

Education Program

The Advisory Committee operated from January to December 2004 to assist *Construction Innovation* develop, monitor and review policy, strategy and planning to ensure appropriate education and training outcome achievement. As part of the strategic review of the Education and Training program, it was agreed that themed industry forums be piloted and evaluated and *Construction Innovation* activities for individual partners be identified through participant discussions. These two communication mechanisms broaden the scope of education and training information dissemination.

Construction Innovation conducted the following events:

CRC Leadership and Career Development Course, Melbourne, September 2004

Construction Innovation researcher, Noppadol Piyatrapoomi, from RMIT University, was funded to attend the five-day residential course to develop increased awareness of leadership and interpersonal processes in research and development teams.

Scholar's Workshop, Brisbane, October 2004

Coinciding with the Clients Driving Innovation International Conference, a Scholar's Workshop focussed on commercialisation, intellectual property, confidentiality agreements, commercialisation strategies and assessment, patent searching, licence agreements and start-ups. This approach is consistent with *Construction Innovation's* drive for more industry-savvy scholars as future leaders.

Youthquake, Melbourne, November 2004

Two early career *Construction Innovation* participants, Sarah Alder (research assistant) and Colin Greville (PhD scholar), attended this signature Year of the Built Environment event, Youthquake, where they explored public policy issues and outlined the role the built environment will play in delivering their view of a future Australia.

BRITE Survey Launch, Brisbane, November 2004

Findings were released of the BRITE Innovation Survey of perceptions of innovation determinants in the industry. Survey participants comprised 1,137 main contractors, trade contractors, consultants, suppliers and clients from businesses in the road/bridge and commercial building sectors in New South Wales, Victoria and Queensland. Results included 10 relatively simple strategies for Australian construction industry businesses to improve their innovation performance.



Industry forums

To disseminate the benefits to industry of research findings *Construction Innovation* conducted four industry information breakfasts (see page 11) and two industry information forums. They were:

- *Planning, Designing and Rating a Sustainable Built Environment*, Brisbane, February 2005
 - this half-day forum in collaboration with Brisbane City Council explored the opportunities for achieving a sustainable built environment and how rating tools play a part in the planning and design process
- *Bringing Innovation to Facility Management*, Brisbane, April 2005
 - this full-day forum was part of the Australian Innovation Festival, featuring presentations on the FM Action Agenda, wayfinding, road maintenance, digital interface of FM practices, corrosion prediction, and environment impact of commercial buildings.



Councillor Tim Nicholls of the Brisbane City Council addresses the *Bringing Innovation to Facility Management* forum.

Scholars making a difference

A recruitment exercise was finalised in August 2004 for fresh PhD and Masters by Research scholars.

Twelve applications were received, and the result was the following scholars being welcomed in 2004-05, complementing the existing eight scholars in the education program:

Joanne Jakovich, PhD — University of Sydney

Brett Mayze, PhD — QUT

Derek Thompson, Masters by Research — RMIT University

Construction Innovation's Scholarship program, as at 30 June 2005, included 10 PhD and one Masters by Research students.

Garry Creedy

Title: Identifying and Matching Project Risk Factors to Delivery Capability in Highway Construction Projects

Research focus (aligned to Project 2001-003-C): This research focusses on highway construction projects in Queensland and uses a road organisation case study to research and analyse a broad range of historical data that have lead to cost overruns in client budget estimates during project delivery. It also aims at developing a statistical risk probability model that can quantify risk provisions as a percentage contingency on-cost for planned highway project types.

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

Biography: Garry joined Queensland Department of Main Roads in 1964 as a cadet draftsman and graduated as a civil engineer in 1972. Until 1992, Garry carried out various civil engineering and project management roles, as well as designing the Department's construction costing and management systems. In 1976 he received a Graduate Diploma in Business Administration from Queensland University of Technology, and this has been followed by his MBA from Deakin University in 1995 and Graduate Certificate in Public Sector Management from Flinders University in 2000.



Degree: PhD, Queensland University of Technology

Start and expected completion dates: March 2003 – March 2006

Supervision

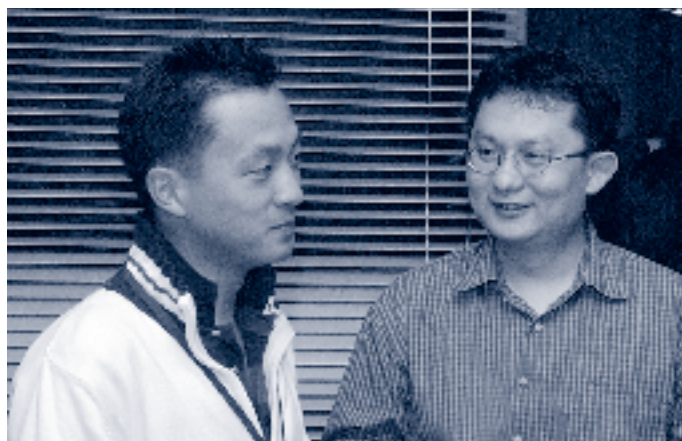
Academic: Professor Martin Skitmore,

Associate Academic: Professor Tony Sidwell (Queensland University of Technology)

Industry: Dennis Wogan (Queensland Department of Main Roads)

"The scholarship has given me the opportunity to look at the international scene in highway construction research, especially in the United States. Professor Trefor Williams from Rutgers University, New Jersey has invited me to visit his university in the near future — an excellent example of the encouragement that academics around the world show to industry research students like myself." Garry Creedy

"The issue of cost escalation in highway projects is one that has concerned client authorities for a long time. Garry's research will be of great value in developing more accurate project cost forecasts. In addition, the wider background research conducted, coupled with Garry's extensive industry background and the connections he has developed both nationally and internationally as part of his PhD development, will prove invaluable to the Queensland Department of Main Roads when he returns to the workplace." Dennis Wogan, Industry supervisor from Queensland Department of Main Roads.



Scholars Ji Soo Yoon and Wei Peng socialising at our 2004 International Conference Clients Driving Innovation.

Education and training

Scholars making a difference



Degree: PhD, University of Western Sydney

Start and expected completion dates: March 2001– late 2006

Supervision

Academic: Associate Professor Graham Miller, **Associate Academic:** Professor Alan Jeary (University of Western Sydney)

Industry: John Oliver (Rider Hunt)

Colin Greville

Title: Psychology of Sustainable Development

Research focus (aligned to a number of Program B projects): This research focusses 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 very limited role in the development of environmentally sustainable residential homes. Why then do some people desire ESD and others not? 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.

Biography: Col began his career working on properties in western Queensland and Western Australia. Col is a licensed builder and completed his trade training with a builder who has won many industry and government awards for ESD. He completed a Bachelor of Building with honours in 1999, continued to work as a builder while working part time as a research assistant, TAFE lecturer and university tutor.

"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 in the same field of endeavour has been exciting and educational. The CRC appears to leave no stone unturned in providing any reasonable benefit that will aid their scholars in completing their research." **Colin Greville**

SCHOLAR



Degree: PhD (Architecture), The University of Sydney

Start and expected completion dates: August 2004 – December 2007

Supervision

Academic: Dr Kirsty Beilharz (The University of Sydney)

Industry: David Marchant (Woods Bagot)

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 stored or 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 in the space.

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 or consumed 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 for public application. 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.

Biography: Joanne graduated with a Bachelor of Environmental Design from the School of Architecture and Fine Arts, University of Western Australia. She completed a Master of Environmental Studies at the Graduate School of Frontier Sciences, University of Tokyo in Japan on a Japan Ministry for Sports and Education Research Scholarship. Following this she worked for architect Fumihiko Maki and participated in several international digital urbanism projects. Currently she is doing a PhD in Architecture at the University of Sydney on a UPA/Co-funded Scholarship.

"The interaction between personal gestures and sound environments will develop as more and more of our environment is connected up via computing. Traditionally, experience of the built environment is predominantly visual and tactile. Joanne is researching what the role of sound may be in the emerging digital world." **David Marchant**, Industry supervisor from Woods Bagot

SUPERVISOR

Tayyab Maqsood

Title: Investigating the Role of Knowledge Management in Supporting Innovation for Effective Planning and Delivery of Construction Projects

Research focus (aligned to Project 2001-004-A): Innovation is being regarded as a key to improving the low productivity commonly witnessed in the construction industry. This research aims to investigate the role of knowledge management in supporting innovation. Soft systems methodology (SSM) has been selected as a basic qualitative research tool to carry out such investigations. The outcome will be the development of models of knowledge management encompassing innovation and organisational learning which can be used to transform an organisation into a learning organisation.

Impact on industry practice: Guidelines and frameworks derived from research to enhance learning in the construction industry and to manage, understand and practise knowledge management efficiently.

Biography: Tayyab, a civil engineer with a Masters of Construction Engineering and Management, has worked in Pakistan, Thailand, UK and Hong Kong in various capacities including lecturer, project engineer and research associate. He is also a member of various professional organisations such as the Institution of Engineers Australia (IEAust), the Australian Institute of Builders (AIB) and the American Society of Civil Engineers (ASCE).



Degree: PhD, RMIT University

Start and expected completion dates: August 2002 – September 2005

Supervision

Academic: Professor Derek Walker (RMIT)

Industry: Gerry Shutt (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 the key drivers and characteristics of an effective safety culture for its industry partner, John Holland. It will also look at measuring and comparing construction 'safety culture' over time and across sites (with a longer-term view of benchmarking across the Australian industry over time).

Biography: Before commencing his PhD, Brett worked with the Queensland State Government on a range of organisational learning and development initiatives. With broad experience in the mining, construction and defence industries Brett has worked with a number of project-based organisations to facilitate individual behavioural and cultural change. He trained as an organisational psychologist with a Masters degree from the University of Queensland and a Bachelor of Science (psychology) from the University of Newcastle.



Degree: PhD, Queensland University of Technology

Start and expected completion dates: January 2005 – January 2008

Supervision

Academic: Dr Lisa Bradley, Associate

Academic: Dr Glenda Maconachie (Queensland University of Technology)

Industry: Dean Cipolla (John Holland)

SCHOLAR

"Partnering with the John Holland group to undertake my research, one longer-term value add to the construction industry will be through gaining an insight into leveraging and improving 'safety culture' at multiple points throughout an organisation." **Brett Mayze**

SUPERVISOR

"Aspects of Brett's work that will benefit the industry include the generation of a theoretical definition that provides a practical application for the assessment of construction 'safety culture' and the development of linkages between construction 'safety culture' and its effects on an organisation's ultimate safety performance." **Dean Cipolla**, Industry supervisor from John Holland

Education and training

Scholars making a difference



Degree: PhD, The University of Sydney

Start and expected completion dates:
February 2003 – July 2006

Supervision

Academic: Professor John Gero,

Associate Academic: Dr Rabee Reffat
(The University of Sydney)

Industry: David Marchant (Woods
Bagot)

Wei Peng

Title: An Adaptive Design Tool that Learns

Research focus (aligned to Project 2001-002-B): Computer-aided design tools continue to be built on a paradigm that says that the tool is unchanged by its use. These design tools repeat themselves irrespective of their interactions with the design environment. 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.

Biography: Before Wei commenced his PhD study in the Key Centre of Design Computing and Cognition at The University of Sydney, he completed his Bachelors degree in Engineering at Wuhan University of Technology, China, and a Masters degree in Information Science at the University of New South Wales. With his solid understanding of the domains and extensive knowledge in computing, he is dedicating himself to research that will add value to the competitiveness of the Australian construction industry.

"This Construction Innovation scholarship has provided me with a great opportunity to further my academic pursuits. It plays a key role in aligning my current research with construction industrial needs." **Wei Peng**

SCHOLAR

"Wei is looking at ways to make design software tools more adaptive. That is, instead of just being a 'dumb' bunch of commands, the tool adapts itself by learning how you do things, and is then able to anticipate and actively help you while designing. Wei assures me that this is definitely not the dreaded Microsoft paper clip!" **David Marchant**, Industry supervisor from Woods Bagot

SUPERVISOR



Degree: PhD, Queensland University
of Technology

Start and expected completion dates:
July 2003 – June 2006

Supervision

Academic: Dr Karen Manley

(Queensland University of Technology),

Associate Academic: Professor Keith
Hampson (CRC for Construction
Innovation)

Industry: Don Allan (Queensland
Department of Public Works)

Tim Rose

Title: Optimising the Impact of Financial Incentive Mechanisms in Australian Commercial Building Projects

Research focus (aligned to Project 2001-012-A): This research identifies the major indicators that predict the level and direction of effort under project-based incentive contracts through a comprehensive literature review. It also explores the specific project drivers that determine the impact financial incentives have on motivation in Australian 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 on what determines the success of financial incentives and what aspects should be taken into consideration when designing financial incentive contracts in this arena. This knowledge will increase the likelihood of successful implementation and improve project performance in future projects.

Impact on industry practice: This research will identify how financial incentives can be applied to improve the level and direction of effort in these specific 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.

Biography: Tim holds an undergraduate honours degree in Construction Management (The University of Newcastle) and was previously employed both in the private and public building sectors, most recently the Queensland Department of Public Works, where he is on a study leave program.

"Supported by input from experienced industry practitioners, this scholarship provides me with opportunities to tailor my research outcomes to the industry. This has increased the relevance of my research to the real world and instilled an awareness that strong links between research and the industry is essential to promote improvements in procurement." **Tim Rose**

SCHOLAR

"QDPW values research into new and novel forms of contract, especially where those forms promote innovation. Tim's research has the capacity to have direct input into the way the department designs its delivery systems especially where financial incentives for innovation and quality are involved." **Don Allan**, Director of the Industry Policy Unit, Industry supervisor from Queensland Department of Public Works

SUPERVISOR

Derek Thompson

Title: Transitional Soundspace

Research focus (aligned to Program B): 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 facilitate greater awareness of perceptual and aesthetic considerations of sound in space, beyond traditional methods of acoustic measurement and analysis. It aims to advance understanding in dynamic aural perception of transitional soundspaces as a basis for application of emerging technologies in real-time, navigable virtual environments.

Biography: Derek has been an acoustical consultant with Arup Acoustics in Australia since 2001, working on a wide range of projects including the design of recording and broadcast studios, theatres, offices, and transportation systems noise control. Derek also has extensive experience in environmental sound mapping and predictive computation. Derek has a Bachelor of Science, and a Bachelor of Music, both from the University of Canterbury. He has also completed study in Electro-acoustic Composition at Victoria University of Wellington.



Degree: Masters by Research, RMIT University

Start and expected completion dates: October 2003 – May 2006

Supervision

Academic: Lawrence Harvey,
Associate Academic: Professor Mark Burry (RMIT University)

Industry: Neill Woodger (Arup Acoustics, New York).

Marcello Tonelli

Title: Impacts on the Commercial Property Market through Planning Policy, Economic Development Strategies and Fiscal Change

Research focus (aligned to: 2001-011-C): 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.

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 captures the expertise from different departments will make a fully informed and better decision. Furthermore, 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. The research would be of use to managers interested in how the prestige of a building influences customers' future repurchase intentions.

Biography: Marcello commenced his candidature at Queensland University of Technology in September 2003. In 1996 he graduated in Business Administration from the University of Pacific in USA and worked as a consultant on management information systems with a focus on model- and data-driven decision-support systems and executive support systems. In 2002, Marcello achieved a Master of Information Technology from James Cook University.



Degree: PhD, Queensland University of Technology

Start and expected completion dates: August 2003 – August 2006

Supervision

Academic: Dr Boaz Bernstein,
Associate Academic: Professor Terry Boyd, (Queensland University of Technology)

Industry: Teng Hee Tan (Queensland Department of Public Works)

"Having an industry supervisor provides an invaluable opportunity to ensure that my research aligns with the problems of real organisations. In addition to the obvious financial benefits, the scholarship has provided a number of quality workshops targeting important issues like commercialisation, intellectual property, and entrepreneurship." **Marcello Tonelli**

Education and training

Scholars making a difference



Degree: PhD, Queensland University of Technology

Start and expected completion dates: February 2002 – June 2006

Supervision

Academic: Professor John Bell,

Associate Academic: Dr Brian Hudson (Queensland University of Technology)

Industry: John Byrne (Queensland Department of Housing)

Ned Wales

Title: A Framework for Incorporating Ecological Sustainability Practices in Master-Planned Communities

Research focus (aligned to project: 2002-063-B): 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 will evaluate models of implementing incentives to achieving sustainable practice through the development approval process at the local government level.

Biography: Los Angeles-born Ned returned to the US from Australia to undertake tertiary studies at the University of California at Berkeley where he completed a double degree in Architecture and Environmental Design. Ned then worked in the San Francisco Bay area as a city planner and later in New York attended Cornell University where he graduated from the Masters Program in Urban Design. In the mid-1990s, Ned was elected to public office in California. During this time he also completed a Masters degree in Political Science and Public Administration.



Degree: PhD, The University of Sydney

Start and expected completion dates: February 2003 – March 2006

Supervision

Academic: Professor Mary Lou Maher (The University of Sydney)

Industry: David Marchant (Woods Bagot)

Ji Soo Yoon

Title: Wayfinding in Dynamic Virtual Worlds using Swarm Intelligence

Research focus (aligned to Project 2002-024-B): Virtual worlds 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 wayfinding capability. Research in wayfinding 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 both professional and non-professional visitors of a virtual environment to find their way without previous training. It examines both the applicability of swarm-intelligence-based agent behaviour models for wayfinding and the role of 'stigmergy' in the wayfinding context. It will also develop electronic pheromones** to guide agent navigation. The intention is to develop an alternative strategy to wayfinding within virtual worlds which better adapts to dynamically changing environments.

Biography: Ji Soo graduated with a Bachelor of Engineering (Computer) (Hons) and a Bachelor of Science (Computer and Mathematics) from The University of Sydney. Ji Soo's research areas include the use of virtual-world technology in the construction industry, swarm intelligence, and embodied agents in virtual worlds. He also works as a research assistant for a *Construction Innovation* research project on high bandwidth collaboration.

*Stigmergy is a type of communication which is conducted 'by altering the state of the environment in a way that will affect the behaviours of others for whom the environment is a stimulus'.

**Pheromones are chemicals, released by animals, that permeate the air and provide chemical messages.

Completed Scholars

Cameron Beard

Title: Information and Communication Technology Integration in the Construction Industry

Research focus (aligned to Project 2001-016-A): Cameron explored the integration of ICT within the construction industry by taking a conceptual view of information and theorising how technologies can be used to assist in the communication of information among project participants. Through focussing on communication and the flow of information through projects, an understanding of individual participants' information and communication requirements can be established thereby providing a framework for the effective integration of ICT.



Degree: PhD, The University of Newcastle

Start and completion dates: February 2003 – February 2005
Supervision

Academic: Professor Swee-Eng Chen, **Associate Academic:** Graham Brewer (The University of Newcastle)

Industry: David Marchant (Woods Bagot)

Agustin Chevez

Title: Sources and Effects of Uncertainty in the Management of Construction Projects

Research focus (aligned to Project 2002-052-C): The motivation behind this research is to reduce the numerous delays and costs overruns on construction projects despite the state-of-the-art planning and controlling techniques that this industry has. Agustin believes, therefore, that there might be a natural factor embedded in the construction environment that hinders the full achievement of project objectives. Throughout the research, various arguments are presented to justify the belief that uncertainty is the common factor that affects all projects. Melbourne's Federation Square is used as a case study for this research, but it is believed that uncertainty affects all projects regardless of their size.



Degree: Masters by Coursework, RMIT

Start and completion dates: December 2003 – February 2005
Supervision

Academic: Patricia McLaughlin (RMIT)

Industry: Gerry Shutt (John Holland)

Merv Cowley

Title: Property Market Forecasting: Valuation Implications

Research focus (aligned to Project 2001-011-C): The project has consolidated previous research and surveyed professionals' views to derive forecasting models tested with local market data. The most statistically reliable version was developed into a software module to link to the investment decision model created by the *Construction Innovation* project, Evaluation of Functional Performance in Commercial Buildings.



Degree: PhD, Queensland University of Technology

Start and completion dates: February 2003 – November 2004
Supervision

Academic: Professor Terry Boyd, **Associate Academic:** Dr Daniel O'Hare (Queensland University of Technology)

Industry: Dale Gilbert/Keith van Eyk (Queensland Department of Public Works)

David Luxmore

Title: Evaluation of GreenSmart Housing

Research focus (aligned to Project 2002-075B): Three GreenSmart houses constructed at Springfield Lakes within Ipswich City Council were studied to deduce the relationship between resource use and environmental and economic benefits of energy- and water-use efficiencies, waste minimisation and best-practice site and construction management. The houses are providing mainstream builders and the general public with examples of healthy comfortable homes with substantially reduced environmental impact.



Degree: Masters by Research, Queensland University of Technology

Start and completion dates: April 2003 – October 2004
Supervision

Academic: Professor Mahen Mahendran, **Associate Academic:** Associate Professor Jay Yang (Queensland University of Technology), Professor Thishan Jayasinghe (Dept of Civil Engineering University, Sri Lanka)

Industry: Rob Ball (Delfin Lend Lease)

Education and training

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, as follows:

2001-012-A:

Innovation Potential, Directions and Implementation in the Building and Construction Product System research outcomes have been incorporated into the University of Western Sydney School of Construction, Property and Planning Degree courses:

- Bachelor of Housing (1st year course)
- Bachelor of Planning (2nd year course).

2001-016-A:

Critical Success Factors for ICT Mediated Supply Chains selected findings have been taken by The University of Newcastle to provide a two-hour lecture, Strategic Use of ICT in Construction Projects, in course BLDG3340 Phase 13 (Strategic management of construction organisations), The Capstone Conference.

2002-022-A:

Value in Project Delivery Systems: Facilitating a Change in Culture case studies are being used as teaching and learning materials, in Relationship Management Contracts BSc and MSc courses at Hong Kong University.

The University of Newcastle will use the case studies as learning materials on the Bachelor of Construction Management (Hons) degree program in 2006, specifically in Course ARBE 2305 Construction Procurement.

An outline of the proposed syllabus is to be used as continuing professional development (CPD), and course content for delivery in either an undergraduate or postgraduate course has been forwarded to QUT Faculty of Built Environment and Engineering, and is now being turned into a CPD course planned for delivery in November 2005.

2002-066-A:

Internationalisation of Construction Industry Design Firms research outcomes are included in the University of Newcastle's:

- 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 15 A Research Methods, Bldg 4320.

2002-067-A:

eBusiness: Security and Legal Issues project outcomes have been included in the QUT School of Law Masters course LWN117: Legal Regulation of the Internet module.

2002-024-B:

Team Collaboration in High Bandwidth Environments methodology for studying collaborative designing is included in the University of Sydney's Master of Design Science (Design Computing) DESC9099 How Designers Think unit. The Generic Skills framework has been used to structure a team activity where Bachelor of Construction Management third-undergraduate students collaborate in the virtual environment. Students were located across Australia and Singapore.

Results of multiviews agent and data models to be included in The University of Sydney's Bachelor of Design Computing DECO1007 Design Data Management and Data Modelling.

A new postgraduate course, Multi Disciplinary Design Studio, has been developed by the University of New South Wales (UNSW). UNSW has requested prototypes of LCADesign (2001-006-B) and Automatic Code Checker (2001-014-B) for the students to trial on their building model. (To ensure that there is no leakage of intellectual property, the source code has been protected and deeds of confidentiality have been signed by the lecturers and students.)

2002-060-B:

Parametric Building Development During Early Design research outputs have been incorporated into an RMIT University Technical Elective, Parametric Design and Scripting, for senior level (4th- and 5th-year) Architect and Industrial Designer students. Students are using the software tools at studio level. Flexible Design, the subject, is being held across the university schools.

2001-003-C:

Value Alignment Process for Project Delivery research outcomes have been introduced into the QUT School of Urban Development Bachelor of Applied Science (Construction Management) and Bachelor of Applied Science (Quantity Surveying) undergraduate unit CNB 420, Current Construction Issues.

2001-008-C:

Project Team Integration: Communication, Coordination and Decision-support research outcomes have been introduced into the QUT School of Urban Development Construction Bachelor of Applied Science (Construction Management) and Bachelor of Applied Science (Quantity Surveying) unit CNB107, Construction 2.

2002-005-C:

Decision-support Tools for Concrete Infrastructure Rehabilitation project outcomes have been incorporated as one-third of the RMIT University course curriculum of CIVE1161/CIVE1162 High Performance Materials, final year elective of the BE (Civil Engineering). Also offered at the Institute of Vocational Education in Hong Kong for the first time in May–July 2005.

2003-029-C:

Maintenance Cost Prediction for Roads research outputs provide potential case study teaching material for RMIT and QUT and is the subject of ongoing discussions.

2002-053-C:

Wayfinding in the Built Environment research has been incorporated into QUT CNB309 Law 2.

Milestones

Description	Milestone date as per Commonwealth Agreement	Achievement date
Review Education and Training Strategy	January 2005	Strategy reviewed as part of revised <i>Strategic Plan 2005–2008</i> .
PhD students – recruit, orientation, commercialisation training	June 2004	Scholars workshop coincided with <i>Clients Driving Innovation</i> International Conference focussed on commercialisation matters.
Student participation in CRC Conference	June 2005	Students had their own stream for presentations at the CRC International Conference <i>Clients Driving Innovation</i> in October 2004.
CRC dissemination workshops	December 2004, June 2005	Students are involved in an ongoing basis with their academic and industry supervisors in presentations regarding their research and where relevant CRC project research.
Industry workshops	Ongoing	Colin Greville (PhD scholar) attended Youthquake, Melbourne in November 2004.



The Minister for the Environment and Heritage, Senator Ian Campbell launching the Your Building Project on 15 June 2005.



The Hon. Warren Entsch, MP, Parliamentary Secretary to the Minister for Industry, Tourism and Resources launching the Sydney Opera House FM Exemplar Project on 28 April 2005.



Janet Holmes à Court (John Holland Chairman) speaking at the 2004 International Conference Clients Driving Innovation.



Collaboration

Vigorous internal and external collaboration is a hallmark of the CRC for *Construction Innovation*. Particular emphasis has been placed on the development of collaborative mechanisms – internally between industry, government and research participants with the end-users particularly through industry associations; and externally to other CRCs and national and international research and industry leaders.

Internal linkages

Robust internal linkages are critical to the ongoing success and cohesion of this CRC. The breadth of our partner network spans client, design consultant, constructor and facility manager responsibilities across five centres of activity around Australia. Integrating the effort of close to 400 individuals across more than 20 organisations working on *Construction Innovation* activities is a significant effort.

Construction Innovation has developed a series of formal and informal approaches to encourage improved internal linkages, including:

- Research Program Workshops (meets four times each year)
- Research Committee (meets four times each year) – ensures the industry, government and research partners provide early ongoing input to the development of research ideas, manage the current research portfolio and strategically evaluate future directions of applied research
- Research Leadership Team (meets every two weeks) – core industry, researcher and headquarters executive team reviewing research proposals and operational and strategic activities
- Scholars' Workshops (meets every six months) – two-day workshops to assist CRC PhD and Masters scholars' skill development and maintaining an applied research focus and cross-institution collegial collaboration
- Internal Bulletin (e-publication to all participants each month) – updating internal participants of research management and events of interest
- Strategic Planning Retreat (meets annually) – attended by Governing Board, Research Committee, and at least one representative of each participant with CRC headquarters – strategically reviewing progress and setting longer-term CRC direction
- Research Conference with an international focus (every two years) – formal presentations of research successes and challenges across projects to showcase CRC projects to a national and international audience, within the broader industry context
- Executive Report Card meetings with partners (meets annually) – customised partner discussions to review value of engagement and identify opportunities for the future
- Special initiative groups (meets as required, for example International Conference Coordination and renewal working groups)
- Intranet – allows each project team to share information within their project team and if they choose, 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 CRC for *Construction Innovation* benefits.

These extensive internal linkages provide a level of collaboration across our industry partners and business associates with our researchers not before seen in this industry. The fundamental requirement for each research proposal to secure the support of at least two research users and two researchers, also drives national collaboration across the supply chain ensuring an applied industry focus. Clearly, achieving our vision of leading the Australian industry in collaboration and innovation requires *rubbing shoulders* with other industry leaders. The sensitive balance of value-adding commitment from our partners to CRC activities and servicing their core business interests remains central to the format and frequency of these CRC linkages. The growing strength of the CRC for *Construction Innovation*'s brand image across our partner network continues as more jointly promoted workshops and publications develop.

Linkages to end-users

In the practical context of the Australian construction industry, linkages to end-users are critical to ensure industry legitimisation and uptake of *Construction Innovation*'s applied research outcomes. Accordingly, our 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 and we continue to consolidate this relationship through active engagement at Board level (facilitated by planning respective Board meetings in a common location over two days and bringing the Boards together for dinner). At a project level, ACIF is a formal participant on our projects – particularly those engaged in innovation and industry development. These industry association networks provide critical linkages for CRC outcomes and continue to ensure our research remains industry-relevant.

Additional external engagement by other research users on research projects is also encouraged for mutual benefit. For example, Environment Australia and the Australian Greenhouse Office (AGO) participate in our sustainability research; Queensland Building Industry Redundancy Trust (BIRT) and the Office of the Australian Safety and Compensation Council (OASCC) together with the ACTU serve on our Occupational Health and Safety (OH&S) Project Reference Group; New South Wales Department of Commerce is working with us to trial the CRC-developed green calculator technology known as *LCADesign*, used to assess the environmental impact of a building design, and Queensland Department of Premier and Trade is 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 end-user engagement in our research initiatives, leading to industry outcomes for dissemination in partnership with the Facilities Management Association. The Sydney Opera House joins the City of Melbourne as fresh industry clients building a productive relationship with our CRC.

Construction Innovation's Senior Management Team, Project Directors and Program Leaders also have active engagement at a formal level with key industry associations in property and construction. Some examples include: John McCarthy is the former inaugural Chair of the Australian Sustainable Built Environment Council (ASBEC) and the Strategic Industry Leaders Forum of the Facility Management Action Agenda and is a Director of the Australian Building Codes Board (ABCB) and former Director of the Association of Consulting Engineers Australia (ACEA). Dr Keith Hampson contributes to the Facility Management Action Agenda Innovation Working Group, serves on the Association of Consulting Engineers Australia National Award Judging Panel and Engineers Australia, Queensland Division Awards of Excellence Judging Panel and Innovation Sub-committee. Peter Scuderi serves on the Australasian Board for the International Alliance for Interoperability (IAI), is Domain Coordinator for AusPeBBu (Australian Performance Based Building initiative) and the Judging Panel for the Australian Institute of Project Management (AIPM) Qld Chapter. Dr Peter Newton serves as Director of ASBEC and has key roles in several sustainable built environment forums such as State of Environment reporting for federal and state governments and judge for Prime Minister's annual Environmentalist of the Year Award. John McCarthy and Peter Newton are also Directors of the International Council for Research and Innovation in Building and Construction (CIB) Board, providing our CRC and Australia with unparalleled access to global research leaders.

On another level, our CRC's formative role in bringing together the diverse interests representing sustainability and the built environment across Australia have delivered an integrated peak body recognised by the Australian Government as the legitimate industry body – the Australian Sustainable Built Environment Council (ASBEC).

The joint launch of our *Your Building Project: Driving Sustainability in Commercial Buildings* in Parliament House on 15 June 2005 by the Minister for the Environment and Heritage, Senator Ian Campbell, provided public acknowledgement of our close relationship with ACIF and ASBEC. In no small way has this major project initiative been attributable to *Construction Innovation's* success in collaborating with end-users and the Australian Government.

A series of CRC industry-focussed events have explicitly highlighted the benefits of industry, government and researchers working together for mutual benefit. In particular, the 2004 *Clients Driving Innovation* International Conference brought together 210 people from across 12 countries, from research and research user organisations, in a strongly supported knowledge exchange model. The feedback from end-users was particularly positive, with special mention being made of the appropriateness of the 50-50 blend of researchers and end-users at this event – measured by attendees and presented papers alike. The success of this conference has leveraged into our Second International Conference: *Moving Ideas into Practice* scheduled for 12-14 March 2006. Each of these conferences features international leaders from industry and research and provided clear Australian leadership in integrating applied research with industry practice.

The *Construction 2020* initiative throughout 2003 and 2004 has, for the first time, sought extensive end-user views and analysed the goals and the research required for the long-term future of the Australian industry. *Construction Innovation's* leadership in this area has undoubtedly provided a national focus to the research needs for our industry. The significance and rigour of this *Construction 2020* Report to Industry has been recognised internationally as world class – with a number of other countries seeking advice and emulating this initiative for their own industry development. It has been an exemplar of end-user engagement and continues to inform our research, education and training, and commercialisation initiatives.

External linkages

Construction Innovation's Governing Board is committed to ensuring strong linkages between CRC partners and Australia's property and construction industry – and internationally. These initiatives support this:

- partner and industry newsletter (every two months) – updating industry on *Construction Innovation* initiatives
- industry forums and presentations – as research project outcomes are delivered *Construction Innovation* has commenced a series of national forums disseminating the results to our partner network and to the industry generally. Additionally, *Construction Innovation's* Senior Management Team, Program Directors and Project Leaders have continued their extensive program of information dissemination through industry conferences and workshops. These have been coordinated by industry associations or external conference organisers. A complete list of *Construction Innovation* presentations to industry is provided in Section 9.
- expanding the CRC Association communication network – our Communication Officer is active in developing valuable networks with other CRCs
- *Construction Innovation* is working with another CRC – CIEAM (Centre for Integrated Engineering Asset Management) in the development of nationally significant infrastructure delivery and asset management case studies that will provide practical content for higher education and industry training modules.



The launch of ICALL at the CRC's International Conference: from left Frederic Bougrain (CSTB, France), Martin Fischer (Stanford University, USA), Pekka Huovila (VTT, Finland), Peter Brandon (University of Salford, UK), Keith Hampson (CRC Construction Innovation)

Collaboration

International linkages

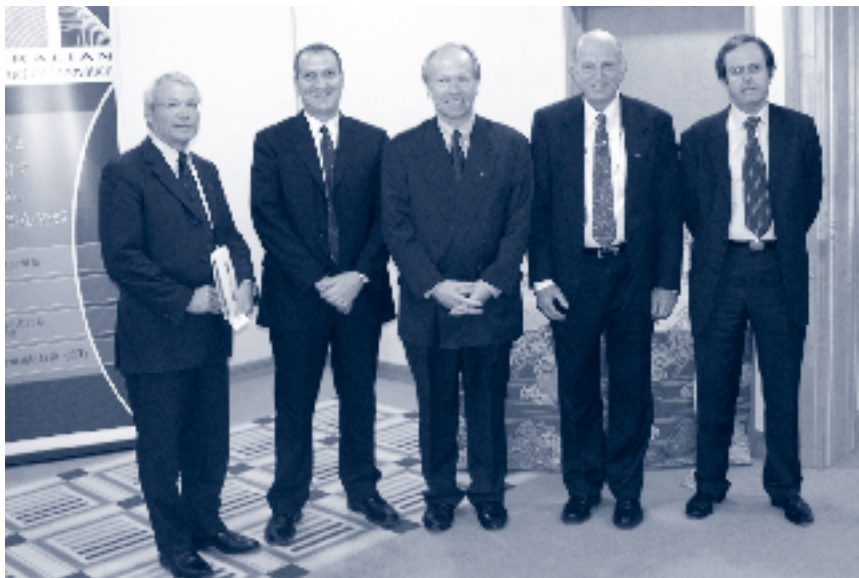
The goal of achieving national and international leadership requires the ability to benchmark and network with the world's best. The CRC for *Construction Innovation* has led the development of the International Construction Research Alliance (ICALL) through the last period. During 2004–05, the ICALL network provided considerable support for the coordination and promotion of *Construction Innovation's* first International Conference themed *Clients Driving Innovation*. This international support through ICALL, together with the CIB provided strong grounding for significant international attendance at this inaugural international conference. The *Clients Driving Innovation* theme provided the opportunity for using the strengths from *Construction Innovation's* research programs complementing national and international industry drivers. It is also expected that specific directions and linkages arising from this October 2004 conference and our upcoming Second International Conference *Moving Ideas into Practice* will complement the focus for the renewal of this CRC.

In March 2005, Dr Keith Hampson further strengthened the international linkages with *Construction Innovation* when he was invited as international keynote speaker to the CIB Second Revaluing Construction Conference in Rotterdam. His presentation titled *Inspiring Change in Australian Property and Construction* detailed the collaboration and applied research being implemented in the Australian industry through *Construction Innovation's* leadership. This acknowledgement of *Construction Innovation's* developing international profile is also highlighted by our Development Manager, Peter Scuderi's invitation to address a number of leading CAD vendors throughout Europe in May 2005 and his upcoming discussions with North American vendors through September 2005. These examples are representative of the high profile and reputation that *Construction Innovation* Program Directors and Project Leaders enjoy on a global scale.

As part of the official Queensland Government Trade Delegation in mid-April 2005, a series of meetings and seminars with senior representatives of the property and construction industry were held in Nagoya, Osaka and Tokyo. The Honourable Peter Beattie, Premier and Minister for Trade, opened the Tokyo seminar and invited all delegates to that evening's official reception.

The trip was undertaken with Dale Gilbert, Director, Built Environment Research Unit, Queensland Department of Public Works (QDPW) and supported by sponsorship from that Department. It has advanced opportunities for international validation and commercialisation of our research and has promoted our partners as leaders in collaboration and innovation.

Construction Innovation's Governing Board Chair, John McCarthy, continues to work actively on the International Board of the CIB. The CIB provides for international exchange and cooperation in research and innovation in building and construction in support of an improved building process and of improved performance of the built environment. The scope of CIB covers the technical, economic, environmental and organisational aspects of the built environment during all stages of its life cycle. John McCarthy's input to the CIB Board is complemented by that of Dr Peter Newton, our Program Director for Sustainable Built Assets, providing a powerful Australian influence on this prestigious global research/research-user network.



International visitors

To ensure international relevance of our research activity and to derive benefit from key international experts, the CRC for *Construction Innovation* supported visits from research and industry leaders throughout 2004–05, as follows:

Professor Peter Brandon (University of Salford, UK) worked with our Centre throughout the year in analysing and refining the *Construction 2020* outcomes. He spent time in Australia with the Centre's CEO convening the first series of national workshops disseminating the *Construction 2020* Vision Report. Peter's senior international reputation has provided a strong impetus to the Australian and global credibility of our Centre.

Pekka Huovila leads the Concurrent Engineering Group at VTT Building Technology in Finland. His expertise in construction logistics and systems has provided input into a number of CRC for *Construction Innovation* projects and ensured his keynote address at the October 2004 international Conference was well received.

Keith Futch is the Managing Director of EastPoint Property Management Services in Hong Kong, housing 10 per cent of Hong Kong's population in properties under his management. Keith's innovative approach to growing the facility management business through enhanced scope and depth of services to the Hong Kong market provided valuable input to the Australian facility management sector.

Professor Martin Fischer leads the Center for Integrated Facility Engineering (CIFE) at Stanford University, California. His international reputation as a leader in advanced applications of 3D CAD and his energy and vision for integrating applied research into industry practice has provided motivation to our CRC's researchers, scholars and research users to advance the uptake of advanced ICT tools in Australia's architecture, engineering and construction sector.

(at left) Dr Keith Hampson (CEO *Construction Innovation*), Professor Gerard Van Erp (Executive Director – *Fibre Composites Design and Development*, University of Southern Queensland), Honourable Peter Beattie MP (Premier of Queensland and Minister for Trade), Dale Gilbert (Manager – Built Environment Research Unit, QDPW) and Steve Rowlinson (Adjunct Professor QUT) at the opening of the Tokyo seminar.

Specified personnel

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

Title and name	Contributing organisation	% Working time in CRC	% Actual time for Yr 04-05	Role in Centre
Professor Keith Hampson	CRC for Construction Innovation	100%	100%	CEO
Ms Carole Green	CRC for Construction Innovation	100%	100%	Business Manager
Mr Peter Scuderi	CRC for Construction Innovation	100%	100%	Development Manager
Professor Dennis Lenard ¹	The University of Newcastle	50%	0%	Program Director, Research Committee
Dr Peter Newton	CSIRO	50%	18%	Program Leader, Research Committee
Professor Tony Sidwell ²	Queensland University of Technology	50%	28%	Program Director, Research Committee, Project Leader
Mr Robin Drogemuller	CSIRO	50%	58%	Platform Director, Research Committee, Project Leader
Mr Don Allan	Queensland Department of Public Works	20%	13%	Deputy Program Director, Research Committee
Mr Ken Stickland ³	Arup Australia	20%	1%	Deputy Program Director, Research Committee
Mr Gerry Shutt	John Holland	20%	16%	Deputy Program Director, Research Committee
Professor Mary Lou Maher	The University of Sydney	50%	56%	Research Committee, Project Leader
Ms Jeanette Clough	Rider Hunt	20%	13%	Deputy Platform Director, Research Committee
Professor Derek Walker	RMIT	50%	20%	Research Committee, Project Leader
Professor Arun Kumar	RMIT	50%	35%	Research Committee, Project Leader
Professor Swee-Eng Chen	The University of Newcastle	50%	4%	Project Team Member
Professor Jane Marceau ⁴	University of Western Sydney	10%	0%	Project Team Member
Mr John Oliver	Rider Hunt	22%	16%	Rider Hunt Projects Coordinator, Chair, Research Committee
Mr John Spathonis	Queensland Department of Main Roads	50%	12%	QDMR Projects Coordinator, Research Committee
Mr Dale Gilbert	Queensland Department of Public Works	10%	13%	QDPW Projects Coordinator, Research Committee

¹ no longer employed by The University of Newcastle

² no longer Program Director effective Jan 05

³ no longer Deputy Program Director effective 1 Jun 04

⁴ no longer working on Project

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. (%)	Commercialisation (%)	CRC Admin. (%)
Felipe Augustin	R	0.6%	-	0.6%	-	0.6%	-	-	-	-
Peter Bowtell	R	0.3%	-	0.3%	-	0.3%	-	-	-	-
Michael Cope	R	0.3%	-	0.3%	-	0.3%	-	-	-	-
Colin Henson	A	0.4%	-	-	-	0.0%	-	-	-	0.4%
Matthew Higgs	R	0.2%	-	0.2%	-	0.2%	-	-	-	-
Richard Hough	R	7.7%	1.4%	1.9%	0.6%	6.7%	-	-	-	1.0%
Andrew Phillips	R	0.2%	-	0.2%	-	0.2%	-	-	-	-
Sheldon Sherman	R	7.1%	-	-	7.1%	7.1%	-	-	-	-
David Singleton	A	0.3%	-	-	-	0.0%	-	-	-	0.3%
Ken Stickland	R	1.2%	0.1%	0.9%	-	1.2%	-	-	-	-
PC Thomas	R	1.1%	-	1.1%	-	1.1%	-	-	-	-
Gary Thorn	R	0.5%	-	-	0.5%	0.5%	-	-	-	-
John Tsoukas	R	0.7%	-	-	0.7%	0.7%	-	-	-	-
TOTAL CONTRIBUTED (% of PERSON YEARS)		20.7%	1.5%	5.5%	9.0%	19.0%	0.0%	0.0%	0.0%	1.8%
Bovis Lend Lease										
Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercialisation (%)	CRC Admin. (%)
Linda Sokolich	R	0.9%	0.9%	-	-	0.9%	-	-	-	-
TOTAL CONTRIBUTED (% of PERSON YEARS)		0.9%	0.9%	0.0%	0.0%	0.9%	0.0%	0.0%	0.0%	0.0%
Brookwater										
Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercialisation (%)	CRC Admin. (%)
David Henry	R	0.5%	-	-	-	0.5%	-	-	-	-
Dayan Jayasekera	R	2.8%	-	0.8%	-	2.3%	-	-	-	0.5%
Roger Maloney	R	1.0%	-	-	-	1.0%	-	-	-	-
Brooke Sellars	A	1.0%	-	-	-	0.0%	-	-	-	1.0%
Brad Tindale	R	1.1%	-	-	-	0.9%	-	-	-	0.3%
Andrew Whitson	R	1.0%	-	-	-	0.8%	-	-	-	0.3%
TOTAL CONTRIBUTED (% of PERSON YEARS)		7.4%	0.0%	0.8%	0.0%	5.4%	0.0%	0.0%	0.0%	2.0%

DEM										
Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercialisation (%)	CRC Admin. (%)
Peter Droege	R	1.8%	1.8%	-	-	1.8%	-	-	-	-
Vincent Guan	R	0.1%	-	-	-	0.1%	-	-	-	-
Nanette Illing-Kelly	R	0.1%	-	-	-	0.1%	-	-	-	-
Jenny Lambert	R	0.1%	-	-	-	0.1%	-	-	-	-
Clare McLay	R	0.1%	-	-	-	0.1%	-	-	-	-
Jon Pizey	R	0.1%	-	-	-	0.1%	-	-	-	-
David Slinn	R	4.1%	2.0%	-	-	2.6%	-	-	-	1.5%
Caroline Tallents	R	0.1%	-	-	-	0.1%	-	-	-	-
TOTAL CONTRIBUTED (% of PERSON YEARS)		6.3%	3.8%	0.0%	0.0%	4.8%	0.0%	0.0%	0.0%	1.5%
John Holland										
Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercialisation (%)	CRC Admin. (%)
Peter Addlem	A	0.5%	-	-	-	0.0%	-	-	-	0.5%
Dean Cipolla	R	19.0%	8.9%	-	-	13.1%	-	-	-	5.9%
Chris Evans	R	1.5%	-	-	1.5%	1.5%	-	-	-	-
Terry Jones	R	4.0%	4.0%	-	-	4.0%	-	-	-	-
Justin Lee	R	0.1%	-	-	0.1%	0.1%	-	-	-	-
Brad Marriot	R	1.3%	1.3%	-	-	1.3%	-	-	-	-
Glenn Palin	A	6.9%	-	-	-	0.0%	-	1.0%	-	5.9%
Gerry Shutt	A	15.5%	1.0%	-	0.3%	9.8%	-	-	-	5.8%
Claudelle Taylor	R	1.3%	-	-	-	1.3%	-	-	-	-
TOTAL CONTRIBUTED (% of PERSON YEARS)		50.0%	15.1%	0.0%	1.9%	31.0%	0.0%	1.0%	0.0%	18.0%
Rider Hunt										
Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercialisation (%)	CRC Admin. (%)
Stephen Ballesty	R	9.9%	-	-	9.9%	9.9%	-	-	-	-
Mark Burrow	R	1.9%	-	-	1.9%	1.9%	-	-	-	-
Jeanette Clough	R	13.4%	-	-	13.4%	13.4%	-	-	-	-
Nicholas Ferrara	R	2.1%	-	-	2.1%	2.1%	-	-	-	-
Roger Hogg	R	3.7%	-	-	3.7%	3.7%	-	-	-	-
Ian Kaye	R	0.1%	-	-	0.1%	0.1%	-	-	-	-
Ewen McDonald	R	0.3%	-	-	0.3%	0.3%	-	-	-	-
Jason Morris	R	14.3%	-	-	14.3%	14.3%	-	-	-	-
Greg Nowak	R	1.5%	-	-	1.5%	1.5%	-	-	-	-
John Oliver	R	15.7%	-	-	15.7%	15.7%	-	-	-	-
Dorothy Soh	R	0.5%	-	-	0.5%	0.5%	-	-	-	-
Reginald Streifler	R	1.4%	-	-	1.4%	1.4%	-	-	-	-
Steve Weatherhead	R	0.2%	-	-	0.2%	0.2%	-	-	-	-
TOTAL CONTRIBUTED (% of PERSON YEARS)		65.0%	0.0%	0.0%	65.0%	65.0%	0.0%	0.0%	0.0%	0.0%
Woods Bagot										
Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercialisation (%)	CRC Admin. (%)
Marija Cakarun	R	0.1%	0.1%	-	-	0.1%	-	-	-	-
Esther Dickins	R	0.5%	-	0.5%	-	0.5%	-	-	-	-
Andrew Ford	R	0.1%	0.1%	-	-	0.1%	-	-	-	-
Kate Frear	R	0.1%	0.1%	-	-	0.1%	-	-	-	-
Fergus Hohnen	R	0.8%	0.1%	0.8%	-	0.8%	-	-	-	-
Sarah Kay	R	0.1%	0.1%	-	-	0.1%	-	-	-	-
Trudy-Ann King	A	0.1%	-	-	-	0.0%	-	-	-	0.1%
Daphne Kreskas	R	0.3%	0.3%	-	-	0.3%	-	-	-	-
Andrew Lopez	R	1.0%	-	1.0%	-	1.0%	-	-	-	-
David Marchant	R	22.6%	0.8%	13.6%	1.5%	16.9%	1.3%	-	-	4.4%
Peter Miglis	R	0.1%	0.1%	-	-	0.1%	-	-	-	-
Kanyarat Nemprepem	R	3.5%	-	3.5%	0.1%	3.5%	-	-	-	-
Kyle Paine	R	0.4%	-	0.4%	-	0.4%	-	-	-	-
Ivan Ross	R	1.6%	1.0%	-	-	1.0%	-	-	-	0.6%
Sue Solly	R	0.1%	0.1%	-	-	0.1%	-	-	-	-
John Tallis	R	0.1%	0.1%	-	-	0.1%	-	-	-	-
April Walsh	R	0.1%	0.1%	-	-	0.1%	-	-	-	-
TOTAL CONTRIBUTED (% of PERSON YEARS)		31.1%	2.6%	19.6%	1.6%	24.8%	1.3%	0.0%	0.0%	5.0%
Australian Building Codes Board										
Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercialisation (%)	CRC Admin. (%)
Brian Ashe	R	2.6%	-	-	0.4%	2.1%	-	-	-	0.5%
Ed Knight	R	0.3%	-	-	-	0.3%	-	-	-	-
TOTAL CONTRIBUTED (% of PERSON YEARS)		2.9%	0.0%	0.0%	0.4%	2.4%	0.0%	0.0%	0.0%	0.5%

Brisbane City Council

Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercialisation (%)	CRC Admin. (%)
Neil Abel	R	0.5%	0.3%	0.2%	-	0.5%	-	-	-	-
Andrew Aitken	R	1.0%	-	0.4%	-	0.7%	-	0.3%	-	-
David Bell	A	1.5%	-	-	-	0.8%	-	-	-	0.7%
Helen Caswell	R	0.3%	-	0.3%	-	0.3%	-	-	-	-
Harry Copeland	R	0.3%	0.2%	-	-	0.3%	-	-	-	-
Paul Cotton	A	0.3%	-	-	-	0.0%	-	-	-	0.3%
Sandra Cranstone	R	0.2%	0.1%	0.1%	-	0.2%	-	-	-	-
Damien Dewar	R	0.3%	-	0.3%	-	0.3%	-	-	-	-
Len Don	R	0.7%	0.2%	-	-	0.7%	-	-	-	-
Noel Faulkner	A	2.5%	-	-	-	0.0%	-	-	-	2.5%
Alex Fisher	R	0.3%	0.2%	-	-	0.2%	-	-	-	0.1%
Medha Gokhale	R	20.7%	-	16.0%	3.3%	19.4%	-	-	-	1.3%
Bronwyn Hicks	A	1.0%	-	-	-	0.0%	-	-	1.0%	-
Allison Horne	A	0.1%	-	-	-	0.0%	-	-	0.1%	-
Russell Hoskins	R	0.6%	-	0.6%	-	0.6%	-	-	-	-
Heidi Illert	A	1.0%	-	-	-	0.0%	-	-	-	1.0%
Steve Keane	R	0.3%	-	-	-	0.3%	-	-	-	-
Judy Kraatz	A	12.1%	-	2.1%	0.2%	2.2%	-	-	-	9.9%
Joyce Law	R	13.1%	-	-	9.1%	13.1%	-	-	-	-
Phillip Lord	R	1.2%	-	-	1.2%	1.2%	-	-	-	-
Sunil Madan	A	1.4%	-	-	0.2%	0.2%	1.1%	-	-	0.1%
Jennifer Nichols	R	1.3%	-	-	-	1.3%	-	-	-	-
Jim Reeves	A	0.1%	0.1%	-	-	0.1%	-	-	-	-
Frank Riley	R	0.1%	-	-	0.1%	0.1%	-	-	-	-
Hans Slebos	A	1.1%	-	-	-	0.0%	1.1%	-	-	-
Dave Stewart	A	0.1%	-	-	-	0.0%	-	-	-	0.1%
Graham Washington	A	0.6%	-	-	0.2%	0.2%	0.4%	-	-	-
TOTAL CONTRIBUTED (% of PERSON YEARS)		62.2%	1.1%	19.9%	14.2%	42.4%	2.5%	0.3%	1.1%	15.9%

Building Commission

Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercialisation (%)	CRC Admin. (%)
Paul Crapper	R	2.0%	1.0%	-	-	2.0%	-	-	-	-
Rob Enker	R	0.6%	-	0.4%	-	0.6%	-	-	-	-
Roger Frith	R	6.3%	2.8%	-	0.2%	6.3%	-	-	-	-
Moshe Gilovitz	R	1.2%	-	0.7%	-	1.2%	-	-	-	-
Dennis Hogan	R	15.4%	-	-	7.5%	15.4%	-	-	-	-
Peter Nassau	R	3.7%	-	-	-	3.7%	-	-	-	-
Jeff Norton	R	0.4%	0.3%	-	-	0.4%	-	-	-	-
TOTAL CONTRIBUTED (% of PERSON YEARS)		29.4%	4.0%	1.1%	7.8%	29.4%	0.0%	0.0%	0.0%	0.0%

Queensland Department of Main Roads

Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercialisation (%)	CRC Admin. (%)
Alan Carse	R	2.6%	-	2.6%	-	2.6%	-	-	-	-
Louise Chandler	R	1.4%	-	-	1.4%	1.4%	-	-	-	-
Raju Chamala	R	1.4%	1.4%	-	-	1.4%	-	-	-	-
David Clifford	A	0.1%	-	-	0.1%	0.1%	-	-	-	-
John Fenwick	R	1.1%	-	-	1.1%	1.1%	-	-	-	-
Ross Guppy	R	2.8%	2.8%	-	-	2.8%	-	-	-	-
Jocelyn Handley	R	0.2%	-	0.2%	-	0.2%	-	-	-	-
Steve Hogan	R	20.3%	-	-	17.2%	17.2%	-	-	-	3.1%
Trevor Los	R	0.1%	-	-	0.1%	0.1%	-	-	-	-
Mano Manoharan	R	0.2%	-	-	0.2%	0.2%	-	-	-	-
Julie Peters	R	7.7%	-	7.7%	-	7.7%	-	-	-	-
Neil Robertson	A	5.2%	-	-	5.2%	5.2%	-	-	-	-
Mark Rogers	R	0.3%	0.3%	-	-	0.3%	-	-	-	-
Bill Semple	R	0.5%	0.5%	-	-	0.5%	-	-	-	-
Graham Shardlow	R	0.9%	0.9%	-	-	0.9%	-	-	-	-
John Spathonis	A	12.3%	3.7%	0.8%	0.9%	5.4%	-	-	-	6.9%
Mike Swainston	A	7.2%	2.1%	-	1.7%	3.8%	-	-	-	3.4%
Justin Weligamage	R	24.3%	-	-	24.3%	24.3%	-	-	-	-
Dennis Wogan	R	2.8%	-	-	-	0.0%	-	-	-	2.8%
Vali Yousefpour	R	2.3%	-	-	2.3%	2.3%	-	-	-	-
TOTAL CONTRIBUTED (% of PERSON YEARS)		93.5%	11.6%	11.2%	54.5%	77.3%	0.0%	0.0%	0.0%	16.2%

Queensland Department of Public Works										
Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercialisation (%)	CRC Admin. (%)
Don Allan	R	12.9%	2.8%	0.3%	0.1%	8.9%	0.3%	-	-	3.8%
Ron Apelt	R	5.0%	-	-	5.0%	5.0%	-	-	-	-
Michael Ball	R	7.3%	-	6.7%	0.6%	7.3%	-	-	-	-
Dayv Carter	R	0.5%	0.5%	-	-	0.5%	-	-	-	-
Selwyn Clark	A	1.3%	-	-	0.6%	0.6%	-	-	-	0.8%
John Coglan	R	0.9%	-	0.9%	-	0.9%	-	-	-	-
John Collin	R	2.3%	-	-	2.3%	2.3%	-	-	-	-
Keith Eaton	R	0.4%	0.3%	-	-	0.4%	-	-	-	-
Ros Edols	R	0.3%	-	0.2%	0.1%	0.3%	-	-	-	-
David Evans	R	2.3%	-	-	-	2.3%	-	-	-	-
Keith Farr	A	0.9%	-	-	-	0.0%	-	-	-	0.9%
Thomas Fussell	R	2.1%	-	0.1%	1.0%	2.1%	-	-	-	-
Bob Giles	R	0.7%	0.6%	-	-	0.6%	-	-	-	0.1%
Dale Gilbert	R	13.1%	-	0.7%	1.1%	10.2%	-	1.8%	0.1%	0.9%
John Gray	R	1.5%	-	1.5%	-	1.5%	-	-	-	-
Stuart Grierson	R	0.7%	-	-	0.3%	0.7%	-	-	-	-
Mark Haug	R	0.4%	0.4%	-	-	0.4%	-	-	-	-
Delwyn Jones	A	28.5%	-	8.5%	-	8.5%	-	-	20.0%	-
Zofia Kijak	A	0.6%	-	-	-	0.0%	0.6%	-	-	-
Paul Krautz	R	0.3%	0.3%	-	-	0.3%	-	-	-	-
Cindy Lee	R	0.6%	-	0.6%	-	0.6%	-	-	-	-
Wendy May-Taylor	A	4.7%	0.5%	-	-	0.5%	-	-	-	4.2%
Sheena McConville	R	0.2%	0.2%	-	-	0.2%	-	-	-	-
Ken Moschner	R	1.2%	0.6%	-	-	0.9%	0.1%	-	-	0.3%
Michelle Porter	R	2.3%	1.4%	-	-	1.4%	-	-	-	0.9%
Roy Sargent	R	1.1%	1.1%	-	-	1.1%	-	-	-	-
Frank Seed	R	0.2%	-	0.2%	-	0.2%	-	-	-	-
Ross Smith	A	0.6%	-	-	-	0.0%	-	-	-	0.6%
Teng Hee Tan	R	0.5%	-	-	-	0.5%	-	-	-	-
Julia Willis	A	7.0%	-	-	-	0.0%	-	-	-	7.0%
Rob Williams	R	3.4%	1.9%	-	-	3.4%	-	-	-	-
TOTAL CONTRIBUTED (% of PERSON YEARS)		103.4%	10.5%	19.6%	11.0%	61.1%	1.0%	1.8%	20.1%	19.4%
Queensland Department of State Development and Innovation										
Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercialisation (%)	CRC Admin. (%)
Terry Gibson	A	0.3%	-	-	-	0.0%	-	0.3%	-	-
Sue Mackenzie-Smith	A	6.3%	3.0%	-	-	3.0%	-	1.5%	-	1.8%
Brendan Richardson	R	2.5%	2.3%	-	-	2.3%	-	0.3%	-	-
TOTAL CONTRIBUTED (% of PERSON YEARS)		9.0%	5.3%	0.0%	0.0%	5.3%	0.0%	2.0%	0.0%	1.8%
CSIRO										
Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercialisation (%)	CRC Admin. (%)
Michael Ambrose	R	33.9%	-	33.9%	-	33.9%	-	-	-	-
Miles Anderson	R	12.4%	-	12.4%	-	12.4%	-	-	-	-
Steven Brown	R	9.9%	-	9.9%	-	9.9%	-	-	-	-
Ivan Cole	R	12.0%	-	12.0%	-	12.0%	-	-	-	-
Penny Corrigan	R	8.6%	-	8.6%	-	8.6%	-	-	-	-
John Crawford	R	17.4%	-	12.4%	5.0%	17.4%	-	-	-	-
Angelo Delsante	R	5.0%	-	5.0%	-	5.0%	-	-	-	-
Lan Ding	R	84.3%	-	84.3%	-	84.3%	-	-	-	-
Robin Drogemuller	R	58.0%	-	39.0%	19.0%	58.0%	-	-	-	-
Greg Foliente	R	4.0%	4.0%	-	-	4.0%	-	-	-	-
Shawn Foo	R	51.0%	-	20.5%	30.5%	51.0%	-	-	-	-
Wayne Ganther	R	11.6%	-	11.6%	-	11.6%	-	-	-	-
David Johnston	R	9.9%	-	9.9%	-	9.9%	-	-	-	-
Larry Little	R	0.3%	-	-	-	0.3%	-	-	-	-
John Mahoney	R	4.8%	-	4.8%	-	4.8%	-	-	-	-
Stephen McFallen	R	20.5%	19.2%	1.3%	-	20.5%	-	-	-	-
Cheryl McNamara	R	4.5%	-	-	4.5%	4.5%	-	-	-	-
Anne Miller	R	13.3%	-	13.3%	-	13.3%	-	-	-	-
Steve Moller	R	16.6%	-	16.6%	-	16.6%	-	-	-	-
Peter Newton	R	17.7%	-	11.4%	-	17.7%	-	-	-	-
Phillip Paevere	R	9.3%	-	9.3%	-	9.3%	-	-	-	-
David Patterson	R	10.8%	-	10.8%	-	10.8%	-	-	-	-
Lam Pham	R	1.4%	-	-	1.4%	1.4%	-	-	-	-
Todd Remmers	R	16.8%	-	16.8%	-	16.8%	-	-	-	-
Hans Schevers	R	10.0%	-	-	10.0%	10.0%	-	-	-	-

CSIRO cont.

Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercialisation (%)	CRC Admin. (%)
Steven Shaw	R	26.3%	-	-	26.3%	26.3%	-	-	-	-
Gerry Trinidad	R	46.6%	-	32.7%	13.9%	46.6%	-	-	-	-
Selwyn Tucker	R	37.2%	-	37.2%	-	37.2%	-	-	-	-
Angela Williams	R	10.1%	-	10.1%	-	10.1%	-	-	-	-
TOTAL CONTRIBUTED (% of PERSON YEARS)		564.0%	23.2%	423.8%	110.5%	564.0%	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. (%)	Commercialisation (%)	CRC Admin. (%)
Helen Belcher	R	5.2%	5.0%	-	0.2%	5.2%	-	-	-	-
Graham Brewer	R	24.0%	24.0%	-	-	24.0%	-	-	-	-
John Burgess	R	5.0%	3.8%	-	0.7%	5.0%	-	-	-	-
Swee-Eng Chen	R	4.2%	0.6%	-	-	2.5%	1.7%	-	-	-
Thayaparan Gajendran	R	6.3%	6.3%	-	-	6.3%	-	-	-	0.0%
Rod Gameson	R	12.5%	-	7.8%	1.4%	10.1%	0.5%	-	-	1.9%
Rod Halligan	R	8.6%	4.0%	-	-	8.6%	-	-	-	-
Marcus Jeffries	R	16.2%	16.2%	-	-	16.2%	-	-	-	-
Adrian Kirk	R	13.8%	13.8%	-	-	13.8%	-	-	-	-
Anton Kriz	R	6.4%	6.4%	-	-	6.4%	-	-	-	-
Chris Landorf	R	1.1%	-	0.3%	-	1.1%	-	-	-	-
Kerry London	R	68.6%	57.5%	-	1.0%	63.3%	0.5%	1.4%	0.3%	3.3%
Adrian Page	R	0.1%	0.1%	-	-	0.1%	-	-	-	-
Willy Sher	R	8.7%	-	4.5%	3.2%	7.7%	1.0%	-	-	-
Peter Ward	R	4.5%	2.9%	-	1.6%	4.5%	-	-	-	-
Tony Williams	R	11.5%	-	11.5%	-	11.5%	-	-	-	-
Loong Wong	R	1.3%	1.3%	-	-	1.3%	-	-	-	-
TOTAL CONTRIBUTED (% of PERSON YEARS)		197.8%	141.7%	24.1%	8.0%	187.4%	3.7%	1.4%	0.3%	5.2%

QUT

Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercialisation (%)	CRC Admin. (%)
John Bell	R	1.8%	-	1.8%	-	1.8%	-	-	-	-
Martin Betts	R	7.9%	3.6%	-	-	6.0%	-	1.9%	-	-
Bert Biggs	R	25.8%	25.8%	-	-	25.8%	-	-	-	-
Colin Boyd	R	1.0%	1.0%	-	-	1.0%	-	-	-	-
Terry Boyd	R	0.8%	0.8%	-	-	0.8%	-	-	-	-
Jon Bunker	R	3.8%	-	3.8%	-	3.8%	-	-	-	-
Adrian Burgess	R	16.9%	1.0%	-	-	14.4%	1.0%	1.5%	-	-
Sharon Christensen	R	6.7%	6.7%	-	-	6.7%	-	-	-	-
Ian Cowling	R	1.3%	-	1.3%	-	1.3%	-	-	-	-
Steve Coyne	R	1.8%	-	1.8%	-	1.8%	-	-	-	-
Phil Crowther	R	0.3%	-	0.3%	-	0.3%	-	-	-	-
Ed Dawson	R	4.6%	4.6%	-	-	4.6%	-	-	-	-
Nur Demirebilek	R	11.8%	-	11.8%	-	11.8%	-	-	-	-
Paul den Ronden	R	2.7%	-	2.7%	-	2.7%	-	-	-	-
Bill Duncan	R	6.0%	6.0%	-	-	6.0%	-	-	-	-
Brian Fitzgerald	R	0.8%	0.8%	-	-	0.8%	-	-	-	-
Ernest Foo	R	14.4%	14.2%	-	-	14.4%	-	-	-	-
Yin Foong	R	2.5%	-	2.5%	-	2.5%	-	-	-	-
Andrew Frowd	R	1.8%	-	-	1.8%	1.8%	-	-	-	-
John Hayes	R	1.5%	-	1.5%	-	1.5%	-	-	-	-
Ross Hayward	R	5.0%	-	5.0%	-	5.0%	-	-	-	-
Matthew Humphreys	R	1.8%	-	1.3%	-	1.8%	-	-	-	-
Stephen Kajewski	R	11.8%	-	-	11.3%	11.8%	-	-	-	-
Rosemary Kennedy	R	0.3%	-	0.3%	-	0.3%	-	-	-	-
Kame Khouzam	R	2.5%	-	2.5%	-	2.5%	-	-	-	-
Anne Krupa	A	8.8%	-	-	-	6.3%	-	-	-	2.5%
Andreas Nata-atmadja	R	9.5%	-	-	9.5%	9.5%	-	-	-	-
Binh Pham	R	1.3%	-	1.3%	-	1.3%	-	-	-	-
Steve Rowlinson	R	17.0%	17.0%	-	-	17.0%	-	-	-	-
Tony Sidwell	R	27.9%	3.0%	-	11.2%	25.4%	-	-	-	2.5%
Roland Simons	R	2.0%	1.3%	-	-	2.0%	-	-	-	-
Debbie Smit	R	41.8%	13.4%	-	7.5%	38.8%	1.6%	1.4%	-	-
Ned Wales	R	0.6%	-	0.6%	-	0.6%	-	-	-	-
Jay Yang	R	23.8%	-	23.8%	-	23.8%	-	-	-	-
Jinglan Zhang	R	5.0%	-	5.0%	-	5.0%	-	-	-	-
TOTAL CONTRIBUTED (% of PERSON YEARS)		272.8%	99.2%	66.9%	41.2%	260.5%	2.6%	4.7%	0.0%	5.0%

RMIT										
Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercialisation (%)	CRC Admin. (%)
Lionel Boxer	R	5.0%	-	-	5.0%	5.0%	-	-	-	-
Peter Bryar	R	15.0%	-	-	15.0%	15.0%	-	-	-	-
Mark Burry	R	4.2%	-	4.2%	-	4.2%	-	-	-	-
Mai Chaing	A	6.3%	-	-	-	0.0%	-	-	-	6.3%
John Dalrymple	R	22.6%	-	-	16.3%	18.3%	-	-	-	4.4%
Saman de Silva	R	20.0%	-	17.5%	2.5%	20.0%	-	-	-	-
Andrew Finnegan	R	5.0%	5.0%	-	-	5.0%	-	-	-	-
Tim Grant	R	2.5%	-	2.5%	-	2.5%	-	-	-	-
Libby Hess	A	5.0%	-	-	-	0.0%	-	-	-	5.0%
Sophie James	A	1.3%	-	-	-	0.0%	-	-	-	1.3%
Arun Kumar	R	35.0%	-	1.3%	29.3%	31.8%	-	-	-	3.3%
Tom Molyneaux	R	3.8%	-	3.8%	-	3.8%	-	-	-	-
Eric Pagliarella	A	5.0%	-	-	-	0.0%	2.5%	-	-	2.5%
Leigh Peterson	A	6.0%	-	-	-	1.3%	-	-	-	4.8%
Sujeeva Setunge	R	35.0%	-	3.8%	31.3%	35.0%	-	-	-	-
Ashish Shah	R	20.0%	-	-	20.0%	20.0%	-	-	-	-
Peter Stewart	R	11.3%	8.8%	-	-	8.8%	-	-	-	2.5%
Kathryn Thomas	A	1.3%	-	-	-	0.0%	-	-	-	1.3%
Derek Walker	R	20.5%	11.3%	-	4.2%	15.4%	5.0%	-	-	-
Andrew Wilson	R	25.0%	25.0%	-	-	25.0%	-	-	-	-
TOTAL CONTRIBUTED (% of PERSON YEARS)		249.5%	50.0%	32.9%	123.4%	210.9%	7.5%	0.0%	0.0%	31.1%
The University of Sydney										
Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercialisation (%)	CRC Admin. (%)
Kirsty Beilharz	R	7.5%	-	2.5%	-	2.5%	5.0%	-	-	-
Ooi Lai Chui	A	1.3%	-	1.3%	-	1.3%	-	-	-	-
Andy Dong	R	29.0%	-	13.8%	12.5%	26.3%	-	0.8%	0.8%	1.3%
Leslie George	A	7.0%	-	-	-	0.0%	-	-	-	7.0%
John Gero	R	29.1%	-	22.1%	-	22.1%	5.0%	0.8%	1.3%	-
Megan Haig	A	3.0%	-	0.8%	-	0.8%	-	-	-	2.3%
Mary-Louise Huppatz	A	2.8%	-	0.8%	-	0.8%	-	-	-	2.0%
David Leifer	R	5.0%	-	-	5.0%	5.0%	-	-	-	-
Mary Lou Maher	R	55.8%	-	35.0%	6.3%	41.3%	5.0%	5.0%	0.8%	3.8%
Gary Moore	A	4.0%	-	-	-	0.0%	-	-	-	4.0%
Joe Nappa	A	3.3%	-	0.8%	-	0.8%	-	-	-	2.5%
Suzanne Roberts	A	9.0%	-	1.8%	0.5%	2.3%	-	-	-	6.8%
Mike Rosenman	R	35.8%	-	33.8%	-	33.8%	-	2.0%	-	-
Kerry Song	A	3.0%	-	-	-	0.0%	-	-	-	3.0%
Matthew Storey	A	1.8%	-	-	-	0.0%	-	-	-	1.8%
Julian Tam	A	4.3%	-	-	-	0.0%	-	-	-	4.3%
Jason Thorne	A	13.2%	-	3.8%	1.3%	5.0%	-	-	-	8.2%
Alan Tracey	R	2.5%	-	-	2.5%	2.5%	-	-	-	-
TOTAL CONTRIBUTED (% of PERSON YEARS)		214.6%	0.0%	116.1%	25.5%	141.6%	15.0%	8.5%	2.8%	46.8%
University of Western Sydney										
Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercialisation (%)	CRC Admin. (%)
Don Dingsdag	R	23.8%	23.8%	-	-	23.8%	-	-	-	-
Rosemary Dorrough	A	1.5%	-	-	-	0.0%	-	-	-	1.5%
Mary Hardie	R	50.0%	25.0%	1.3%	-	50.0%	-	-	-	-
Lesley Hayes	A	1.5%	-	-	-	1.5%	-	-	-	-
Alan Jeary	A	8.8%	-	-	8.3%	8.3%	0.6%	-	-	-
Shahed Khan	A	2.5%	-	2.5%	-	2.5%	-	-	-	-
Graham Miller	R	22.3%	5.8%	6.3%	6.3%	20.3%	0.4%	1.1%	0.1%	0.4%
TOTAL CONTRIBUTED (% of PERSON YEARS)		110.3%	54.5%	10.0%	14.5%	106.2%	1.0%	1.1%	0.1%	1.9%

Staff Table 2

CRC Paid Program Staff

Name	Employing organisation	Main activity	Total % of time	% spent on Research Program			Total on Research	% spent on Education Program	% spent on External Comm.	% spent on Commercialisation	% spent on CRC Administration
				Subprogram							
				A	B	C					
Sarah Alder	QUT	R	100	-	100	-	100	-	-	-	-
Guillermo Aranda-Mena	RMIT	R	100	55	-	45	100	-	-	-	-
Felipe Augustin	CSIRO	R	25	-	25	-	25	-	-	-	-
Nathaniel Bavinton	UNC	R	45	45	-	-	45	-	-	-	-
Thomas Bellamy	UNC	R	100	-	100	-	100	-	-	-	-
Zafer Bilda	USYD	R	57	-	57	-	57	-	-	-	-
Peter Black	QUT	R	20	20	-	-	20	-	-	-	-
Aletha Blayse	UWS	R	15	15	-	-	15	-	-	-	-
Fanny Boulaire	CSIRO	R	100	-	55	45	100	-	-	-	-
Lionel Boxer	RMIT	R	30	-	-	30	30	-	-	-	-
Angela Bradbury	CSIRO	R	55	-	55	-	55	-	-	-	-
Peter Bryar	RMIT	R	30	-	-	30	30	-	-	-	-
Linda Candy	USYD	R	15	-	15	-	15	-	-	-	-
Julian Canterbury	RMIT	R	30	-	30	-	30	-	-	-	-
Wan Yee Chan	CSIRO	R	65	-	65	-	65	-	-	-	-
Li Chen	RMIT	R	100	-	100	-	100	-	-	-	-
Pooi Sun Chen	UNC	R	35	35	-	-	35	-	-	-	-
Fiona Cheung	QUT	R	100	100	-	-	100	-	-	-	-
Lawrence Cheung	CSIRO	R	5	-	5	-	5	-	-	-	-
Merv Cowley	QUT	R	10	-	-	10	10	-	-	-	-
John Crawford	CSIRO	R	15	-	-	15	15	-	-	-	-
Nicola Croce	UNC	R	80	80	-	-	80	-	-	-	-
Betul Dal	CSIRO	R	70	-	10	60	70	-	-	-	-
Luke Davey	UNC	R	10	10	-	-	10	-	-	-	-
Kevin Davies	USYD	R	15	-	15	-	15	-	-	-	-
Phillip Douglas	RMIT	R	90	-	90	-	90	-	-	-	-
Rong Du	QUT	R	20	20	-	-	20	-	-	-	-
Stephen Egan	CSIRO	R	100	-	40	60	100	-	-	-	-
Phoebe Everingham	UNC	R	15	15	-	-	15	-	-	-	-
Alison Fairley	RMIT	R	55	-	55	-	55	-	-	-	-
Shawn Foo	CSIRO	R	25	-	15	10	25	-	-	-	-
David Fox	UNC	R	5	5	-	-	5	-	-	-	-
Michael Frahm	QUT	R	20	20	-	-	20	-	-	-	-
Chau Giang	USYD	R	30	-	30	-	30	-	-	-	-
Juanma Gonzelez-Nieto	QUT	R	40	40	-	-	40	-	-	-	-
Carole Green	CRC HQ	A	100	3.3	3.3	3.3	10	10	10	15	55
Andrew Hampson	UNC	R	60	60	-	-	60	-	-	-	-
Keith Hampson	CRC HQ	R	100	8.3	8.3	8.3	25	10	20	20	25
Mary Hardie	UWS	R	66	-	16	50	66	-	-	-	-
Chen HuaizHong	UNC	R	5	5	-	-	5	-	-	-	-
Karli James	RMIT	R	50	-	50	-	50	-	-	-	-
Melissa James	CSIRO	R	25	-	-	25	25	-	-	-	-
Renae Jones	QUT	R	10	10	-	-	10	-	-	-	-
Julie Jupp	USYD	R	50	-	50	-	50	-	-	-	-
Wai Tak Kan	USYD	R	5	-	5	-	5	-	-	-	-
Rosemary Kennedy	QUT	R	10	-	-	10	10	-	-	-	-
Phillip Kimmet	QUT	R	25	-	-	25	25	-	-	-	-
Loretta Kivlighon	CSIRO	R	85	-	55	30	85	-	-	-	-
Brian Bing Yan Lee	USYD	R	15	-	-	15	15	-	-	-	-
Pak San Liew	USYD	R	90	-	90	-	90	-	-	-	-
Weena Lokuge	RMIT	R	35	-	-	35	35	-	-	-	-
Isolde Macatol	UWS	R	40	40	-	-	40	-	-	-	-
Julie Macinerny	CSIRO	R	10	-	-	10	10	-	-	-	-
Karen Manley	QUT	R	100	100	-	-	100	-	-	-	-
John Mashford	CSIRO	R	95	-	70	25	95	-	-	-	-

Staff Table 2 cont.

CRC Paid Program Staff

Name	Employing organisation	Main activity	Total % of time	% spent on Research Program			Total on Research	% spent on Education Program	% spent on External Comm.	% spent on Commercialisation	% spent on CRC Administration
				Subprogram							
				A	B	C					
Kathryn McCabe	UNC	R	75	75	-	-	75	-	-	-	-
Judith McCann	UNC	R	75	65	10	-	75	-	-	-	-
Kevin McDonald	CSIRO	R	100	-	50	50	100	-	-	-	-
Cheryl McNamara	CSIRO	R	96	-	91	5	96	-	-	-	-
Elspeth Mead	QUT	R	60	-	60	-	60	-	-	-	-
Daniyal Mian	QUT	R	100	-	-	100	100	-	-	-	-
Anne Miller	CSIRO	R	87	-	87	-	87	-	-	-	-
Pene Mitchell	CSIRO	R	15	-	15	-	15	-	-	-	-
Tim Muster	CSIRO	R	15	-	15	-	15	-	-	-	-
Abolghasem Nazamian	RMIT	R	90	-	-	90	90	-	-	-	-
Otti Newhouse	CSIRO	R	10	-	-	10	10	-	-	-	-
Paul Nicholas	RMIT	R	5	-	5	-	5	-	-	-	-
David Paterson	CSIRO	R	45	-	45	-	45	-	-	-	-
Wei Peng	USYD	R	40	-	40	-	40	-	-	-	-
Chintha Perena	RMIT	R	30	-	-	30	30	-	-	-	-
Julie Peters	RMIT	R	40	-	40	-	40	-	-	-	-
Noppadol Piyatrapoomi	RMIT	R	100	-	-	100	100	-	-	-	-
Michael Pomplun	QUT	R	20	20	-	-	20	-	-	-	-
Julio Rosenblatt	USYD	R	20	-	20	-	20	-	-	-	-
Peter Scuderi	CRC HQ	R	100	20	20	20	60	10	10	10	10
Ashish Shah	RMIT	R	50	-	-	50	50	-	-	-	-
Stephen Shaw	CSIRO	R	15	-	15	-	15	-	-	-	-
Vaughn Sheahan	UWS	R	75	75	-	-	75	-	-	-	-
Susan Sheratt	UNC	R	60	-	60	-	60	-	-	-	-
Gregory Smith	USYD	R	80	-	80	-	80	-	-	-	-
Paul Smith	QUT	R	70	60	-	10	70	-	-	-	-
Gitachari Srikanathan	RMIT	R	25	25	-	-	25	-	-	-	-
Warren Staples	RMIT	R	75	-	-	75	75	-	-	-	-
Alison Terry	RMIT	R	25	-	25	-	25	-	-	-	-
Marcello Tonelli	QUT	R	5	-	-	5	5	-	-	-	-
Gerry Trinidad	CSIRO	R	25	-	25	-	25	-	-	-	-
Emily Tucker	USYD	R	20	-	20	-	20	-	-	-	-
Srikanth Venkatesan	RMIT	R	5	-	-	5	5	-	-	-	-
Phillipa Watson	CSIRO	R	20	-	20	-	20	-	-	-	-
Achim Weippert	QUT	R	50	-	-	50	50	-	-	-	-
Andrew Wilson	RMIT	R	10	10	-	-	10	-	-	-	-
Ji Soo Yoon	USYD	R	30	-	30	-	30	-	-	-	-
TOTAL CRC			4365	1037	1982	1142	4160	30	40	45	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 Commercialisation	Person Years spent on CRC Admin.
				Subprogram			Total on Research				
						A	B	C			
TOTAL CONTRIBUTED			21.1	4.4	7.5	4.9	18.5	0.4	0.2	0.3	1.7
TOTAL FUNDED BY CRC			43.7	10.4	19.8	11.4	41.6	0.3	0.4	0.5	0.9
GRAND TOTAL			64.7	14.7	27.3	16.3	60.1	0.6	0.6	0.7	2.6
Proportion of total professional staff resources			100%	23%	42%	25%	93%	1%	1%	1%	4%

List of publications and presentations

Books and refereed journal articles

- Aranda-Mena, G., Blismas, N. and Wakefield, R., 'A Model for the Uptake of E-business by Building Small and Medium Enterprises' (under review)
- Aranda-Mena, G., Sher, W., Gameson, R. and Ward, P., 'Evolving Trends in nD Modelling: The Construction Planning Workbench' Architectural Engineering and Design Management (under review)
- Blayse, A. and Manley, K., 'Key Influences on Construction Innovation', Construction Innovation, Vol 4, No 3, pp 1–12, September 2004
- Cheung, F., Rowlinson, S. and Jefferies, M., 'Relationship Contracting in Australia', Journal of Construction Procurement: Special Issue on 'Trust in Construction' (accepted for publication)
- CRC for Construction Innovation 'Clients Driving Innovation International Conference' 25-27 October 2004
- London, K., Chen, J. and Bavinton, N., 'Adopting Reflexive Capability on International Briefing', Facilities, Special issue: Briefing, 23, 2005
- Maier, M.L., Liew, P.-S., Gu, N. and Ding, L., 'An Agent Approach to Supporting Collaborative Design in 3D Virtual Worlds', Automation in Construction, 2005
- Maqsood, T., Finegan, A. and Walker, D., 'Biases and Heuristics in Judgment and Decision Making: The Dark Side of Tacit Knowledge', Issues in Informing Science and Information Technology, 2004
- Newton, P., '2006 Australian State of the Environment Report: Human Settlements Theme Commentary' Department of Environment and Heritage, Canberra, 2005
- Nezamian, A., Setunge, S. and Chandler, L., 'A case study of application of FRP composites in strengthening of the reinforced concrete headstock of a bridge structure', Journal of Composites for Construction, ASCE publication (reviewers' comments received and revised paper submitted in July 2005)
- Nezamian, A., Setunge, S. and Fenwick, J., 'A Decision-support Tool in Using FRP composites for Rehabilitation of Concrete Bridge Structures' ASCE Journal of Materials in Civil Engineering (Under review)
- Piyatrapoomi, N., Kumar, A. and Setunge, S., 'Framework for Investment Decision-making under Risk and Uncertainty for Infrastructure Asset Management' Research In Transportation Economics, Vol. 8, Economic Impacts of Intelligent Transportation Systems: Innovations and Case Studies, Elsevier, 2004
- Rowlinson, S., Cheung, F., Simons, R. and Rafferty, A., 'Alliancing in Australia: No Litigation Contracts: A Tautology?', ASCE Journal of Professional Issues in Engineering Education and Practice: Special Issue on 'Legal Aspects of Relational Contracting' (accepted for publication)
- Schevers, H., Trinidad, G., Drogemuller, R. and Newton, P., 'Towards Integral Design Support for Urban Development', IT in Construction (in press) 2005
- Smith, G., Maher, M.L., Rosenman, M., Ding, L. and Marchant, D., 'A Prototype to Facilitate Distributed Collaborative Designing', Journal of Computing and Information Science Engineering (submitted February 2005)
- Walker, D., 'The Competitiveness of Having a Knowledge Advantage', AIQS Building Economist Magazine
- Walker, D., Maqsood, T. and Finegan, A., 'The Culture of the Knowledge Advantage (K-Adv): A Holistic Strategic Approach to the Management of Knowledge', Knowledge Management in the Construction Industry: A Socio-Technical Perspective. Kazi A.S. Hesinki, Finland, Idea Group Publishing, 2005

Refereed conference papers

- In accordance with the Commonwealth Agreement Construction Innovation is required to participate in partner and associate network seminars and conferences. The following is a listing of papers presented by researchers and students at such events and the Construction Innovation Clients Driving Innovation International Conference.
- Ambrose, M., Mead, E. and Miller, A., 'Sustainable Suburbs: The Developer's Challenge', CRC for Construction Innovation, Clients Driving Innovation International Conference, Surfers Paradise, Australia, 25–27 October 2004
- Ambrose, M. and Miller, A., 'How to Achieve Sustainability: Regulatory Challenges', Conference on Sustainable Building South East Asia, Kuala Lumpur Malaysia, 11–13 April 2005
- Aranda-Mena, G., Sher, W., Gameson, R. and Ward, P., 'Mapping Planners' Information-visualisation Requirements for 4D CAD Developments', CRC for Construction Innovation, Clients Driving Innovation International Conference, Surfers Paradise, Australia, 25–27 October 2004
- Aranda-Mena, G., Sher, W., Gameson, R. and Ward, P., 'Towards nD Modelling: Current Needs and Expectations of Virtual Reality in AEC', Architect 3000, Barcelona, 2 July 2004
- Boyd, T. and Kimmet, P., 'Innovative Benchmarks for Built Asset Performance: The Triple Bottom Line Approach', CRC for Construction Innovation, Clients Driving Innovation International Conference, Surfers Paradise, Australia, 25–27 October 2004
- Candy, L., Bilda, Z., Maher, M.L. and Gero, J., 'Evaluating Software Support for Video Data Capture and Analysis in Collaborative Design Studies', QualIT conference, Brisbane, November 2004
- Chen, L., Douglas, P., de Silva, S. and Peters, J., 'Evaluation of Valuation of Noise Amelioration Treatments Within and Outside the Road Reserve', Annual Conference of the Australian Acoustical Society, Acoustics 2004, Gold Coast, Australia, 3–5 November 2004
- Cheung, F., Rowlinson, S. and Jefferies, M., 'A Critical Review of the Organisational Structure, Culture and Commitment in the Australian Construction Industry', in (ed) Sullivan, K. and Kashiwagi, D., International Symposium of CIB W92/TG23/W107 on the Impact of Cultural Differences and Systems on Construction Performance, Las Vegas, Nevada, USA, 8–10 February 2005
- Cole, I., Trinidad, G., Corrigan, P., Maher, M.L., Liew, P., Gilbert, D., Ball, M. and Carse, A., 'Defining Reference Service Life: An Open Innovation Approach', 10DBMC International Conference On Durability of Building Materials and Components, Lyons, France, 17–20 April 2005
- Cowley, M., 'Forecasting Property Performance', CRC for Construction Innovation, Clients Driving Innovation International Conference, Surfers Paradise, Australia, 25–27 October 2004
- de Silva, S., Douglas, P., Chen, L. and Peters, J., 'Creating a Proactive Decision-support Environment in Managing Road Traffic Noise', CRC for Construction Innovation, Clients Driving Innovation International Conference, Surfers Paradise, Australia, 25–27 October 2004
- Ding, L., Drogemuller, R., Jupp, J., Rosenman, M. and Gero, J., 'Automated Code Checking', CRC for Construction Innovation, Clients Driving Innovation International Conference, Surfers Paradise, Australia, 25–27 October 2004
- Douglas, P. and de Silva, S., 'Comparative Study: Health Research on Traffic Noise Pollution VS. Technical Research on Traffic Noise Mitigation', IABSE-04, Shanghai, China, 22–24 September 2004

List of publications and presentations



◀ *Sujeewa Setunge (RMIT) and Delwyn Jones (Queensland Department of Public Works) ▶*
presenting papers at the CRC's 2004 International Conference



Drogemuller, R., Crawford, J. and Egan, S., 'Linking Early Design Decisions Across Multiple Disciplines', European Conference on Product and Process Modelling in the Building and Construction Industry: ECPPM 2004, Istanbul, Turkey, 8–10 September 2004

Du, R., Foo, E., Boyd, C. and Fitzgerald, B., 'Secure Communication Protocol for Preserving E-tendering Integrity', Fifth Asia-Pacific Industrial Engineering and Management Systems Conference, Gold Coast, Australia, 12–15 December 2004

Finegan A. and Maqsood T., 'A Case Study of the Adoption of ICT Innovation in a Remotely Located Construction Organisation', CIB W102 meeting on Information and Knowledge Management in Building and International Conference: Information and Knowledge Management in a Global Economy: Challenges and Opportunities for Construction Organisations, Lisboa, Portugal 19–20 May 2005

Gameson, R., Sher, W., Williams, A. and Bellamy, T., 'Necessary Skills and Practices Required for Effective Participation in High Bandwidth Design Team Activities', CRC for Construction Innovation, Clients Driving Innovation International Conference, Surfers Paradise, Australia, 25–27 October 2004

Gero, J.S., Maher, M.L., Bilda, Z., Marchant, M., Namprempree, K. and Candy, L., 'Studying Collaborative Design in High Bandwidth Virtual Environments', CRC for Construction Innovation, Clients Driving Innovation International Conference, Surfers Paradise, Australia, 25–27 October 2004

Humphreys, M., Mian, D. and Sherman, S., 'The Development and Use of Secondary Performance Indicators for Measuring Project Health', CRC for Construction Innovation, Clients Driving Innovation International Conference, Surfers Paradise, Australia, 25–27 October 2004

Jones, D., Watson, P. and Mitchell, P., 'Building Project Definition Needs', Sustainability Measures for Decision-support, Fourth Australian Life Cycle Assessment Conference, Sydney, 23–25 Feb 2005

Kajewski, S., Weippert, A., Remmers, T. and McFallan, S., 'ICT in the Australian Construction Industry: Status, Training and Perspectives' CRC for Construction Innovation, Clients Driving Innovation International Conference, Surfers Paradise, Australia, 25–27 October 2004

Keast, R. and Hampson, K., 'Innovation Networks in the Construction Arena: The Strategic Management of Mixed Enterprises', International Research Symposium on Public Management, Milan, 6–8 April 2005

Kimmet, P., 'Social Responsibility, Sustainability and the Triple Bottom Line: Bringing Building Stakeholders Back In', CRC for Construction Innovation, Clients Driving Innovation International Conference, Surfers Paradise, Australia, 25–27 October 2004

Kumar, A., 'The Role of Risk Modelling for Predicting Maintenance and Rehabilitation Budgets', Pavement Management Systems Asia 2005, Singapore, 31 May – 1 June 2005.

London, K. and Chen, J. 'The Development of Soft Strategic Indicators for International Client Satisfaction', CRC for Construction Innovation, Clients Driving Innovation International Conference, Surfers Paradise, Australia, 25–27 October 2004

London, K., Chen, J. and Bavinton, N., 'The role of investment, exchange and accumulation of non-economic capital on international project performance', 2005 CIB International Symposium on Procurement Systems: The Impact of Cultural Differences on Construction Performance, Las Vegas, USA, 7–10 February 2005

Maher, M.L., Rosenman, M., Ding, L., Smith, G., Marchant, D. and Dong, A., 'Supporting Collaboration and Multiple Views of Building Models in Virtual Worlds', CRC for Construction Innovation, Clients Driving Innovation International Conference, Surfers Paradise, Australia, 25–27 October 2004

Manley, K., Blayse, A. and Swainston, M., 'Implementing Innovation on Commercial Building Projects in Australia', CRC for Construction Innovation, Clients Driving Innovation International Conference, Surfers Paradise, Australia, 25–27 October 2004

Manley, K. and Blayse, A., 'Innovation In The Australian Road Construction Industry: Making Better Use of Resources', New Zealand Institute of Highway Technology, Towards Sustainable Land Transport Conference, Wellington, New Zealand, 21–24 November 2004

Maqsood, T., Walker, D. and Finegan, A., 'Project Histories and Project Learning: A Knowledge Management Challenge', 20th ARCOM Conference, Edinburgh Scotland, 1–3 September 2004

Maqsood, T., Walker, D. and Finegan, A., 'Current State of Knowledge Management, Potential and Trends: Implications for the Construction Industry', CRC for Construction Innovation, Clients Driving Innovation International Conference, Surfers Paradise, Australia, 25–27 October 2004

Maqsood T., Walker, D. and Finegan, A., 'An Investigation of ICT Diffusion Issues in an Australian Construction Contractor Company Using SSM', CIB2004 Globalisation and Construction, Bangkok, 17–19 November 2004

Maqsood T., Finegan, A. and Walker, D., 'Tacit Knowledge and Worldviews: A Case Study of the Construction Tendering Process', CIB W102 meeting on Information and Knowledge Management in Building and International Conference on Information and Knowledge Management in a Global Economy: Challenges and Opportunities for Construction Organisations, Lisboa, Portugal, 19–20 May 2005

Mian, D., Sherman, S., Humphreys, M. and Sidwell, A., 'Construction Projects Immediate Health Check: A CSF & KPI Approach', Project Management Australia Conference (PMOZ) 'Projects Powering the Economy', Melbourne, 12–13 August, 2004

Miller, A. and Ambrose, M., 'Energy Efficient Multi Storey Residential Developments', Conference on Sustainable Building, South East Asia, Kuala Lumpur Malaysia, 11–13 April 2005



◀ Stephen Kajewski (QUT) and Saman de Silva (RMIT) ▶
presenting papers
at the CRC's 2004
International
Conference



Mitchell, P., Jones, D., Watson, P., Johnson, D. and Seo, S., 'A National Building Products Inventory', Sustainability Measures for Decision-support Fourth Australian Life Cycle Assessment Conference, Sydney, 23–25 Feb 2005

Nezamian, A. and Setunge, S., 'Comparison Between ACI 440 and FIB 14 Design Guidelines in Using CFRP for Strengthening of a Concrete Bridge Headstock', Fourth International Conference on Advanced Composite Materials in Bridges and Structures, Calgary, Alberta, 20–23 July 2004

Nezamian, A., Setunge, S. and Fenwick, J., 'Reliability-Based Optimal Solution for Rehabilitation or Strengthening of Existing Bridge Structures', CRC for Construction Innovation, Clients Driving Innovation International Conference, Surfers Paradise, Australia, 25–27 October 2004

Nezamian, A. and Setunge, S., 'Development of a User-Friendly Guide for Rehabilitation or Strengthening of Bridge Structures Using Fibre Reinforced Polymer Composites', CRC for Construction Innovation, Clients Driving Innovation International Conference, Surfers Paradise, Australia, 25–27 October 2004

Nezamian, A., Setunge, S. and Carse, A., 'Effect of Environmental Conditions on Degradation and Lifetime Performance of Reinforced Concrete Piers Strengthened Using Fiber Reinforced Composites', First International Conference of Asian Concrete Federation, Chiang Mai, Thailand, 28–29 October 2004

Nezamian, A., Setunge, S. and Chandler, L., 'A Comparison of External Post Tensioning and Use of FRP Composites in Strengthening of the Reinforced Concrete Bridge Headstock of Tenthill Bridge in Queensland', ACMSM 18, Perth, Australia, 1–3 December 2004

Nezamian, A. and Setunge, S., 'A Case Study of Application of FRP Composites in Strengthening of the Reinforced Concrete Headstock of a Bridge Structure', Second International Conference on FRP Composites in Civil Engineering, Adelaide, 8–10 December 2004

Nezamian, A. and Setunge, S., 'Prediction of Shear Strength of Reinforced Concrete Beams After Initiation of Shear Cracks', Fourth Australasian Congress on Applied Mechanics, Melbourne, 16–18 February 2005

Piyatrapoomi A., Kumar A., Robertson N., Weligamage J., 'Reliability of Optimal Intervals for Pavement Strength Data Collection at the Network Level', Sixth International Conference on Management Pavements, Brisbane, 19–24 October 2004.

Piyatrapoomi, N., Kumar A., Robertson, N. and Weligamage, J., 'Risk Assessment in Life-Cycle Costing for Road Asset Management', CRC for Construction Innovation, Clients Driving Innovation International Conference, Surfers Paradise, Australia, 25–27 October 2004.

Piyatrapoomi, N., Kumar A., Robertson, N. and Weligamage, J., 'A Probability Method for Assessing Variability in Budget Estimates for Highway Asset Management', Fifth International Conference on Road and Airfield Pavement Technology (ICPT5), Seoul, South Korea, 10–12 May 2005

Reffat, R., Gero, J. and Peng, W., 'Improving the Management of Building Life Cycle: A Data Mining Approach', CRC for Construction Innovation, Clients Driving Innovation International Conference, Surfers Paradise, Australia, 25–27 October 2004

Reffat, R., Gero, J. and Peng, W., 'Using Data Mining to Improve the Building Life Cycle' 38th Annual Conference of Architectural Science Association, ANZAScA, Launceston, Australia, 10–12 November 2004

Rose, T. and Manley, K., 'A conceptual Framework to Investigate the Optimisation of Financial Incentive Mechanisms in Construction Projects', CIB W92/T23/W107 International Symposium on Procurement Systems: The Impact of Cultural Differences and Systems on Construction Performance, Las Vegas, 7–10 February, 2005

Rosenman, M., Smith, G., Ding, L., Marchant, D. and Maher, M.L., 'Multidisciplinary Design in Virtual Worlds', CAAD Futures 2005, Vienna, 20–22 June 2005

Rowlinson, S. and Cheung, F., 'Relational Contracting, Culture and Globalisation' in (ed) Ogunlana, S., Charoenngam, C., Herabat, P. and Hadikusumo, B., International Symposium of CIB W107/TG23, Joint Symposium on Globalisation and Construction, Bangkok, 17–19 November 2004

Rowlinson, S., 'Building Value in Project Delivery Systems: Facilitating a Change in Culture: Lessons From Australia', Pavement Management Systems Asia 2005, Singapore, 31 May – 1 June 2005

Schevers, H., Trinidad, G., Crawford, J. and Drogemuller, R., 'Open Parametric Design System for Early Design Phases', AEC2005: Third International Conference on Innovation in Architecture, Engineering and Construction (AEC), Rotterdam, 15–17 June 2005

Shah, A. and Kumar, A., 'Optimisation of Maintenance Expenditure for Buildings: Refurbish or Demolish?', IABSE 2005 Conference, New Delhi, January 2005.

Sidwell, A. and Kennedy, R., 'The Journey to Delivered Value in Australian Procurement', AUBEA National Conference, University of Newcastle, Australia, 7–9 July 2004

Sidwell, A. and Kennedy, R., 'Re-valuing Construction Through Project Delivery' ARCOM Conference, Heriot-Watt University, Edinburgh, 1–3 September 2004

Trinidad, G., Boulaire, F., McNamara, C. and Drogemuller, R., 'Logic Programming in a Construction Planning Workbench', CRC for Construction Innovation, Clients Driving Innovation International Conference, Surfers Paradise, Australia, 25–27 October 2004

Tsoukas, J., 'Project Diagnostics: Assessing the Condition of Projects and identifying Poor Health', Combining Forces, Eleventh Joint CIB International Symposium, Helsinki, June 13–16, 2005

Tucker, S., Ambrose, M., Johnston, D., Seo, S. and Newton, P., 'Eco-Assessment of Commercial Buildings', Fourth Australian Life Cycle Assessment Conference, Sydney, 23–25 February 2005

List of publications and presentations

Watson, P., Jones, D. and Mitchell, P., 'A Building Sustainability Assessment Framework', CRC for Construction Innovation, Clients Driving Innovation International Conference, Surfers Paradise, Australia, 25–27 October 2004

Watson, P., Jones, D. and Mitchell, P., 'Are Australian Building Eco-assessment Tools Meeting Stakeholder Decision-making Needs?', Context of Architecture 38th annual International Conference of the Architectural Science Association, ANZAScA, Launceston, Australia, 10–12 November 2004

Watson, P., Jones, D. and Mitchell, P., 'Redefining Life Cycle for a Building Sustainability Assessment Framework', Sustainability Measures for Decision-support Fourth Australian Life Cycle Assessment Conference, Sydney, 23–25 Feb 2005

Weippert, A. and Kajewski, S., 'Industry Culture: Challenges to the Successful Implementation of Innovative Change', CRC for Construction Innovation, Clients Driving Innovation International Conference, Surfers Paradise, Australia, 25–27 October 2004

Williams, R., 'e-Tendering: Benefits, challenges and Recommendations for Practice', CRC for Construction Innovation, Clients Driving Innovation International Conference, Surfers Paradise, Australia, 25–27 October 2004

Conference papers (excluding keynotes)

Beard, C., 'Implementation Issues for Building Product Models in Australia: A Framework for Investigation', CRC for Construction Innovation, Clients Driving Innovation International Conference, Surfers Paradise, Australia, 25–27 October 2004

Bryar, P. and Dalrymple, J., 'International Business Profile Benchmarking: An Improvement Tool for SME Construction Subcontractors', Hoque, Z.M.H., (Ed), International Business Research Conference, World Business Institute, Melbourne, November 2004

Chen, L., Douglas, P., de Silva, S. and Peters, J., 'Noise Management in Urban Environments' QDMR Technical Forum, Brisbane, 4–6 August 2004

Cheung, F., Rowlinson, S., Spathonis, J., Sargent, R., Jones, T., Jefferies, M.C. and Foliente, G., 'Organisational Structure, Culture and Commitment: An Australia Public Sector Case Study', in (ed.) McCarthy, J.V. and Hampson, K., CRC for Construction Innovation, Clients Driving Innovation International Conference, Surfers Paradise, Australia, 25–27 October 2004

Chevez, A., 'Sources and Effects of Uncertainty in the Management of Construction Projects: Federation Square', CRC for Construction Innovation, Clients Driving Innovation International Conference, Surfers Paradise, Australia, 25–27 October 2004

Creedy, G., 'Risk Factors Leading to Cost Over-run in Highway Construction Projects', CRC for Construction Innovation, Clients Driving Innovation International Conference, Surfers Paradise, Australia, 25–27 October 2004

Dalrymple, J. and Boxer, L., 'Exploring the Cost of Tendering', International Business Research Conference, Hoque, Z.M.H. (ed.), World Business Institute, Melbourne, November 2004

Dalrymple, J. and Staples, W., 'Exploring Best Value', Hoque, Z.M.H. (ed.) International Business Research Conference, World Business Institute, Melbourne, November 2004

Greville, C., 'Client Decisions and ESD: The Story So Far', CRC for Construction Innovation, Clients Driving Innovation International Conference, Surfers Paradise, Australia, 25–27 October 2004

Hefferan, M., 'Knowledge-Intensive Businesses and Their Changing Demands for Fixed Assets', CRC for Construction Innovation, Clients Driving Innovation International Conference, Surfers Paradise, Australia, 25–27 October 2004

Hogan, D., 'Building Commission, Wayfinding in the Built Environment' Australian Institute of Building Surveyors, Victorian Chapter State Conference, Melbourne, 1 October 2004

Hogan, D., 'Wayfinding in the Built Environment', CRC for Construction Innovation, Clients Driving Innovation International Conference, Surfers Paradise, Australia, 25–27 October 2004

Hogan, D., 'Building Commission, Wayfinding in the Built Environment' Australian Institute of Building Surveyors, National Conference, 10 November 2004, Hobart

Jones, D., Messenger, G. and Lyon Reid, K., 'Sustainability at William McCormack Place', CRC for Construction Innovation, Clients Driving Innovation International Conference, Surfers Paradise, Australia, 25–27 October 2004

London, K., 'Cultural and Business: Exporting Design Services From Australia to China', International Conference on Discourse and Cultural Transformation, Zhejiang University, Hangzhou, September 2004

Luxmore, D., 'GreenSmart Housing Case Study: Successes and Lessons', CRC for Construction Innovation, Clients Driving Innovation International Conference, Surfers Paradise, Australia, 25–27 October 2004

Manley, K. and Swainston, M., 'Innovation in the Building and Construction Industry', Road Systems and Engineering Forum, Queensland Department of Main Roads, Bardonia, Queensland, 5 August 2004

Peng, W., 'Assisting Interactions in a Dynamic Design Process: A New Role for an Adaptive Design Tool', CRC for Construction Innovation, Clients Driving Innovation International Conference, Surfers Paradise, Australia, 25–27 October 2004

Robertson, N. and Kumar, A., 'Investment Decision Framework for Infrastructure Asset Management' The Victorian Roads Conference, Melbourne, 20–21 April 2005

Rose, T., 'A Conceptual Framework to Investigate the Performance of Financial Incentive Mechanisms in Construction Projects', CRC for Construction Innovation, Clients Driving Innovation International Conference, Surfers Paradise, Australia, 25–27 October 2004

Rowlinson, S. and Cheung, F., 'Relationship Management in QDMR ' Road System and Engineering Technology Forum, Brisbane, 4–5 August 2004

Rowlinson, S., 'Value in Project Delivery Systems: Facilitating a Change in Culture', Tenth Annual Road System and Engineering Technology Forum, Brisbane, 4–6 August 2004

Rowlinson, S., 'An Overview of Research into Procurement Systems, Best Practice and the Client Perspective', Revaluing Construction 2005: The Challenge of Change in Construction, Rotterdam, 22–23 March 2005

Shah, A. and Kumar, A., 'Challenges In Residual Service Life Assessment For Refurbishment Projects, PRRES 2005, Melbourne, January 2005

Sidwell, A., 'A Decision-support Tool for Assisting Selection of Project Delivery Methods', Revaluing Construction 2005, Rotterdam, 22–23 March 2005

Tonelli, M., 'Cre Workshop Part 1: Comprehending the Context', CRC for Construction Innovation, Clients Driving Innovation International Conference, Surfers Paradise, Australia, 25–27 October 2004

Tucker, S., 'Service Life Performance and Planning of the Built Environment: European Developments', CRC for Construction Innovation, Clients Driving Innovation International Conference, Surfers Paradise, Australia, 25–27 October 2004

Tucker, S., 'Value Adding in 3D CAD models for Environmental Assessment of Building' CRC for Construction Innovation, Clients Driving Innovation International Conference, Surfers Paradise, Australia, 25–27 October 2004

Wales, P., 'Achieving Sustainability in the 21st Century', CRC for Construction Innovation, Clients Driving Innovation International Conference, Surfers Paradise, Australia, 25–27 October 2004

Yoon, J.S., 'What About Those Ants? Swarm Intelligence for Virtual Environments', CRC for Construction Innovation, Clients Driving Innovation International Conference, Surfers Paradise, Australia, 25–27 October 2004

Keynote speakers

Ambrose, M., 'Best Practice Sustainable Residential Sub-divisions', Green Buildings Conference, Sydney, 29 June 2005

Hampson, K., 'Presentation on Construction Innovation, Inaugural meeting of the Innovation Sub-committee of Engineers Australia, Brisbane, 29 July 2004

Hampson, K., 'Vision 2020: Inspiring Change in the Australian Property and Construction Sector', Revaluing Construction 2005, Rotterdam, 22 March 2005

Hampson, K., 'CRC for Construction Innovation: Leading Change in the Australian Property and Construction Sector', Construction Summit, Hyatt Regency, Coober Pedy, Australia, 7 October 2004

Kumar, A., 'The Role of Risk Modelling for Predicting Maintenance and Rehabilitation Budgets', Pavement Management Systems, Asia 2005, International Quality and Productivity Centre, Singapore, 31 May 2005

Newton, P., 'Measuring Urban Performance', Auckland Regional Council Workshop, New Zealand, 20 June 2005

Scuderi, P., 'Eco Profiling of Building Products via a National Life Cycle Inventory Database', Green Buildings Conference, Sydney, 29 June 2005

Zhu, Y. and London, K., 'Cultural and Business: Exporting Design Services from Australia to China', International Conference on Discourse and Cultural Transformation, Zhejiang University, Hangzhou, September, 2004 (1 of 6 subtheme keynotes, 3 main keynotes)

Industry and academic presentations by CRC for Construction Innovation

Presentations by project personnel listed by project

2001-004-A, Walker

- 22 November 2004: School of Construction Engineering and Infrastructure Management, Asian Institute of Technology, Bangkok
- 14 December 2004: Project Management Institute, Lahore Chapter, Pakistan

2001-012-A, Manley

- 9 September 2004: Industry breakfast, Melbourne
- 17 November 2004: Survey launch, Brisbane

2002-022-A, Rowlinson

- April 2004: 'Queensland Week' in conjunction with Trade minister Beattie's Trade Mission, Japan
- 27 July 2004: Facilitating a Change in Culture Workshop 4, Brisbane
- 25 August 2004: Differing 'Mindsets' Collaborating on Infrastructure, Brisbane
- 12 October 2004: Manager (Infrastructure Delivery) Workshop, QDMR
- 28 October 2004: Government Asset Management Arena, Brisbane
- 31 January 2005: Facilitating a Change in Culture Workshop 5, Brisbane

2002-067-A, Betts

- 26 August 2004: eTender Workshop, QDPW
- 31 August 2004: eTender Workshop, QDMR
- 15 September 2004: Law and IT presentations: Brisbane
- 11 November 2004: eTenderBox Presentation, Brisbane City Council
- 19 November 2004: AusTender Presentation, Brisbane
- 13 April 2005: Government Asset Management Arena, Brisbane

2003-050-A, Cipolla

- November 2004: Australian Construction Association, Sydney
- 16 February 2005: Construction Induction Training Work Group, Sydney

2004-016-A, London

- 2 February 2005: South-East Queensland Regional Council's Construction and Demolition Waste Seminar, Gold Coast

2001-002-B, Gero

- 19 March 2004: Industry presentation to Woolworths
- 19 March 2004: Industry presentation to University of Sydney FMO
- 22 March 2004: Industry presentation to AMP
- 13 April 2004: Industry presentation to Resolve FM
- 30 July 2004: Project briefing, QDPW

List of publications and presentations

2001-006-B, Tucker

- 26 April 2005: Bringing Innovation to Facility Management forum, Brisbane
- 15 June 2005: FMA Queensland Innovation Forum, Brisbane

2002-010-B, Cole

- 26 April 2005: Bringing Innovation to Facility Management forum, Brisbane

2002-024-B, Maher

- 3 August 2004: High Bandwidth Collaboration Workshop: University of Sydney
- 7 September 2004: Broadband Expo, Gold Coast
- 28 October 2004: Government Asset Management Arena, Brisbane

2002-051-B, Moller

- 2 February 2005: Right-Sizing HVAC Workshop, Melbourne

2002-059-B Cole

- 20 August 2004: 'Local and Geographic Mapping and its Contribution to Asset Management' to Cement and Concrete Users Review Group, Department of Commerce, Sydney

2001-003-C, Sidwell

- 15 July 2004: Presentation of project outcomes, Arup Sydney
- 16 July 2004: Presentation of project outcomes, Melbourne
- 29 October 2004: Government Asset Management Arena, Brisbane

2001-010-C, Kumar

- 26 April 2005: Bringing Innovation to Facility Management forum, Brisbane

2002-005-C, Setunge

- 2 August 2004: Whole-of-life cycle analysis in rehabilitation of bridge structures, QDMR, Brisbane
- 29 September 2004: Workshop on the prototype software tool developed for whole-of-life cycle cost analysis, QDMR, Brisbane
- 28 February 2005: A user-friendly guide for rehabilitation or strengthening of bridge structures using fibre-reinforced polymer composites, Arup, Melbourne

2002-052-C, Tsoukas

- 15 July 2004: Presentation of project outcomes, Arup Sydney
- 16 July 2004: Presentation of project outcomes, Melbourne
- 23 July 2004: Presentation of project outcomes, Arup Brisbane
- 28 October 2004: Government Asset Management Arena, Brisbane
- 15 February 2005: Presentation of project outcomes, Brisbane
- 16 February 2005: Presentation of project outcomes, Sydney
- 17 February 2005: Presentation of project outcomes, Melbourne

2002-053-C, Hogan

- 26 April 2005: Bringing Innovation to Facility Management forum, Brisbane

2002-056-C, Drogemuller

- 13 July 2004: Construction Planning and Estimating Workbench seminar, RMIT University, Melbourne
- 14 July 2004: Construction Planning and Estimating Workbench seminar, University of Sydney
- 15 July 2004: Construction Planning and Estimating Workbench seminar, Woods Bagot Brisbane
- 3 September 2004: Student presentation, RMIT University, Melbourne
- 29 September 2004: ICT Platform projects, RAIA Education Committee, Canberra
- 1 October 2004: CRC for *Construction Innovation* Capability in ICT for Facility Managers, Sydney Opera House Facilities Managers
- 4 November 2004: Update on CRC CI Projects based on IFC Platform, IAI International Committee, Singapore
- 3 December 2004: Hearne Scientific, Melbourne

2003-029-C, Kumar

- 1 September 2004: Maintenance Cost Prediction for Roads workshop with industry partners
- 2 March 2005: Methodology Development workshop with industry partners
- 6 June 2005: Business Research Interim Series, RMIT
- 27 June 2005: Research Outcome workshop with industry partners

2003-037-C, Drogemuller

- 13 July 2004 Construction Planning and Estimating Workbench seminar, RMIT University, Melbourne
- 14 July 2004: Construction Planning and Estimating Workbench seminar, University of Sydney
- 15 July 2004: Construction Planning and Estimating Workbench seminar, Woods Bagot Brisbane

2004-011-B, Ding

- 28 October 2004: Government Asset Management Arena, Brisbane

2005-001-C, Morris

- 26 April 2005: Bringing Innovation to Facility Management forum, Brisbane

Presentations by Peter Scuderi, Development Manager of CRC for Construction Innovation

23–26 August, 2004, CWIC Technology Roadmap for Virtual Prototyping Industry Forum, Brisbane, Sydney and Melbourne

13 September 2004, Curriculum Development Virtual Prototypes, Konstruct National TAFE Construction Conference, Brisbane

16 September 2004, Curriculum Development Virtual Prototypes, National Advanced Building Studies, TAFE Conference, Sydney

29 September 2004, Sustainability: Virtual Prototypes, Australian Council of Tall Buildings, Brisbane

11 October 2004, Virtual Prototyping, QUT, School of Construction Management & Property, CNB420 Current Construction Issues

4 November 2004, Update on IAI Education & Training Program, IAI International Committee, Singapore

5 November 2004, Facilitated IAI International Education Program Workshop, Singapore

29 November 2004, Queensland Health, Geoff Stevenson, DG, Brisbane

1 December 2004, AIPM, Peter Shears, CEO, Sydney

2 December 2004, Australian Procurement and Construction Council, Jane Montgomery-Hribar, CEO, Canberra

2 December 2004, Master Builders Association, Wilhelm Harnisch, CEO and Jerry Howard, D/CEO, Canberra

3 December 2004, Hearne Scientific, Melbourne,

9 December 2004, Queensland Department of Education and Training, Brisbane

17 January 2005, Queensland Board of Architects, Brisbane

17 January 2005, Building Products Innovation Council, Brisbane,

18 January 2005, Queensland Building Services Authority, Brisbane

10 February 2005, Planning, Designing and Rating a Sustainable Built Environment Industry Forum, Brisbane

15 February 2005, Brisbane City Council City Planning, Brisbane

21 February 2005, Urban Development Institute of Australia, Brisbane

3 March 2005, Board of Professional Engineers, Brisbane

7 March 2005, Natspec, Sydney

8 March 2005, Property Council Australia, Sydney

9 March 2005, Royal Australian Institute of Architects, Canberra

22 March 2005, Royal Australian Institute of Architects, Brisbane

5 April 2005, Building Designers Association, Melbourne

Presentations by Dr Keith Hampson, CEO of the CRC for *Construction Innovation*

8 June 2004, Partnering for Progress: Western Australia and the CRC for *Construction Innovation*, Presentation to WA Government, Perth

1 July 2004, C2020 Workshop, Adelaide

5 July 2004, C2020 Workshop, Perth

7 July 2004, C2020 Workshop, Darwin

12 July 2004, C2020 Workshop, Melbourne

13 July 2004, C2020 Workshop, Brisbane

21 July 2004, Innovation Forum Presentation: 'Research Partnerships: Advancing Collaboration and Innovation', Brisbane

21 July 2004, Research Partnerships: Advancing Collaboration and Innovation, FMA Queensland Branch Innovation Forum, Brisbane

21 July 2004, FMA Queensland Innovation Forum and Trade Show, Brisbane

22 July 2004, Moving Ahead – Quality and Delivery in CRC *Construction Innovation*, Brisbane

29 July 2004, Advancing Innovation in Engineering Development and Construction (the value of collaboration!), Engineers Australia (Qld) Division

3 August 2004, New opportunities, new challenge, CRC *Construction Innovation* Program Workshop, Sydney

6 August 2004, New opportunities, new challenges in CRC *Construction Innovation*, Brisbane

17 August 2004, Sustainability Research in CRC *Construction Innovation*, Industry Presentation, Sydney

23 August 2004, Innovation through Alliancing, Invited Presentation, Brisbane

25 August 2004, Differing Mindsets Collaborating on Infrastructure Industry Breakfast, Brisbane

9 September 2004, The BRITE *Construction Innovation* Showcase Industry Breakfast, Melbourne

29 September 2004, A National Sustainability Focus in Commercial Buildings, Australian Greenhouse Office, Canberra

1 October 2004, CRC for *Construction Innovation* Capability in ICT for Facility Managers, Sydney Opera House Facilities Managers

7 October 2004, National Construction Summit, *Construction 2020: A Vision for Australia's Property and Construction Industry*, Coolum

15 October 2004, Partnering for Progress through Collaborative Construction Research, Chinese Construction Delegation, Brisbane

24 October 2004, Collaborative Research in an International Environment, International Construction Research Alliance (ICALL) Working Group, Brisbane

26 October 2004, International Construction Research Alliance (ICALL) Launch, Clients Driving Innovation International Conference, Gold Coast

28 October 2004, Seamless Web of Communication: A Client's Perspective Industry Breakfast, Brisbane

25 January 2005, Delivery and Impact: Moving Ideas into Practice – New opportunities, new challenges, Brisbane

21 March 2005, CRC for *Construction Innovation*: Client Leadership and Innovation, CIB TG58 International Meeting, Rotterdam

22 March 2005, *Construction 2020*: Inspiring Change in Australian Property and Construction, Revaluing Construction 2005 International Conference (Keynote Address), Rotterdam

24 March 2005, Australia's CRC for *Construction Innovation*: Leading Change in Australian Construction, Built Environment Research Leaders Meeting, Paris

12 April 2005, Australia's CRC for *Construction Innovation*: Partnering for Leadership, Official Queensland Government Trade Delegation, Osaka

14 April 2005, Australia's CRC for *Construction Innovation*: Partnering for Leadership, Official Queensland Government Trade Delegation, Tokyo

26 April 2005, Bringing Innovation to Facility Management Industry Forum, Brisbane

26 April 2005, The Sydney Opera House FM Exemplar Project: Leading Change in Australian FM, Bringing Innovation to Facilities Management, Brisbane

20 May 2005, Engaging with Industry ... Demystified?, CRCA Annual Conference, Melbourne

30 May 2005, Australia's CRC for *Construction Innovation*: Partnering for Leadership, China National Construction Association, (CHINCA) Delegation to Queensland, Brisbane

31 May 2005, The Sydney Opera House FM Exemplar Project: Leading Change in Australian FM, FMA Queensland Branch Forum, Brisbane

9 June 2005, Queensland Budget Impact on Construction Industry Breakfast, Brisbane

Communication strategy

Internal communication is ongoing through the monthly Bulletin which reaches 250 people. Our intranet site continues to make an essential contribution to the exchange of information with project teams. It includes updated report style guidelines that have also been distributed to all project staff.

External communication is ongoing through more diverse media, and features the following:

The *Construction Innovation website* underwent significant revision and is now part of a Content Management System which has both improved its useability and ease of uploading and updating (e.g. upcoming events, press releases, newsletters, presentations, photographs). It now also includes a more powerful search engine, UPDATE newsletter subscription option, targeted metadata, print function and an increasingly comprehensive listing of contact details and images of CRC people.



Project outcomes continue to be related through industry-focussed seminars (see Section 4 for details) delivered to our partners and to a wider audience including professional associations.

The **UPDATE newsletter** is uploaded to the website every two months and distributed by email to a national and international audience of more than 2500. We receive regular contributions from project team members as well as from personnel from industry associations supplying updates on their activities and upcoming events.

The brochures *Building our Future*, *Strategic Plan 2003–2008* and *LCADesign: Automated eco-efficiency assessment of commercial buildings* were updated and reprinted to ensure relevance of content.

A series of information brochures, videos and posters from CRC projects have been developed with more planned.

Project Brochures (available in print and downloadable from website)

Value in Project Delivery Systems: Facilitating a Change in Culture [Rowlinson, QUT]

Value in Project Delivery: Project Diagnostics [Tsoukas, Arup]

Project Diagnostics – providing successful project outcomes [Tsoukas, Arup]

Road Asset Management Investment [Kumar, RMIT]

Wayfinding in the built environment [Hogan, Building Commission]

DesignCheck – Automated Codechecking [Ding, CSIRO]

Sustainability and the Building Code of Australia [Ashe, ABCB]

Automated Estimator [Drogemuller, CSIRO]

Automated Scheduler [Drogemuller, CSIRO]

Project Videos (compiled and distributed on CD-rom)

Value in Project Delivery: Facilitating a Change in Culture [Rowlinson, QUT]

Value in Project Delivery: Project Diagnostics [Tsoukas, Arup]

Code Checking Phase 2 [Ding, CSIRO]

Environmental Assessment Systems for Commercial Buildings [Tucker, CSIRO]

Investment Decision Framework for Civil Infrastructure Asset Management [Kumar, RMIT]

Executive Report Cards are produced annually and tailored to appeal to the interests of each of our partners individually. The report cards provide a snapshot of the performance of the value of the participant's investment in the CRC. This is an annual process over the September/December period, following the data collection for the Annual Report.

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.



SMEs

The Australian Construction Industry Forum (ACIF) is Australia's peak construction industry consultative organisation with almost 200,000 members. The growing relationship between *Construction Innovation* and ACIF is strengthening the CRC's industry connections with SMEs. This strategic alliance enables us to jointly engage in setting research directions, become partners in technology transfer, leverage applied research for industry benefit and share our communication networks.

Through publications such as the BRITE Innovation Survey Executive Summary and special Reports to Industry being developed for a suite of other CRC projects, SMEs will have access to the outcomes of our applied research and how they can be practically implemented across the industry.

Media

Articles in **print, electronic and broadcast media** are produced regularly for a number of outlets that have been identified as high priority. A comprehensive listing of these is provided below.

Print media

July 2004 **Construction conference goes global** *National Business News Monthly*

July 2004 **Construction Innovation looks ahead to 2020** *Building Australia*

July 2004 **Performance-based building codes and fire engineering yield innovative design solution** *Building Australia*

August 2004 **Clients driving innovation on track** *Master Builder Magazine*

August 2004 **Envisioning the industry's future** *Construction Contractor*

August 2004 **Reality TV reinforcing stereotypes** *Construction Contractor*

August 2004 **Construction Innovation has 2020 vision for the future** *The Australian Building Surveyor*

September 2004 **ASBEC — greening our built environment** *Building Australia*

September 2004 **ASBEC, the council for a greener built environment** *National Building News Monthly*

September 2004 **Construction looks back for the future** *Building Australia*

September 2004 **LCADesign is a green calculator for the construction industry** *Compass (EPA)*

September 2004 **First define sustainability** *Construction Contractor*

September 2004 **Reality TV reinforces industry stereotypes** *Building Australia*

September 2004 **What's on in September and October** *National Building News Monthly*

October 2004 **eValuBuild: optimising investment decisions for commercial buildings** *Building Australia*

October 2004 **Project Diagnostics investigates construction project health** *Master Builder Queensland*

November 2004 **2004 BRITE innovation survey results** *Building Australia*

November 2004 **Industry support for lifetime predictions** *Building Australia*

December 2004 **A council for sustainability — ASBEC Chambers' Eco-Efficiency Newsletter**

December 2004 **How innovative are you?** *Glass Australia Magazine*

December 2004 **2004 International Conference — Clients Driving Innovation** *Construct*

January 2005 **Construction innovators** *Engineers Australia Civil Ed*

January 2005 **QUT BRITE innovation survey seeking construction innovators** *InnovationXchange Network*

January 2005 **Construction innovators — please step forward** *ARF e-newsletter*

January 2005 **AIRAH enews**

January 2005 **Innovative contractors asked to stand up** *ConstructionEquipmentNews.net*

January 2005 **Construction innovators e-news** *RAIA*

January 2005 **Innovative contractors asked to stand up** *Construction Equipment News.net*

January–February 2005 **ASBEC — building pathways to sustainability** *Building Australia*

February 2005 **Construction innovators — please step forward** *bcm*

Feb–Mar 2005 **The BRITE innovation survey and construction innovators — please step forward!** *Master Builder Victoria*

February 2005 **Innovation trends revealed** *EcoLibrium (AIRAH Journal)*

February 2005 **Construction innovators — please step forward** *FM Magazine Website*

February 2005 **Must innovate to succeed/Innovators step forward** *Construction Contractor*

February 2005 **Innovate or perish** *Property Australia*

February 2005 **Project Diagnostics — advanced warning system** *National Building News Monthly*

February 2005 **Smoothing bumpy projects** *Solve (CSIRO)*

February 2005 **CRC for Construction Innovation: Construction 2020** *fm Facility Management*

February 2005 **Australian invention provides rapid cure** *Construction Equipment News.net*

February 2005 **Innovation trends revealed** *Ecolibrium (AIRAH journal)*

February 2005 **Software to keep projects on target: CSIRO** *www.infolink.com.au*

March 2005 **CRC for Construction Innovation calls for innovators** *Stormwater Industry Association*

March 2005 **Lies, damned lies and ...** *CEN ConstructionEquipment News.net*

March 2005 **Innovative building projects sought** *EcoLibrium (AIRAH Journal)*

March 2005 **Orientation, orientation, orientation — cooling Queensland's suburbs** *Master Builder Queensland*

March 2005 **Safety depends on attitude not legislation** *Construction Contractor*

March 2005 **Construction innovators — please step forward** *Glass Australia Magazine*

Communication strategy

March 2005 **Construction Innovation** ventures into Japan *Building Australia*

March–April 2005 The BRITE innovation survey and construction innovators — please step forward! *Master Builder WA*

28 April 2005 Facility management yearns for centre stage *The Australian Financial Review (CSIRO Solve)*

29 April 2005 Facility management best practice exemplar project *Local Government Weekly*

April 2005 Aussie cure for sick projects *Building Products News*

April 2005 The Sydney Opera House — leading by example *National Building News Monthly*

April 2005 Performance-based building codes and fire engineering yield innovative design solution *Master Builder Victoria*

April 2005 Sydney Opera House Exemplar Project *FMA Newsletter*

April 2005 Aussie contractors outperform Kiwis *Building Australia*

April 2005 Opera House Exemplar Project — the first stage of implementation *FM Express*

April–May 2005 Construction innovation potential *Master Builder Victoria*

April–May 2005 Facility management — a developing profession *Master Builder Queensland*

April–May 2005 The Sydney Opera House Exemplars Project *fm Facility Management*

May 2005 Check this out *infolink.com.au*

May 2005 A new era of virtual cooperation *Master Builder Queensland*

May 2005 How innovative are we? and Innovators being asked to step forward *Voice Data Electrical (NECA)*

13 May 2005 Right design can deliver big savings *The Courier Mail*

16 May 2005 Ridding the opera of its inner phantoms *The Australian Financial Review (CSIRO Solve)*

16 May 2005 R&D builds hard dollars *The Australian Financial Review (CSIRO Solve)*

June 2005 Opera House showcases the Facility Management Agenda Launch *fm Facility Management*

June 2005 Profiling in 3D *Building Australia*

June 2005 Are you a company of BRITE sparks? *SDI Magazine*

June 2005 Outstanding whole-of-life gains without higher up-front costs *Master Builder Victoria*



June 2005 Sydney Opera House takes centre stage in facilities management case study *QUT Beeline*

June 2005 A new era of virtual cooperation *Master Builder Queensland*

Press releases

October 2004 Innovation vs business as usual *International Conference Release*

October 2004 Sustainable knowledge society – a European approach/Beyond the Tower of Babel/ Property managers borrow hospitality approach *International Conference Release*

October 2004 Features ICALL launch and speakers Wild, Fischer and Campbell *International Conference Release*

November 2004 High innovators in construction

January 2005 Construction innovators — please step forward

February 2005 Aussie cure for sick projects

April 2005 Sydney Opera House FM Exemplar Project launch

May 2005 Here come the solar 'burbs

May 2005 Does your new office or house design comply?

June 2005 Guide for greener commercial buildings under construction

Television

ABC Asia Pacific TV – Nexus - Leading Edge – Building Smarter (program featuring Project Diagnostics) aired 7 March 2005 ▼



Radio

26 October 2005 Professor Martin Fischer interviewed live by Paul Bevan, Morning Show presenter ABC radio, Newcastle

6 May 2005 Michael Ambrose on Sustainable Subdivisions project interviewed by ABC Southern Queensland radio

9 May 2005 Michael Ambrose on Sustainable Subdivisions project interviewed by ABC Canberra radio

Sponsorship provided

2004 RS & E Technology Forum, Silver Sponsorship (Queensland Department of Main Roads)

Sponsorship Australian Universities Building Educators Association (AUBEA) Conference

Sponsorship of Year of the Built Environment (YBE) National Awards

Supporter of 6th International Conference on Managing Pavements (Queensland Department of Main Roads)

Sponsorship contribution for 2005 Australian Institute of Project Management (AIPM) Conference

Grants and awards

Grant

Type of grant: Innovation Access Program – Industry (IAccP-Industry) which aims to foster innovation and competitiveness by increasing the take up of new technologies and best-practice processes by Australian industry, particularly SMEs.

Title: Sydney Opera House – FM Exemplar Project

Amount of Grant: \$100,000

Period of Grant: Feb 05 – Feb 06

Description: The project's aim is to support a major recommendation from the Facilities Management Action Agenda. This recommendation is to establish an "exemplar case study" for awareness raising and demonstration of leading-edge facilities management. This grant supports the CRC Project 2005-001-C Sydney Opera House – FM Exemplar Project which identifies best practice methodologies in the areas of digital interface modelling, procurement, benchmarking and facilities management using the Sydney Opera House as an exemplar case study. The grant will provide finances for the project to review current facilities management procurement and delivery relative to existing leading practice, and implement the advanced strategies. It will assist the research at the Sydney Opera House to establish an exemplar project, and the facilities management industry to disseminate the knowledge gained from this demonstration exercise.

Sponsorship received

Organisation providing sponsorship	Sponsorship details
Royal Australian Institute of Architects	<i>Construction 2020</i> workshops
Master Builders Association Tasmania	<i>Construction 2020</i> workshops
John Holland Pty Ltd	<i>Construction 2020</i> workshops
Ebsworth & Ebsworth Lawyers	<i>BRITE Breakfast</i> , Melbourne, 9 September 2004 <i>BRITE Construction Innovation Showcase</i> , Savoy Park Plaza, Melbourne: 9 September 2004
Qld Master Builders Association	<i>Construction 2020</i> workshops
Housing Industry Association	<i>Construction 2020</i> workshops
Martin Lack & Associates	<i>Differing mindsets collaborating on infrastructure</i> (Industry Breakfast), Carlton Crest Hotel, Brisbane, 25 August 2004 <i>Seamless Web of Communication – A Client's Perspective</i> (Industry Breakfast), Mercure Hotel, Brisbane, 28 October 2004
Queensland Department of Public Works	Gold sponsorship of 2nd International Conference <i>Clients Driving Innovation – Moving Ideas into Practice</i> , Gold Coast, 12–14 March 2006
Ebsworth & Ebsworth Lawyers	<i>A Sustainable Built Environment: Planning, Designing and Rating It</i> (Forum), Brisbane City Hall, 10 February 2005
Sing Tel Optus	<i>Bringing Innovation to Facility Management</i> seminar, Brisbane City Hall, 26 April 2005 <i>Impact of the Budget</i> (Ministerial address/Seminar), Carlton Crest Hotel, Brisbane, 9 June 2005
Queensland Department of Main Roads	Bronze sponsorship of 2nd International Conference <i>Clients Driving Innovation – Moving Ideas into Practice</i> , Gold Coast 12–14 March 2006
Australian Institute of Quantity Surveyors	Formal dinner sponsorship of 2nd International Conference <i>Clients Driving Innovation – Moving Ideas into Practice</i> , Gold Coast, 12–14 March 2006
Australian Greenhouse Office	Bronze sponsorship of 2nd International Conference <i>Clients Driving Innovation – Moving Ideas into Practice</i> , Gold Coast, 12–14 March 2006
Australian Institute of Project Management	Bronze sponsorship of 2nd International Conference <i>Clients Driving Innovation – Moving Ideas into Practice</i> , Gold Coast 12–14 March 2006
Australian Performance Based Building Initiative (Aus-PeBBu)	Gold sponsorship of 2nd International Conference <i>Clients Driving Innovation – Moving Ideas into Practice</i> , Gold Coast, 12–14 March 2006

Grants and awards

Awards

Engineering Excellence

Project Leader Professor Arun Kumar from RMIT and his team received a High Commendation at the 2005 Queensland Engineering Excellence Awards. The CRC project Investment Decision Framework for Civil Infrastructure Asset Management was entered in the award category of Research, Development and Innovation. This project contributes on many levels to greater cost effectiveness in asset data collection of Queensland's road network. This award is recognition of the standard of outcomes being achieved through the collaborative participation of industry, government and research at our CRC.



Professor Arun Kumar and Noppadol Piyatrapoomi (RMIT University), Neil Robertson and Justin Weligamage (Queensland Department of Main Roads) and CEO Keith Hampson with the project award of High Commendation at the Queensland Engineering Excellence Awards.

Photo by Peter Robey Photography © 2005

Fresh Innovator

Dr Lan Ding was one of 16 finalists selected in this year's Fresh Innovators Awards for DesignCheck – a *Construction Innovation* project. The project team led by Lan developed an automated design-checking system that quickly assesses if a building design meets the requirements of Australia's new building disabled access code (see page 21). The Fresh Innovators forum helps 16 early career innovators develop expertise in presenting their ideas clearly to a general audience and to the media. After a day of media and presentation training, the finalists presented their innovations to university, school and business audiences, as well as the general public and the media.



The 2005 Fresh Innovators (with Lan Ding on the far left)

Performance measures

The CRC for *Construction Innovation*'s activities have been significantly broadened in 2004–05 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. The Performance Indicators addressed in the Annual Report are those agreed to in the current Commonwealth Variation

QUALITY RESEARCH

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

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.

2003–04

Special emphasis is placed on participant relations – with clear opportunities for participants to provide feedback through the Annual Executive Report Card interview, the Annual Strategic Planning Session, Board Meetings, Project Reviews and numerous one-on-one discussions. *Construction Innovation*'s stakeholders have again confirmed the broad satisfaction of partners and users with the results from research projects and technology transfer. Clear, open and targeted questions at Project Reviews require participants to identify the extent of project diffusion into partner organisations; whether the project focus is satisfactory to industry partners; and direct benefits from this research. Invariably the consensus reinforces the value of the research and supports our participants in the delivery of short-term, explicit outcomes. A greater appreciation of the inherent value of networking with participants across the supply chain between researchers and research users is becoming apparent.

Contributions of in-kind from both industry and government research users exceed anticipated commitments, highlighting the value to industry.

2002–03

The recent Executive Report Card interviews with all *Construction Innovation* stakeholders have confirmed the broad satisfaction of partners and users with early results from research projects and early engagement in technology transfer activities. Some participants are providing 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.

2. Increase volume of research contribution to CRC

2004–05

Research users (industry and public participants) and researchers have increased their delivered in-kind by 3% 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% 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% above expectations with in-kind from research users exceeding anticipated commitments by approximately 9% – 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.

2003–04

Research users (industry and public participants) and researchers have increased their delivered in-kind by 2% in excess of that anticipated throughout 2003–04 in this our third year of operation. The Governing Board's determination in ensuring that the first three years of our Centre's operation secure the full commitment of in-kind support on average has yielded most satisfying results. This pleasing result reflects increased confidence in the research development and management processes as well as the maturation of research user expectations.

2002–03

Participants have overall provided substantially increased levels of in-kind support in this our second year of operations compared to the inaugural year. We expect that year 3 will again surpass these early levels of in-kind contributions, reflecting increased confidence in the developed processes and relevance and satisfaction of the partners with the direction and management of the research initiatives.

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

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.

2003–04

In March 2004, the Australian Building Codes Board (ABCB) adopted sustainability as a theme for the future Building Code of Australia (BCA). As background to this major decision *Construction Innovation's* project recommendations from Project 2001-013-B were circulated to ABCB Board Members – demonstrating the ability of the CRC to shape national industry practice.

The Queensland Department of Main Roads (QDMR) has indicated that implementation of research outputs from 2001-010-C *Investment Decision Framework for Infrastructure Asset Management* [Kumar, RMIT] would provide them with early opportunities to:

- better understand the testing regime applied to the falling weight deflectometer based on sealed roads
- reliably extend the interval of test from the current 200 m to somewhere between 700 and 1200 m (depending upon different soil types)
- drive improved value road maintenance practices, extending the length of road testing available to the Queensland Government four times for the same budget
- deliver a vastly improved ability to manage the roads at the network level.

The Queensland Department of Public Works (QDPW) has indicated that implementation of research outputs from 2001-011-C *Evaluation of Functional Performance of Commercial Buildings* [Boyd, QUT] would provide them with early opportunities to:

- make better capital investment decisions in buying, selling or refurbishing a property investment at the right time
- improve risk management by analysing the income, expenditure, environmental and social variables on a property investment
- optimise the value of a property investment and portfolio by monitoring income and expenditure that has the potential to increase the value and lead to enhanced decision making.

2002–03

One significant adoption is the ABCB's utilisation of the environmental sustainability research outcomes from Project 2001-013-B to shape its recommendations for the Future Building Code of Australia. The recent seminar on Property Performance delivered by Professor Terry Boyd had strong participation from Partner representatives. The 2003/2004 year will see the trialling of several technologies and management systems within partner organisations.

Outcomes of *Construction Innovation* projects will emerge early in the next period. However indications from preliminary results and track testing of initial outcomes on a number of our projects provides strong confidence that the adoption of research results will significantly benefit research users.

4. Increase national and international collaborations

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.

2003–04

National collaborations have experienced exponential growth through the *Construction 2020* initiative and Education Reference group. Discussions are underway with peak industry bodies to incorporate *Construction Innovation's* research findings in their seminar and information dissemination services.

International visitors and reference to the CRC by international research and industry development groups has also increased. *Construction Innovation* is represented on the Australasian Board of the International Alliance for Interoperability (IAI) and has been asked to coordinate the international group's education and training strategy.

Three UK research and industry groups (Constructing Excellence, CIRIA and BSRIA) have asked *Construction Innovation* for memorandum of associations for two way collaborations in disseminating best practice business processes and technologies to the construction industry. It is expected that performance against this measure will be further enhanced with the extension of *Construction Innovation* activities throughout this next period, fuelled by senior level engagement in the CIB and ICALL network.

2002–03

This year has seen the development of the Education / Training and Technology Transfer Programs including collaboration with several industry groups such as Construction Training Queensland, Green Building Council, Master Builders Association and the International Alliance for Interoperability to name a few. This involvement ranges from participation in the Education or Technology Transfer Committee to providing on-the-ground support for industry technology transfer.

International visitors through Professor Peter Brandon and Professor John Bennett contributed to international exposure and provided input to research projects, research management and strategic activities. The formalisation of the International Construction Research Alliance with European, Scandinavian and North American research institutes now provides the base for further targeting of international visitors and collaborations with *Construction Innovation* and will contribute to *Construction Innovation's* expanding international profile in the upcoming period.

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

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.

2003–04

The BRITE project has undertaken a national innovation case study program and a national innovation survey investigating the industry's innovation performance. Although it is too early to have a measure of changes to innovation performance over time, the project's activities have demonstrably increased awareness of the benefits of innovation in the industry. Over 5000 case study booklets have been distributed through industry associations and industry events, and over 30 articles have appeared in industry magazines, reaching close to half a million readers.

2002–03

The project measuring this is the BRITE project, which has the aim of promoting the incidence and quality of innovation in the Australian building and construction industry. In March and April 2004, an innovation survey will be undertaken covering strategies to maximise value-added and the generation of new ideas within the industry, in part.

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

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.

2003–04

The ABCB's adoption of the CRC *Construction Innovation* project recommendations, including sustainability as a 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, through Robin Drogemuller, ICT Platform Director has contributed to the development of the IAI project on Reinforced Concrete Structures and Foundation Structures. This project aims to improve processes within the industry through defining the use and sharing of information.

A Delphi survey has been conducted to provide expert opinion on the life of components in buildings. Thirty different components were surveyed with a range of materials, coatings, environments and failure considered. The survey included both service life and aesthetic life, and time to first maintenance.

In collaboration with our government, industry and research partners, *Construction Innovation* is developing software tools that can use 3D CAD technology to model complex building designs. *Construction Innovation's* tools focus on the *objects* within 3D CAD models, these encapsulate all the information about an element. 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.

The following are four tools being developed.

LCADesign is an automated eco-efficiency design tool for commercial buildings that makes assessments directly from 3D CAD drawings.

The Automatic Estimator has the ability to increase productivity for those involved in the quantification and costing of building designs from the 3D model of a building.

The Automatic Code Checker checks building designs for compliance with AS1428 *Design for Access and Mobility* which is compulsory for all new and existing buildings.

The Contract Planning Workbench automates the generation of first cut construction activity schedules for refinement by planners.

2002–03

One significant adoption is the ABCB's utilisation of the environmental sustainability research outcomes from Project 2001-013-B to shape its recommendations for the Future Building Code of Australia.

The other very significant the development of specifications for IFC standards that has been undertaken in Project 2001-007-C. The researchers have developed specifications for 30 new IFCs that have now been included in the 2X2 IFC Specification. This specification will ultimately be developed into IFC software by the International Alliance for Interoperability. This is a global organisation developing IFC for the industry in its adoption of object oriented technology. It is also important to note that of the 300 IFCs in existence, project 2001-007-C uses 100 of them.

7. Contribution by CRC participants in developing public policy initiatives

2004-05

Public policy makers in QDPW, QDMR, QDSOI, 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.

2003-04

Public Policy makers in QDPW, QDMR, QDSOI, ABCB, Building Commission (Victoria) and Brisbane City Council are actively seeking the 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). This national venture brings together key green players from across Australia – local, state and industry to collaborate to achieve more nationally uniform green development guidelines. We anticipate that this company will independently act as a significant player in the move to a more sustainable built environment in this country.

Construction Innovation is working 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.

Traffic noise management in urban environments is becoming a *social obligation*. *Construction Innovation* is working with the Queensland Government to conduct a comparative cost-benefit assessment of noise amelioration by means of alternative treatments outside the road reserve compared with the present practice of treatment within the road reserve. The project aims to foster a full range noise abatement strategy encompassing source, path and noise receiver. The benefit of such a study would be to mitigate the problem where it is most effective and would defuse traditional *authority* boundaries to produce the optimum outcome.

2002-03

The value of projects that have QDPW, QDMR, ABCB and BC indicate we are making a strong contribution to public policy. In addition, Professor Tony Sidwell's projects in Program Area C major input to public procurement decisions.

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

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.

2003-04

Collaboration is a hallmark of this CRC – from Governing Board to Research Committee to Program and Project Workshops. The requirement for a minimum of two researchers and two organisations from industry and/or government drive collaboration around the supply chain and nationally. Publications arising from CRC projects invariably enjoy joint authorship from researchers and research users with a pleasing trend towards mutual intrinsic benefits through *rubbing shoulders* in CRC activities.

2002-03

This is exemplified in the policy of each research project, whereby there has to be a minimum of two researchers and two persons from industry and/or government. The Research Conference and upcoming Second Year Review will highlight the strong nature of the research/research user interface. 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

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.

2003-04

The 80 hits on the national and regional newspapers, radio and industry magazines confirm the growing acceptance of CRC for Construction as a leader of collaborative innovation research in Australia. With over 30 industry association magazine articles being published each year on the BRITE project, over half a million readers have already been introduced to the *industry learnings* provided by this project alone. 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 that are not familiar with the CRC.

2002-03

As of April 2003, inquiries from community members, industry personnel and journalists increased 100% via phone, email, and verbal face-to-face about the CRC for *Construction Innovation* and associated projects.

EDUCATION AND TRAINING

1. Uptake of *Construction Innovation* inputs to curriculum

2004-05

The number of courses incorporating *Construction Innovation* research input has increased markedly in the reporting period, as evidenced on page 37. Each of our University participants has been active in promoting the CRC research outcomes into their curriculum development.

2003-04

For a listing of the courses at QUT, University of Newcastle and RMIT incorporating input from *Construction Innovation* see page 37.

2002-03

With the establishment of the Education and Training Advisory Group in the next quarter, uptake of *Construction Innovation* inputs into curriculum will increase markedly.

2. Co-supervision of students by industry partners

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.

2003-04

All 13 PhD and Masters scholars either have industry supervisors or direct contact with industry in their areas of research.

2002-03

All nine scholars have industry supervisors. The three scholarships in the process of being filled at the end of the year also have nominations for industry supervisors who provide valuable perspective from research users.

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

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.

2003-04

Ten additional scholarships will be made available commencing August 2004 through to October 2004.

2002-03

Nine scholarships have been granted to date. The total is now seven PhD scholars (one deferred until September 2003) and two Masters by Research scholars. One more PhD and two more Masters by Research scholarships will be granted early next year.

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

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 QSDI. The new Masters by Research scholar comes from our industry partner Arup.

2003-04

Four of our scholars come from our industry partners, two from QDPW, one from QDMR and one from Queensland Department of State Development and Innovation (QSDI). It is expected the next round of scholars will also have representation from our private industry partners.

2002-03

Two scholars come from our industry partner organisations, one each from QDPW and QDMR. It is a requirement that each scholar has an industry associate supervisor from the CRC for *Construction Innovation* partners.

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

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, RAlA, Facility Management Association of Australia, Property Council of Australia and Urban Development Institute of Australia.

2003-04

Project Outcomes have been delivered to industry via industry seminars and conferences, in-house briefing sessions, curriculum development and industry workshops. Organisations like the Australian Construction Industry Forum (ACIF) and the Australian Institute of Project Management (AIPM) and the IAI have partnered with the CRC for *Construction Innovation* to deliver these outcomes to industry.

2002-03

There are no alliances delivering research outputs yet, but 2003/2004 will see a significant increase due to the Education and Training and Technology Transfer programs being developed. Project Outcomes will be delivered to industry via in-house training course, professional development courses, curriculum development and industry workshops. Organisations like Construction Training Queensland, ACIF and others will partner with the CRC for *Construction Innovation* to deliver these outcomes.

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

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.

2003-04

Two of the 13 scholars receive top-up salaries from the employers during the period of the scholarship.

2002-03

Nine scholarships have been granted to date. Each scholarship is worth \$30,000 a year, which includes a \$24,000 stipend and a \$6,000 allowance for support such as project management and applied research management skills. Two of the nine scholars are also receiving top up salaries or assistance from the employers during the period of their scholarships.

EXTERNAL COMMUNICATION

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

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.

2003-04

20 press releases were distributed to specialist and general media, 6 radio interviews were conducted

2002-03

13 press releases were distributed to specialist and general media, resulting in 25 articles and 7 radio interviews

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

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 10 is testimony to the growth in influential publication through this CRC.

2003-04

Procurement Strategies A Relationship-based Approach, Walker, DHT and Hampson, KD, (Blackwell Publishing, 1993 300pp) is increasingly being recognised as an international reference for innovative procurement strategies. Clients and leading constructors have purchased multiple copies and it is being used as a text for Masters students internationally. *Construction 2020 – A Vision for Australia's Property and Construction Industry* (CRC for *Construction Innovation*, 2004, 46pp). delivers the results of path-breaking methodology and analysis of industry visions and barriers for the future of Australia's property and construction industry. This leading Australian example of industry foresight is being distributed throughout the CIB network and is expected to be a key initiative for a fresh task force with the CIB focussing on innovative futures in construction.

2002-03

24 articles/papers were published in industry-relevant publications in 2002-03.

1 book for industry was published in 2002-03.

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

2003-04

30 refereed papers were presented, 23 papers at international conferences, and a further 7 papers were presented at national conferences.

2002-03

11 refereed conference papers were presented.

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

2003-04

101 presentations of significance were made in 2003-04.

2002-03

53 presentations were made in 2002-03.

COMMERCIALISATION**1. Diffusion activities undertaken by CRC audience indicated by number of project-initiated seminars and workshops****2004-05**

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

2003-04

29 project-initiated seminars and workshops were held by 7 projects.

2002-03

21 project-initiated seminars and workshops were held by 6 projects.

2. Invitations as keynote speaker to industry conferences, seminars, etc**2004-05**

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

2003-04

Two project researchers were invited to deliver keynote presentations.

2002-03

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

3. Increase in participation in industry, trade and academic conferences**2004-05**

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

2003-04

Construction Innovation was represented in 17 industry and trade conferences.

2002-03

Representatives from CRC for *Construction Innovation* participated in 53 industry and trade conferences.

4. Increase in publications for industry users**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 authored between industry and researchers have provided evidence of the increasing industry user engagement in *Construction Innovation's* publication record.

2003-04

In addition to the bi-monthly newsletter and monthly bulletins, the CRC members have access to the CRC intranet. The intranet contains project reports that are either accessible by the project team or by the whole CRC network. During 2003-04, the BRITE projects produced seven industry booklets highlighting innovation in the Australian property and construction industry. Over 5000 copies of the booklets have been distributed to industry.

The CRC internet has a series of documents available to the public including a final research report on environmentally sustainable development and how it should be incorporated into the BCA, press releases, presentation and links to two project websites.

2002-03

Since November 2002, a bi-monthly newsletter has been produced for CRC members, distributed to 250 people. As of June 2003, another bi-monthly newsletter was formed, distributed to a national and international audience of 2500. 19 Executive Report Cards have been produced for partners on CRC activities. Four brochures have been produced, including *Building our Future*, *Strategic Plan 2003-8*, *Project Summaries*, and *biographies of the CRC leadership team*. One project has produced a brochure on their activities (*LCADesign*), and two projects have developed project-related websites for public access. One book has been published as a result of research outcomes, for sale to industry and the broader community. Our internet site is being constantly updated for industry and the broader community, and includes media releases, reports, presentations, news, projects, etc.

5. Increase in number of media clippings/appearances

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.

2003-04

The 80 media hits in the form of magazine and newspaper articles and press releases (including six radio interviews) for 2003-04 is a significant increase over the previous reporting period.

2002-03

35 media clippings were produced in 2002-03, a substantial increase from last year. In addition, CRC personnel conducted 7 radio interviews. The CRC also provided footage/stills for a CD promoting Queensland as a Smart State.

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

2004-05

A number of our partners have had significant financial benefits through 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.

2003-04

No income has been received directly by the CRC from commercialisation of Intellectual Property. A number of our partners have had significant financial benefits through the improvement of internal processes.

2002-03

At this stage of establishment, no income has been received from commercialisation of IP.

ADMINISTRATION

1. Satisfaction of Participant and Commonwealth with 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.

2003-04

The Executive Report Card process continues to demonstrate satisfaction with the financial and research management systems. The Second Year Review was most positive, stating: "The Panel believes the CRC to be performing well in all aspects, especially in research management."

2002-03

The CRC has initiated a formal rigorous reporting and feedback process (Executive Report Card) to report to each of the 19 Participants progress highlighting areas of particular interest to each Participant. Written reports are followed by a discussion which seeks feedback according to a specific agenda.

2. Effective Centre operations across all Commonwealth programs

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.

2003–04

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

2002–03

The Executive Report Card process has confirmed an overall satisfaction of Participants with the Centre's operations across all program areas. Significantly, it was identified that the CRC is delivering increased profile for the CRC and its Participants. The Participants recognised the value of this promotion and support increasing promotion activities. The Commonwealth has indicated its satisfaction by acceptance of last year's Annual Report with only one specific comment referring to the need to increase in-kind contributions where shortfalls existed.

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

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.

2003–04

A number of projects have commenced during 2003–04 including with our business associates such as the Construction Training Queensland, Australian Construction Industry Forum and Queensland Department of Housing. In addition, we are engaging further with participation from Property Council of Australia, and the Property Services Training Australia who both have representation on the Education Committee.

Discussions are continuing for a major case study with The City of Melbourne and one of their flagship refurbishing projects.

2002–03

We have had interest at proposal level from the Queensland Department of Health and have projects approved that include Construction Training Queensland, Australian Construction Industry Forum and Queensland Department of Housing.

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

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 end-user engagement in our research initiatives. The City of Melbourne is also a fresh industry clients building a productive relationship with our CRC.

2003–04

Collaborations are underway particularly in the Education and Training and Technology Transfer activities with peak industry and regulatory groups as both programs are ramping up for delivery during 2004–05.

2002–03

We have brokered two consultancies between our Researchers and a Commonwealth Department.

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

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.

2003–04

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

2002–03

Satisfaction level of partners is strong with existing partners confirming their on-going support and fresh interest from potential new partners.

Acronym list

American Society of Civil Engineers	ASCE	Environmental Protection Agency	EPA
Architecture Engineering and Construction	AEC	environmentally sustainable development	ESD
Association of Consulting Engineers Australia	ACEA	executive support systems	ESS
Association of Researchers in Construction Management	ARCOM	facility management	FM
Australian Universities Building Educators Association	AUBEA	fibre-reinforced polymer	FRP
Australian Building Codes Board	ABCB	Forest and Wood Products Research and Development Corporation	FWPRDC
Australian Construction Industry Forum	ACIF	Housing Industry Association	HIA
The Australian Council for Infrastructure Development	AusCID	human-computer interfaces	HCI
Australian Greenhouse Office	AGO	heating, ventilation and air-conditioning	HVAC
Australian Institute of Builders	AIB	industry foundation classes	IFC
Australian Institute of Management	AIM	information and communication technology	ICT
Australian Institute of Project Management	AIPM	Institution of Engineers Australia	IEAust
Australian Performance Based Building Initiative	AusPeBBu	intellectual property	IP
Australian Procurement and Construction Council	APCC	International Alliance for Interoperability	IAI
Office of the Australian Safety and Compensation Council	OASCC	International Construction Research Alliance	ICALL
Australian Sustainable Built Environment Council	ASBEC	International Council for Research and Innovation in Building and Construction	CIB
Bill of Quantities	BoQ	key performance indicators	KPIs
Bovis Lend Lease	BLL	life cycle analysis	LCA
Brisbane City Council	BCC	National Occupational Health and Safety Commission	NOHSC
Brisbane Water Enviro Alliance	BWEA	noise-induced hearing threshold shifts	NITS
Building Code of Australia	BCA	Occupational Health and Safety	OHS
Building Commission (Victoria)	BC	outcomes performance indicators	OPI
Building Industry Redundancy Trust (Queensland)	BIRT	Property Council of Australia	PCA
Building Products Innovation Council	BPIC	Queensland Department of Main Roads	QDMR
Building Research, Innovation, Technology and Environment	BRITE	Queensland Department of Public Works	QDPW
Building Services Research and Information Association	BSRIA	Queensland Department of State Development and Innovation	QDSDI
carbon fibre-reinforced polymer	CFRP	Queensland University of Technology	QUT
case-based logic	CBL	Research and development	R&D
corporate real estate	CRE	Royal Melbourne Institute of Technology	RMIT
Centre for Integrated Engineering Asset Management	CIEAM	small-to-medium size enterprises	SMEs
Civil Contractors Federation	CCF	small office – home office	SOHO
Commonwealth Scientific and Industrial Research Organisation	CSIRO	Smart and Sustainable Built Environment	SASBE
computer-assisted design	CAD	soft systems methodology	SSM
Contract Planning Workbench	CPW	strategic asset maintenance	SAM
Cooperative Research Centre	CRC	Technical and Further Education	TAFE
Cooperative Research Centre Association	CRCA	vocational education and training	VET
Continuing Professional Development	CPD	University of New South Wales	UNSW
critical success factors	CSF	Urban Development Institute of Australia	UDIA
decision-support systems	DSS	Year of the Built Environment	YBE
engineering database management	EDM		



CRC Construction Innovation
BUILDING OUR FUTURE

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B U I L D I N G O U R F U T U R E