Cooperative Research Centre for *Construction Innovation*

Annual Report 2003-04

LEADERS IN PROPERTY AND CONSTRUCTION RESEARCH

CRC AUSTRALIA

CRC Construction Innovation
BUILDING OUR FUTURE

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

Contents

Partners

Industry

ARUP

Bovis Lend Lease

BROOKWATER

dem

John Holland

Rider Hunt

WOODS BAGOT

Government

ARCR

BRISBANE CITY

Building Commission

Queensland Government Department of Main Roads

Queensland Government Department of Public Works

Queensland Government State Development and Innovation

Research

CSIRO

QUT

RMIT UNIVERSITY

The University of Newcastle Australia

The University of Sydney

University of Western Sydney

CRC objectives

1

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 broad and achievable 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 basis 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, effective delivery and management of whole-of-life assets.

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.

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 and *Construction Innovation*'s core of research and headquarters is based at Queensland University of Technology in Brisbane.

Industry

- Arup Australia
- Bovis Lend Lease
- Brookwater JV
- 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

CRC AUSTRALIA

CRC Construction Innovation
BUILDING OUR FUTURE

Executive summary

2

Chair's insight

John McCarthy

The CRC for *Construction Innovation* is consolidating its vision to lead the Australian property and construction industry in innovation and collaboration. *Construction Innovation* continues to work closely with its industry and government research users as our research teams move towards finalising research outcomes for uptake by our industry partners and the property and construction industry as a whole.

John McCarthy is recognised as one of the industry's leaders. He has an intimate working relationship with major banks, superannuation funds, institutional investors, financiers and senior real estate professionals and property analysts, as well as most industry bodies within the building and construction industry. Professional roles have included Director of Property Funds Management at Deutsche Bank, and former National President of the Property Council of Australia. John has held senior executive positions with ANZ and Colonial. He is currently a director to the Australian Building Codes Board (ABCB) after spending five years as Chair for the Australian Construction Industry Forum. He also serves as Chair of ASBEC and is Australia's first industry representative on the International Board of the CIB. John currently works out of Sydney as Senior Executive of Australian Enterprise Holdings.

In line with *Construction Innovation*'s drive for greater national and international engagement, five initiatives stand out.

The first has been the spearheading of our national focus through the *Construction 2020* initiative which set a leadership agenda for Australia's property and construction industry. The *Construction 2020* workshop series and dissemination of the far-reaching document *Construction 2020 — A Vision for Australia's Property and Construction Industry* were launched in Parliament House, Canberra, by the Minister for Science, Peter McGauran, and the Minister for Industry, Tourism and Resources, Ian Macfarlane, on 23 June 2004. *Construction 2020* and relationships with the industry associations will be a fundamental input into shaping the future of our CRC as we move to the development of our renewal bid next year.

The second initiative has been the consolidation of the International Construction Research Alliance (ICALL) bringing together leading international applied research and development organisations that service property and construction throughout North America, the United Kingdom and Europe. *Construction Innovation*'s membership of this key group confirms our CRC's important role in the international arena which will be confirmed at our upcoming first international conference in October this year, themed *Clients Driving Innovation.*

The third initiative came to fruition in May this year with this CRC's election to the International Board of the International Council for Research and Innovation in Building and Construction (CIB). As our CRC's nominee on this Board, I plan to provide a clear Australian research user perspective in helping shape the international research agenda for this influential group of more than 3000 members from 100 countries. I will be working to ensure our CRC's engagement with the CIB will deliver significant Australian benefits over the next few years.

Fourth, at a national level, *Construction Innovation* has played a key formative role in the formation of the Australian Sustainable Built Environment Council (ASBEC). Now incorporated as a company, ASBEC has a charter of bringing together the somewhat disparate regional, state and national organisations providing input to the sustainability agenda for the built environment, with the goal of unifying national guidelines for green development. Only in this way will Australia benefit from the well-intentioned energies of this wide variety of players. We are pleased to have been able to work with the Royal Australian Institute of Architects and other members of the Australian Construction Industry Forum in this initiative which I feel confident will deliver long-term benefits for sustainable development in this country.

Finally, one initiative for which I am particularly proud is our CRC's investment in the future intellectual capacity of our industry. Currently *Construction Innovation* supports 13 PhD and Masters students across the nation. We have now interviewed for an additional ten PhD scholarships which will provide Australia's property and construction industry with a significantly increased higher research capability. This is complemented by our developing input to the higher education curriculum at undergraduate and postgraduate levels in addition to our discussions with training providers in the TAFE and VET sectors. Our *Construction 2020* results confirm that the lack of appropriate skill development is of crucial industry concern for the future. This CRC intends to make an impact in this area.

As Chair of the Governing Board of *Construction Innovation,* it has been my pleasure to oversee the positive development of our Board as a coherent, powerful and strategically focussed team. We are indeed fortunate to have such a highly competent and motivated Governing Board committed to the performance of this CRC in meeting industry needs and strengthening the applied research and education so needed in this vital industry sector.

I look forward to working closely and productively throughout 2004–05 with our Chief Executive Officer, Dr Keith Hampson, and the dedicated and professional staff and stakeholders that comprise *Construction Innovation.*

CEO's report

Keith Hampson

This past year has been critical for our CRC for *Construction Innovation.* We have now entered a new era with a substantial number of research projects coming to a close throughout 2004. This signifies a change of focus for our industry, government and research partners. In addition to continuing to develop and manage research projects, we are also defining valuable outcomes from our projects and disseminating the results within our partner network and the industry more generally. Also vital is securing commercialisable project outcomes by identifying pathways to industry adoption and securing a financial return where possible.

A hallmark of this past 12 months has been successfully securing the in-kind support across the CRC ensuring that the ambitious targets from the Commonwealth Agreement, signed back in 2001, have been delivered by 2004. This has required sustained effort across each of our partners and they should be congratulated for their significant efforts in this strengthened engagement.

In terms of partners, we've ensured the ongoing involvement of our major partner groups in addition to securing the core partnership of Australia's largest municipality, the Brisbane City Council, who joined our CRC from 1 January 2004. Additional negotiations for fresh partners continues with potential private sector and government organisations.

Significant project outcomes have emerged from our three research program areas as detailed in Section 5.

The important CRC Program Second Year Review was conducted in August and October 2003. The review process evaluated our progress against the five Commonwealth objectives of Research, Education and Training, Commercialisation, External Communication, and Administration. The Review Panel believed the Centre to be performing well in all respects, especially in research management and highlighted that the calibre and enthusiasm of all personnel interviewed was impressive as was the team spirit. I place on record my appreciation for the enormous efforts made by our committed Participants and staff these past three years.

Successful external communication has continued to be a significant achievement for our CRC with 80 major publications in the national and trade press this past 12 months. Effective communication of the CRC's activities throughout our existing partner network and industry associations (especially the Australian Construction Industry Forum) continues to be a hallmark of the collaboration led by this CRC. Targeting key media opportunities will remain a high priority for communicating *Construction Innovation* activities.

An important initiative early in this next period is the October 2004 *Clients Driving Innovation* International Conference. The theme of this event is closely aligned to the outcomes of our CRC's industry contributions and highlights the strength and collaboration in our industry, government and research partners in driving collaboration and innovation though partnerships. It is expected that this conference will reinforce the value of the applied research outcomes and further focus our future research and technology transfer to *make a mark* for this industry.

We are approaching the midpoint of our CRC's life. I'm confident that the 306 individuals who personally contribute to the success of *Construction Innovation* across Australia will remain committed to driving the CRC's outcomes to make a significant positive difference for the Australian property and construction industry. In particular, I acknowledge our national headquarters team based at QUT in Brisbane. They are a close-knit, capable and highly committed team, well placed to address our future challenges together.

Our goal to make a real and lasting difference drives us to our strategic pathway to renewal. We are committed to a second round CRC application in early 2006 and well advanced with our initiatives to provide industry input and secure support from existing and fresh partners. We plan to build on the successes of this CRC in servicing the Australian property and construction industry for its future.

Keith Hampson is committed to building a more internationally competitive Australian property and construction industry by developing and promoting applied technology and innovative practices. As CEO of Construction Innovation, *he 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.*

3 Description of 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 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 enhancing 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.

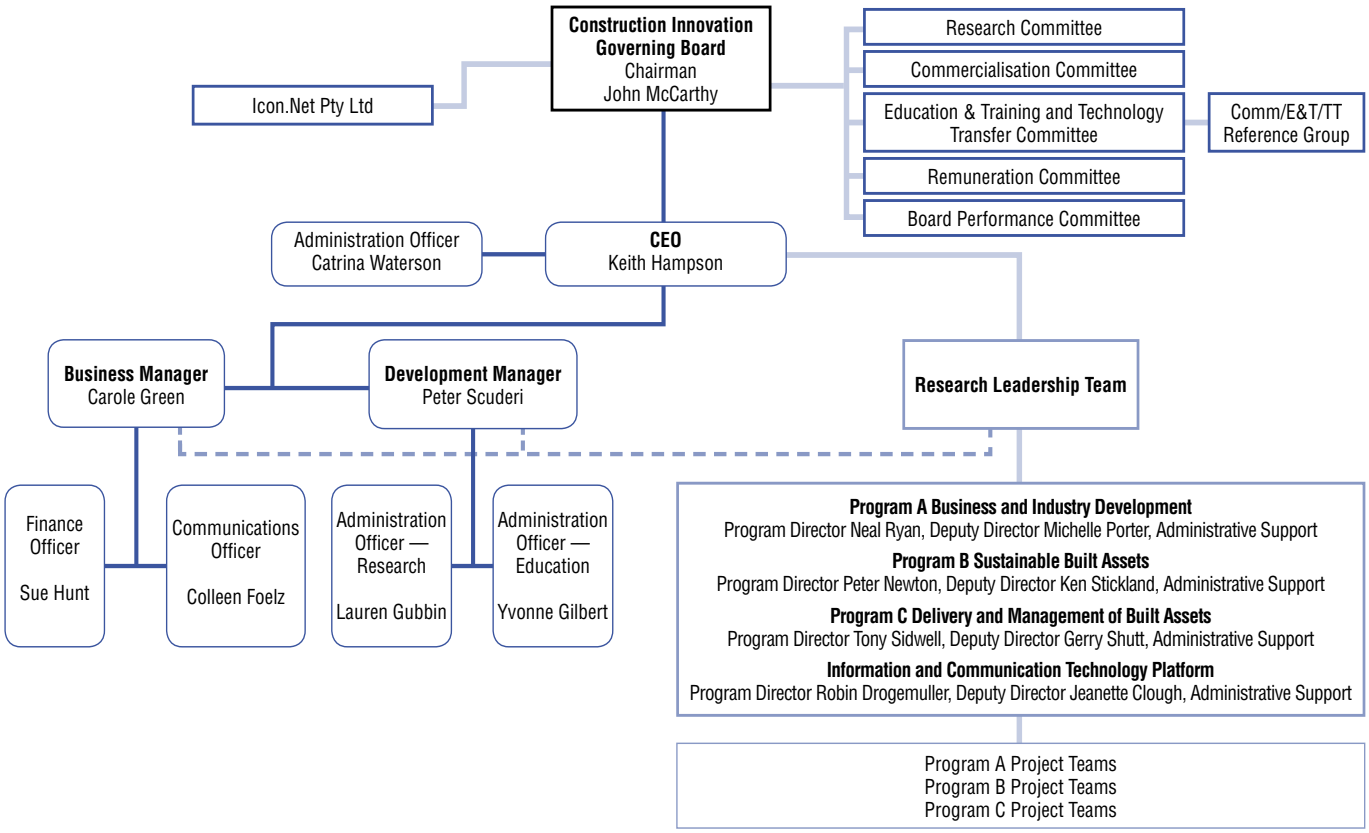
Five additional positions located in our Queensland University of Technology (QUT) headquarters support the activities of *Construction Innovation.* They are:

- Administration Officer — Catrina Waterson
- Finance Officer— Sue Hunt (previously held by Brad Warner)
- Communications Officer — Colleen Foelz (previously held by Kate Finlayson)
- Administration Officer, Research — Lauren Gubbin
- Administration Officer, Education — Yvonne Gilbert.

Other committees include:

- The Education & Training and Technology Transfer Committee which has met twice. It provides advice on disseminating outcomes of projects to our participant and industry network.
- The Commercialisation Committee has met twice and provides project direction setting of the CRC's commercialisation activities.

CRC for *Construction Innovation* Organisation Structure



The CRC headquarters team for *Construction Innovation*

The CRC for *Construction Innovation* has a team of eight servicing our five program areas: Research, Education and Training, Communication, Commercialisation, and Administration.

Meet the team at Construction Innovation *headquarters.*

Dr Keith Hampson

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

Carole Green

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

Peter Scuderi

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

Colleen Foelz

Communications Officer with responsibilities for media coverage, communication strategies and marketing.

Sue Hunt

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

Yvonne Gilbert

Administration Officer — Education, with responsibilities for education and training, and technology transfer activities.

Lauren Gubbin

Administration Officer — Research, with responsibilities for administration of the research program.

Catrina Waterson

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

Description of structure and management

3

Governing Board


1


2


3


4


5


6


7


8

The CRC for *Construction Innovation*'s Governing Board met five times in 2003–04, in Sydney, Brisbane (twice), Melbourne and Canberra. The Governing Board is responsible for determining *Construction Innovation* 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. John McCarthy has continued to most effectively chair the Governing Board.

Changes to Board membership during the year include Rod Wissler replacing John Gough due to a change in position within Queensland University of Technology (QUT), Tong Wu from University of Western Sydney replacing Neil Furlong from RMIT, Don Allan replacing Keith Farr due to a change in position in the Queensland Department of Public Works, and Noel Faulkner joining the Board from March 2004 as Brisbane City Council nominee. The three Queensland State Government representatives continue to rotate their attendance at Board meetings so that at any one meeting there are two in attendance. Our Board members bring a wealth of experience and industry contacts to *Construction Innovation.*

1 **Governing Board Chair, John McCarthy** is immediate past Chair of the Australian Construction Industry Forum (ACIF), Director of the Australian Building Codes Board, Director of the International Council for Building Research Studies and Documentation (CIB) and Director of the Association of Consulting Engineers, Australia (ACEA). Professional roles have included Director of Property Funds Management at Deutsche Bank and MD of Abigroup Asset Services.

2 **Don Allan** is Acting Executive Director of Building Division, Queensland Department of Public Works, and is responsible for building and built environment research, policy and advice, and the provision and management of the government's office accommodation and employee housing portfolio. The Building Division of the Department works to establish and enhance strong links with the building and construction industry to foster innovation and industry improvement.

3 With over 40 years in the Department of Public Works, **Keith Farr** has extensive experience in asset management, property management, building procurement and corporate real estate. Keith has held the position of Acting General Manager, QBuild, since September 2003. He previously held the position of Executive Director, Building Division. He is responsible for the Department's delivery of maintenance, building, and construction and community services to government agencies and communities throughout Queensland.

4 **Noel Faulkner** is the 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.

5 **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 secretary to the Governing Board. 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.

6 **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 PhD focussed on technology strategy and competitive performance in construction.

7 **Mike Hefferan** is the Executive Director of Industry Development Queensland, Department of State Development, and is 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.

8 **Larry Little** has participated in industry groups including the Construction Industry Development Agency, the Joint Building Standards Policy Board and CIB. He is currently the Chief of CSIRO Manufacturing and Infrastructure Technology.

9 **Gary Moore** holds the Foundation Chair of Environment-Behaviour Studies as well as being Dean of Architecture at The University of Sydney. Before coming to Australia, he was Director of the Wisconsin Space Grant Consortium. He is the immediate past president of the Association of Architecture Schools of Australasia, and Chair of the Council of Deans of Architecture and the Built Environment.

10 **John Oliver** is Managing Director of Rider Hunt in 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. John's skills lie in a hands-on approach bringing his experience in contractual and cost-planning matters together to provide risk-averse strategies.

11 **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.

12 **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. He chairs the Australian Construction Industry Forum, the National Engineering Registration Board and the Building Standards Sector Board of Standards Australia. David is Immediate Past President of the Association of Consulting Engineers Australia.

13 **Rod Wissler's** professional background is in the Arts industry. He completed a PhD in German literature and was CEO of the Twelfth Night Theatre Company. Since joining QUT his work has focussed on research and postgraduate studies. His current portfolio responsibilities include international marketing and protocol, the QUT International College, Research and Commercialisation, Fundraising and Alumni, Community Service, Creative Industries Sector and the Gardens Point Cultural Precinct. Rod formally took up his Board position in early 2003–04.

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

15 **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. Tong took up his Board position in early 2003–04.

Attendance at CRC *Construction Innovation* Governing Board meetings 2003–04

Board member	No. of meetings attended	No. attended by alternates
John McCarthy	5	
Don Allan	3	
Keith Farr	0	1
Noel Faulkner	2	
Carole Green	5	
Keith Hampson	5	
Mike Hefferan	2	1
Larry Little	3	2
Gary Moore	5	
John Oliver	4	
Glenn Palin	5	
David Singleton	4	1
Rod Wissler	5	
Dennis Wogan	3	1
Chung-Tong Wu	2	1

Attendance at Icon.Net Pty Ltd Meetings 2003–04

Company officers	No. of Icon meetings attended	No. attended by alternates
John McCarthy	2	
Keith Hampson	2	
Carole Green	2	
John Oliver	1	
Glenn Palin	2	
David Singleton	1	1
Rod Wissler	2	
Chung-Tong Wu	1	1

Description of structure and management

3 Research Committee

The Research Committee met four times during 2003–04 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.


1

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 those 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-adverse strategies.


2


3


4


5


6


7


8


9

Program A: Business and industry development

2 Director — Dennis Lenard
Director, Centre for Infrastructure and Property, University of Newcastle (now CEO, Constructing Excellence, UK) (replaced by Neal Ryan, Professor of Management, QUT)

3 Deputy Director — Don Allan
Director, Industry Policy, Queensland Department of Public Works (QDPW) (replaced by Michelle Porter, Acting Director, Industry Policy Unit, QDPW)

Program B: Sustainable built assets

4 Director — Peter Newton
Science Director, Chief Research Scientist, CSIRO

5 Deputy Director — Ken Stickland
Building Services, Arup Australasia

Program C: Delivery and management of built assets

6 Director — Tony Sidwell
Professor of Construction Management, Queensland University of Technology

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

ICT Platform

8 Director — Robin Drogemuller
CSIRO Principal Research Scientist, Integrated Design and Construction Systems

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

Secretary

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

Headquarters Staff

11 **Keith Hampson**
CEO, CRC for *Construction Innovation*

12 **Carole Green**
Business Manager, CRC for *Construction Innovation*

Other Committee Members

13 **Brian Ashe**
Manager – Research, Australian Building Codes Board

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

15 **Richard Hough**
Principal, Arup Australasia

16 **Judy Kraatz**
Group Manager, The Architecture Group, Brisbane City Council

17 **Arun Kumar**
Associate Dean (Research & Development), Professor of Highway Engineering, Royal Melbourne Institute of Technology

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

19 **Mary Lou Maher**
Professor of Design Computing, The University of Sydney

20 **Peter Nassau**
Director, Building Quality, Building Commission, Victoria

21 **John Spathonis**
Principal Manager (Research & Development), Queensland Department of Main Roads

22 **Yang Xiang**
Associate Professor in Structural Engineering, School of Engineering and Industrial Design, University of Western Sydney (replaced Graham Miller on 2 April 2004)

The following people served as alternates at some Research Committee meetings held in 2003–04: **Ken Moschner** (QDPW), **Michelle Porter** (QDPW)


10


11


12


13


14


15


16


17


18


19


20


21


22

Centre Visitor

We wish to acknowledge the significant support provided by **Professor Vernon Ireland** as our Centre Visitor until 30 June 2004. Vernon's valuable input during *Construction Innovation*'s formative stages has shaped this CRC into a more business-focussed research and implementation centre. In accordance with new CRC guidelines, however, *Construction Innovation* will not be continuing to engage a Centre Visitor.

Commercialisation/ Technology transfer/Utilisation

4

Commercialisation/Technology Transfer Program — Implementation

Construction Innovation has established several overriding principles to guide the development and implementation of its Commercialisation/Technology Transfer Program in fulfilling the Commonwealth Government's Cooperative Research Centre objectives — namely, to enhance the transfer of research outputs into commercial or other outcomes of economic, environmental or social benefit to Australia.

The two guiding principles in achieving this goal, are to ensure intellectual property (IP) management and strategies for commercialisation are targeted to potential commercial opportunities, and to transfer public good research outcomes to *Construction Innovation* partners, the construction industry and the broader Australian community.

Construction Innovation seeks to develop solutions for the participants and industry that will result in positive industry change. The strategy for commercialisation/ technology transfer of the research involves the participation of clients and major players from the construction industry as partners in *Construction Innovation*. As leaders in the industry, they have carriage of the decision making, the major projects, and influence over the tools, technologies and management systems that drive adoption of new ideas by the industry.

Commercial exploitation of IP may happen in a number of ways including the joint ownership and operation by groups of partners, establishing spin-off companies with shareholders by *Construction Innovation* participants or by licensing and patents. *Construction Innovation* pays special care to protect its innovations by copyright and confidentiality agreements.

As with the Education Program, *Construction Innovation* has developed three levels of activities.

- an Education & Training and Technology Transfer Committee (known as the Education Committee) convenes quarterly and has a monitoring and review role for the Commercialisation/Technology Transfer Program
- the Commercialisation, Education and Training and Technology Transfer Reference Group (known as the Reference Group) convenes six-monthly and provides a conduit between *Construction Innovation* and various industry groups and educational institutions
- the development and implementation of the Education, Training and Technology Transfer Program (known as the Education Program) Operational Plan (see page 27).

Technology Transfer Program — Operational Plan

Construction Innovation has developed an operational plan to drive its activities in Technology Transfer. In summary the key activities are as follows:

1. *Construction Innovation* is working with partners to identify the most appropriate way to disseminate research findings within their organisation as well as working with industry associations on joint seminars and/or presentations at industry seminars and conferences.

   Actions to date — *Construction Innovation* is working through dissemination strategies with partners and is having ongoing discussions with the Australian Construction Industry Forum and other key industry groups. This has resulted in key personnel delivering joint seminars, keynote addresses and other presentations at national and international events.

2. *Clients Driving Innovation* is *Construction Innovation*'s first international conference which will be held in October 2004. More than 150 delegates from the Australian and international community will present and participate. The conference is being supported by the International Council for Research and Innovation in Building and Construction (CIB) and International Construction Research Alliance (ICALL) networks.

   Actions to date — Planning for the international conference is well underway with over 65 papers expected from industry and research presenters from Australia, North America, Europe and Asia. Keynote speakers have been selected from major construction and research institutions.

3. *Construction Innovation* is committed to distributing public good research outcomes to industry and the broader community through the production of publications, media coverage, information sheets, booklets and books. In addition, research reports that are not IP sensitive are made available to the public through the *Construction Innovation* website.

   Actions to date — *Construction Innovation* has produced a library of case studies to improve the incidence and quality of innovation in the Australian property and construction industry. The case studies have been widely distributed to industry and have been used to develop an undergraduate course in *Current Industry Issues* delivered at Queensland University of Technology (QUT). In addition, *Construction Innovation* has produced information sheets or brochures on a range of projects from evaluating the commercial performance of non-residential buildings to *health* checks on projects and environmental calculators.

4. *Construction Innovation* is working with project teams to deliver early benefits to industry partners through project-based workshops imparting knowledge and findings gained through the research process.

   Actions to date — Themes of workshops have included decision making on procurement systems, cultural issues relating to relationship contracting, information and communication technology (ICT) applications in the design and construction phases of projects, and investment decision making in infrastructure maintenance.

5. Pathways to project completions are undertaken six-to-nine months from the project end date to ensure that opportunities for industry partners to trial outputs, disseminate and/or implement research findings are optimised. Completion Strategies prepare our research for education and training, technology transfer and commercialisation activities.

   Actions to date — Through 2003–04, 19 Completion Strategies were developed and ratified by the *Construction Innovation* Board.

Research

5

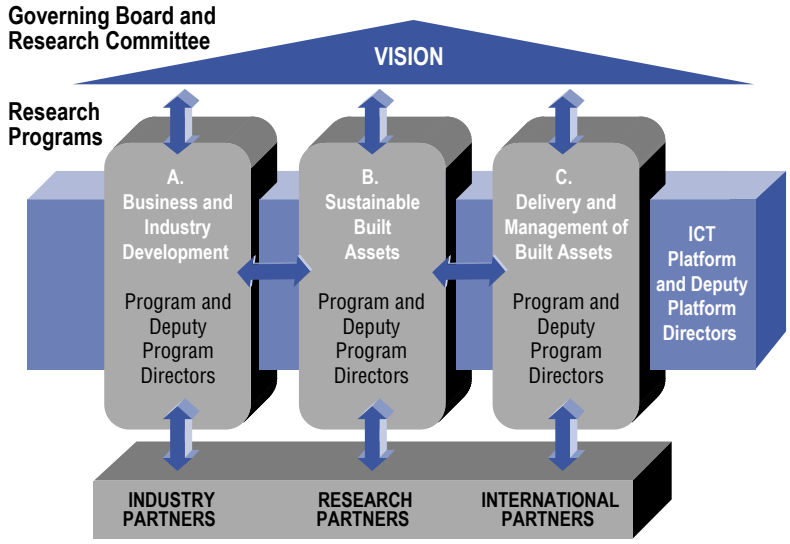
Construction Innovation has as one of its core goals the development and delivery of a quality industry-led research program.

Construction Innovation's existing 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.

In addition to Australia's strengths in research and development (R&D) across five universities and CSIRO, *Construction Innovation* has formed international alliances ensuring Australian property and construction is linked with key international R&D providers. The International Construction Research Alliance (ICALL) between the CRC for *Construction Innovation* and leading international research organisations in North America and Europe will provide a vehicle for ensuring that Australian leadership in research and innovation is informed by global initiatives.

The CRC for *Construction Innovation* wishes to thank Dennis Lenard for his contribution as Program Leader of Program A until September 2003 when he left Australia to take up the CEO role for the United Kingdom's *Constructing Excellence* program.

CRC for *Construction Innovation:* Research Program Structure



A. Business and industry development

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 strong industry outcomes especially from the research project *Innovation, Potential Directions and Implementation in the Building and Construction Product System* (the BRITE project – Building Research Innovation Technology and Environment) which at its February 2004 launch attracted the interest of more than 200 attendees — highlighting the considerable industry interest in *doing it a better way.*

B. Sustainable built assets

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.

In Program B, a major industry outcome has been the adoption by the Australian Building Codes Board (ABCB) in June 2004 of substantial recommendations arising out of the CRC project *Sustainability and the Future Building Code of Australia.* For the first time, the national regulators have agreed that sustainability should be a goal of the Building Code of Australia (BCA) and the ABCB has acknowledged the valuable research contribution carried out by the CRC in reaching this decision.

Additionally the *LCADesign* research project — *Environmental Assessment Systems for Commercial Buildings* — is due for completion. This *green calculator* provides an opportunity for the CRC's sustainability focus to drive real changes to industry practice in designing for eco-efficiency. Industry interest in this project has been considerable and activities are under way in analysing commercialisation options.

C. Delivery and management of built assets

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.

In Program C, the drive for improving procurement processes in Australia has ensured interest in the value alignment project which has developed a Decision Support Tool based on a database of existing projects to evaluate procurement decisions. This management tool will provide valuable assistance to public and private sector clients and construction managers in selecting the most appropriate procurement method.

The *eValuBuild* project (2001-011-C, p. 22) provides a software-based tool to assist building owners and managers in ongoing investment decisions for commercial buildings. Demonstrations of this tool to industry has generated substantial interest and options for commercialisation are under consideration.

Research

5

Program A: Business and industry development

Program Director: Neil Ryan **Deputy Program Director: Michelle Porter**

Research Project 2001-004-A

Knowledge Management and Innovation Diffusion

Project Leader:

Derek Walker
RMIT

Project team:

Arup Australasia
Peter Bowtell

Bovis Lend Lease
Mark McSweeney

John Holland
Gerry Shutt

Building Commission
Roger Frith, Jeff Norton

Queensland Department of Main Roads
Don Allan, Craig Carpenter, David Clifford, Bill Semple, Jane Williamson

Queensland University of Technology
Tony Sidwell

RMIT
Andrew Finegan, Andrew Wilson

The University of Newcastle
Graham Brewer, Judith McCann

Project Duration: July 2001 – July 2004

Project Description:

The research has highlighted how management of expert knowledge and information, together with an Information and Communication Technology (ICT) decision support tool, may be applied to other innovative ICT decision support tools.

Progress:

The project has delivered 10 refereed conference papers, a final research report and an industry booklet on the Knowledge Advantage theory which is based on three concepts — an ICT-enabled infrastructure, a leadership infrastructure and human infrastructure.

Future Directions:

The final research report will be made available to *Construction Innovation* partners via access from the *Construction Innovation* intranet. The report will provide a basis for future research and testing of the Knowledge Advantage theory by industry.

Research Project 2001-012-A

Innovation Potential, Directions and Implementation in the Building and Construction Product System

Project Leader:

Karen Manley
Queensland University of Technology

Project team:

Arup Australasia
Richard Hough

Queensland Department of Main Roads
Dion Harle, Mike Swainston

Queensland Department of Public Works
Don Allan

Queensland Department of State Development and Innovation
Rob Wilcox

CSIRO
Steve McFallan

Queensland University of Technology
Aletha Blayse

University of Western Sydney
Michelle Coillet, Jane Marceau

Project Duration: January 2003 – December 2005

Project Description:

During the first 18 months of the project, focus 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.

Progress:

Significant progress has occurred on this project through the development of industry-focussed case study material which has been broadly distributed to the Australian property and construction industry through Australian Construction Industry Forum (ACIF), the project partner charged with the dissemination of the research outcomes. In the early part of 2004, a survey instrument was distributed to a sample of 1000 companies with a 30 percent response rate received. The instrument has provided direction for fieldwork and has provided insights into the key influences on *Construction Innovation* and an understanding of their dynamics and inter-relationships.

Future Directions:

The benefit of this research for the Australian property and construction industry is access to information that will better equip the government and associated departments to strive for innovation best practice and improved business performance. The information is presented at www.brite.crcci.info, a website containing a series of innovation best practice case studies and the results of the Australian innovation survey of companies in the property and construction industry.

Research Project 2001-016-A

Critical Success Factors for ICT Mediated Supply Chains

Project Duration: July 2002 – June 2004

Project Description:

This research team has created a model that identifies critical success factors in ICT-mediated supply chains acknowledging the differing needs of individual organisations and participants in temporary project organisations.

Progress:

The project team has delivered five research reports on Quantitative Methodology, Qualitative Methodology, a report on Candidate Success Factors, the findings of a Delphi Study and the preliminary findings from an Australian National Survey. Three case studies are being developed using a pilot study taken from an industry partner's project. A consolidated project report and a best practice guide framework have commenced.

Future Directions:

The Australian property and construction industry will benefit from this research by having access to a model to establish a best practice framework that acknowledges participants' differing needs in temporary project organisations.

Project Leader:

Graham Brewer
The University of Newcastle

Project team:

Woods Bagot
David Marchant

Queensland Department of Main Roads
Geoff Caldwell, Raju Chamala

CSIRO
Robin Drogemuller

The University of Newcastle
Kathryn McCabe, Thayaparan Gajendran, Swee-Eng Chen

Research Project 2002-022-A

Value in Project Delivery: Facilitating a Change in Culture

Project Duration: September 2002 – January 2005

Project Description:

This research team is addressing a specific need identified by the industry partners. Alliancing is a growing and important area of Australian property and construction delivery systems. Most organisations, although conceptually in favour of the approach, do not have the necessary culture and tools within their organisation to make it operate effectively. The research will show how fostering the right culture is not a challenge for the project team alone; the client organisation must also develop an appropriate culture to be able to propose and manage relationship contracts. The success of projects, particularly alliancing projects, is predicated on developing a collaborative project culture.

Progress:

The project team has delivered one refereed conference paper and has undertaken surveys within the project team's government departments. It is undertaking a case study on a relationship contract and is developing success factors for teams operating within relationship-type contracts.

Future Directions:

The Australian property and construction industry will benefit from this research by having access to a *Toolkit* for applications with a participating organisation. They will be able to extend the focus of the kit from the client organisation to all project stakeholders and will also have access to best practice guides.

Project Leader:

Steve Rowlinson
Queensland University of Technology

Project team:

John Holland
Terry Jones

Queensland Department of Main Roads
Kurt Marsden, Mark Rogers, John Spathonis

Queensland Department of Public Works
Roy Sargent, Mat Tiley

CSIRO
Greg Foliente

Queensland University of Technology
Fiona Cheung, Alannah Rafferty, Tony Sidwell, Roland Simmons

RMIT
Derek Walker

The University of Newcastle
Marcus Jefferies

Program A: Business and industry development

Research Project 2002-062-A

Ethical Behaviour in the Construction Procurement Process

Project Leader:

Adrian Kirk
The University of Newcastle

Project team:

John Holland
Jeff Horsley

Rider Hunt
John Oliver

Building Commission
Roger Frith

Queensland Department of Public Works
Don Allan, Ken Moschner, Michelle Porter

Queensland University of Technology
Debbie Smit, Paul Smith

The University of Newcastle
Marcus Jefferies, Jamie Mackee, Judith McCann

Project Duration: June 2003 – December 2004

Project Description:

This research will focus on the design of a set of ethical procurement guidelines for uptake and implementation by major procurers, including government clients, and contractors. Case studies will show examples of innovative ethical procurement and ethical procurement problems. The case studies will enhance the guidelines' rulings, providing examples of *good* and *bad* ethical procurement practices.

Progress:

The research team has facilitated a workshop gauging industry's perceptions of ethics in the construction procurement process. Literature on ethical standards in the Australian construction industry and the international arena has been reviewed. A set of pilot construction procurement guidelines has been developed and is currently being validated by industry, particularly by national representatives of the industry, through four workshops held in Sydney, Brisbane, Melbourne and Canberra.

Future Directions:

The outcome of the project will be the *Ethical Procurement Guidelines,* published in book, pamphlet and webpage formats. The case studies and research summaries will be provided alongside the guidelines.

Research Project 2002-066-A

Internationalisation of Construction Industry Design Firms

Project Leader:

Kerry London
The University of Newcastle

Project team:

Arup Australasia
Richard Hough

DEM
Peter Droege

Woods Bagot
David Marchant

Queensland Department of State Development and Innovation
Terry Gibson, Brendan Richardson

Queensland University of Technology
Steve Rowlinson

Project Duration: December 2003 – December 2004

Project Description:

This project aims to assess the extent of economic sustainability of Australian construction industry small-to-medium-sized enterprises (SMEs) who export design-related products and/or services. This investigation will also identify barriers and success factors experienced by SMEs which increase or reduce their exposure to financial risk.

Progress:

The project team has delivered a literature review comprising issues relating to design management, internationalisation theory, and sustainable business models.

Future Directions:

This research will provide construction sector SMEs that export design expertise with information on business models that will give them the ability to achieve long-term economic sustainability.

Program B: Sustainable built assets

Program Director: Peter Newton **Deputy Program Director: Ken Stickland**

Research Project 2001-002-B

Life Cycle Modelling and Design Knowledge Development in Virtual Environments

Project Duration: October 2001 – 30 September 2004

Project Description:

This research team aims to improve life cycle modelling of buildings through linking 3D models with maintenance data to allow the facility manager and designer to access information and knowledge that is currently inaccessible. The research also integrates data mining agents into the maintenance process to produce timely data for the facility manager on the effects of different maintenance regimes.

Progress:

The project team has demonstrated data mining/knowledge discovery algorithms. It has implemented object-oriented models in virtual environments to provide 3D interaction using data supplied by industry partners and has demonstrated the 3D model interaction. The team has also established the basis for data mining agent technology.

Future Directions:

Benefits of the research outcomes to the Australian property and construction industry include the provision of an improved connection between maintenance and design knowledge on projects. This will be achieved by having access to a demonstration modelling tool in a 3D environment that can be linked directly to an Asset Management System.

Project Leader:

John Gero
The University of Sydney

Project team:

Woods Bagot
David Marchant

Queensland Department of Public Works
Dale Gilbert, Teng Hee Tan

CSIRO
Lan Ding

The University of Sydney
David Gunaratnam, Mary Lou Maher, Rabee Reffat, Mike Rosenman

Research Project 2001-005-B

Indoor Environments: Design, Productivity and Health

Duration: July 2001 – August 2003

Project Description:

This scoping project focussed on minimising the incidences of Legionella disease outbreaks by using new design solutions for commercial air-conditioning cooling towers. This project also determined the availability of Australian and international data for thermal comfort, lighting and indoor air quality; the populations and buildings affected; and procedures by which this information can be used to estimate real costs on the productivity and health of Australian office workers.

Progress:

A multidisciplinary approach was used to develop a detailed and costed research brief for identifying engineering control solutions for Legionella in cooling towers. A literature review on indoor air quality in terms of data collection is also substantially completed. Over 500 references were collected and seven interviews with relevant key industry and research representatives were conducted. A framework for the analysis of the literature (including consideration of the measurement and understanding of productivity) and a map of influences on productivity were developed to assist in understanding the area.

Future Directions:

The suggested future research in Legionella will not be undertaken by *Construction Innovation* as it is outside our core research program. The suggested research for indoor air quality and the productivity frameworks will be considered by *Construction Innovation* in a project which will case study the major refurbishment of an existing commercial building.

Project Leader:

John Bell
Queensland University of Technology

Project team:

Arup Australasia
Haico Schepers

Bovis Lend Lease
Caroline Noller

Queensland Department of Public Works
Dale Gilbert

CSIRO
Steven Brown, Angelo Delsante

Queensland University of Technology
Richard Brown, Veronica Garcia Hansen, Milan Jamriska, Lidia Morawska

Program B: Sustainable built assets

Research Project 2001-006-B

Environmental Assessment Systems for Commercial Buildings

Project Leader:
Selwyn Tucker
CSIRO

Project team:
Arup Australasia
Matthew Higgs, Greg Smith, PC Thomas
Bovis Lend Lease
Caroline Noller
Woods Bagot
Carolyn Mitchell
Australian Building Codes Board
Brian Ashe
Building Commission (Victoria)
Rob Enker
Queensland Department of Public Works
Dale Gilbert, Delwyn Jones, Craig Pearman, Teng Hee Tan
CSIRO
Michael Ambrose, Robin Drogemuller, David Johnston, Stephen McFallan, Grace Mitchell, Peter Newton, Phillipa Watson
Queensland University of Technology
John Bell, Nur Demirbilek, Lidia Morawska, Jay Yang
RMIT
Tim Grant, Karli James
University of Western Sydney
Graham Miller

Project Duration: September 2001 – June 2004

Project Description:

This research provides a practical tool for designers, material producers, government regulators, building owners and managers to enable them to assess the environmental impact of commercial buildings. The research has produced *LCADesign,* a tested prototype of an environmental assessment tool capable of being linked to a 3D CAD model of a building. This 3D CAD model has the capacity to calculate the quantities of each element in any building design described in the 3D computer model. This research project has determined how to convert the quantities of each element into the quantities of each of the main component materials used, and to do this from the earliest possible stages of the design process.

Progress:

The project team has delivered a prototype of *LCADesign* which is being tested by industry partners. Included in the *LCADesign* tool is the Life Cycle Indicators database of materials which could be used as a stand-alone aid for building designers and/or material specifiers. While the environmental database now has considerable breadth in its coverage of products, there are many refinements, consistency checks and Australian details still required. Despite this, life cycle assessment can now be performed on components in the buildings being tested. A broad knowledge of environmental emissions for building-related products has been developed.

Future Directions:

The benefit of this research to the Australian property and construction industry is access to the environmental impact and costs of commercial buildings enabling players to consider these two aspects in tandem as design decisions are being made. *Construction Innovation* is currently assessing options for commercialisation of this research.

Research Project 2001-014-B

Automated Code Checking

Project Leader:
Robin Drogemuller
CSIRO

Project team:
Woods Bagot
David Marchant
Australian Building Codes Board
Brian Ashe
Building Commission (Victoria)
Roger Frith
CSIRO
Lan Ding
The University of Sydney
John Gero, Julie Jupp, Mike Rosenman

Project Duration: July 2002 – December 2003

Project Description:

This project assessed the capacity of object-based CAD systems to support automated checking of designs for compliance against requirements, and tested the comparative strengths and suitabilities of two different rule-checking engines — the Engineering Database Management (EDM) Model Checker and the Solibri Model Checker. The study involved the encoding of sections of the Building Code of Australia (BCA) relevant to access by people with disabilities (Section D3) and the deemed-to-satisfy provisions including AS 1428.1.

Progress:

The project team encoded both performance-based and deemed-to-satisfy provisions of the BCA within the EDM Model Checker and Solibri Model Checker. The evaluations made included the relative performance, the evaluations of the capability, and estimates of the impact of scaling up the systems to handle full codes (i.e. approx. 4000 rules in BCA). A working prototype was delivered able to automatically check the 3D CAD model of a building against the sections of the BCA relevant to access by people with disabilities (Section D3) and the deemed-to-satisfy provisions including AS 1428.1.

Future Directions:

Benefits to the Australian property and construction industry include a guide document for designers using ArchiCAD on how to structure their designs to allow rule checkers to operate effectively. *Construction Innovation* is currently assessing options for commercialisation of this research output.

Research Project 2002-004-B

Noise Management in Urban Environments

Project Duration: April 2003 – December 2004

Project Description:

This research team recognises that noise management is about managing noise to protect community health and wellbeing. Recent 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.

Progress:

The project team has delivered one refereed conference paper and a best practice literature review. In addition, further data acquisition has been undertaken, and development of a simulation model, cost–benefit of alternative treatments and part-calibration of a Decision Support Tool are under way.

Future Directions:

At the completion of the research, the Australian property and construction industry will benefit by having access to a comprehensive, easy-to-understand guide for assessing the main community issues in managing transport-related noise (air, sea, land) in urban environments, and how to address these issues. A software package and user guide for improved noise management decisions will be produced, and innovative pricing arrangements for property potentially affected by noise will also be developed. Finally, the team will also provide innovative approaches to sustainable urban living environments in noise corridors.

Project Leader:

Saman DeSilva
RMIT

Project team:

Arup Australasia
Peter Bowtell

Queensland Department of Main Roads
Arthur Hall, Julie Peters, John Spathonis

Queensland Department of Public Works
Dale Gilbert

CSIRO
Peter Newton

Queensland University of Technology
Ned Wales

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

Research Project 2002-010-B

Life Prediction of Building Material Components

Project Duration: March 2003 – March 2004

Project Description:

This research team has attempted to develop a pilot Delphi study bringing together an expert panel of architects, building scientists, materials scientists, statisticians, IT professionals, asset and facility managers, and construction contractors. The intention of this multi-sectoral team was to ensure robustness as well as the ability to gauge variability in the opinion of the experts with a focus on predicting the life of individual components for specific materials.

Progress:

The project team delivered an audit of metal components in buildings, and Australian Cost Management Manual (ACCM) numbers were assigned to all metal components. An online survey instrument was used, realising the large number of *representative components* to be incorporated into the survey. The results of the survey have been included in the final research report.

Future Directions:

Construction Innovation is considering its future involvement in this area of research.

Project Leader:

Ivan Cole
CSIRO

Project team:

John Holland
Gerry Shutt

Queensland Department of Public Works
Dale Gilbert

CSIRO
Stephen McFallan, Gerry Trinidad

The University of Newcastle
Swee-Eng Chen, Jamie MacKee

Program B: Sustainable built assets

Research Project 2002-024-B

Team Collaboration in High Bandwidth Virtual Environments

Project Leader:

Mary Lou Maher
The University of Sydney

Project team:

Arup Australasia
Richard Hough, Steve Pennell

Woods Bagot
David Marchant, Carolyn Mitchell, Kanyarat Nemprempree

CSIRO
John Crawford, Robin Drogemuller, Lan Ding

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

The University of Sydney
Kirsty Beilharz, Andy Dong, John Gero, Michael Rosenman

Project Duration: February 2003 – December 2005

Project Description:

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 the USA that have resulted in system architectures to support data transfer and information sharing. This project focusses on how these systems and the associated commercial tools can be used in a high bandwidth environment, particularly on early stages of a project in which models for the project are being developed and revised. The project looks at four aspects of collaboration in virtual environments, including the processes that enable effective collaboration using high bandwidth information communication technology (ICT), the models that allow for multiple disciplines to share their views in a synchronous virtual environment, the generic skills used by individuals and teams when engaging with high bandwidth ICT, and the extent to which people contribute to the effectiveness of virtual teams within the industry.

Progress:

The project team has undertaken a literature review on the analysis of collaboration processes, and has reported on experimental methodology for collaboration processes, has presented a workshop demonstrating multiple views used in virtual environments for conceptual design and another demonstrating collaboration process and high bandwidth tools.

Future Directions:

The benefits to the Australian property and construction industry are strategic and opportunistic. Many companies in the construction industry are now ready to pursue high bandwidth collaboration. The opportunity for *Construction Innovation* partners to do this with support from the CRC and with the experience of the research partners provides a competitive advantage that other organisations in the construction industry do not have.

Research Project 2002-043-B

Smart Building for Healthy and Sustainable Workplaces

Project Leader:

Greg Foliente
CSIRO

Project team:

Arup Australasia
Colin Henson, Paul Sloman

Bovis Lend Lease
Des Dykes

Queensland Department of Public Works
Dale Gilbert

CSIRO
Steve Brown, Angelo Delsante, Philip Paevere, Charles Rono, Pavan Sikka

Queensland University of Technology
John Bell, Jay Yang

Project Duration: January 2003 – July 2003

Project Description:

This project promoted social, economic and environmental sustainability in the built environment through research into the development of *smart building* technologies that support healthy indoor environments, energy-efficient operation, and the maintenance of workplaces. While this research was a scoping study, the long-term goal for this project was to develop and implement technologies to support people-friendly (i.e. healthy), eco-friendly and commercially viable buildings and facilities, and to facilitate triple-bottom-line assessment and reporting. The study aimed to assess technologies that could measure and control factors important for healthy and sustainable workplaces.

Progress:

The Scoping Study was completed and included consultations with contractors and other specialists, and an extensive review of literature to determine state-of-the-art practice. A facilitated workshop was conducted with experts and industry representatives that confirmed the findings in the review, provided input into development of Phase 2 of the project (prototyping and field trial), and mapped potential flow-on projects for the future. A final report was delivered.

Future Directions:

Construction Innovation is considering its future involvement in this area of research.

Research Project 2002-059-B

Case Based Reasoning in Construction and Infrastructure Projects

Project Duration: October 2003 – March 2005

Project Description:

The project has two major objectives being to develop an *engine* that uses Case Based Logic (CBL) to link together process modules to form tailored models for specific applications and to apply this approach to estimate the life of components in construction and infrastructure projects. Studies have demonstrated that statistical models of component life, though useful, are extremely limited in their application and cannot predict outside the data sets used to generate the models. Process-based models are much more flexible, but such models are very costly to develop and, as they need to be developed for each material, it is not feasible to develop a whole-of-structure system based on individually constructed models.

Progress:

The project team has delivered reports defining coverage of the system and existing CSIRO microclimate and material models. A plan of the module framework and rules has been completed together with a list of microclimate and degradation models.

Future Directions:

This project will focus on predicting the life of the key metallic construction materials and components and assessing the viability of the technique to a wider range of materials such as concrete (including reinforcement) and timber.

This research project has two major implications to industry and Australia. In its specific application to life prediction of construction materials it will provide for the first time a modelling framework that is robust, flexible, comprehensive and durable. This will permit accurate inputs into environmental impact, damage risk and other models. It will provide industry with a unique tool that can be used for modelling a wide variety of complex systems.

Project Leader:

Ivan Cole
CSIRO

Project team:

Queensland Department of Main Roads
Alan Carse, John Spathonis

Queensland Department of Public Works
Dale Gilbert, David Harrison

CSIRO
Wayne Ganther, Gerardo Trinidad

The University of Sydney
Mary Lou Maher

Research Project 2002-060-B

Parametric Building Development during Early Design

Project Duration: July 2003 – August 2004

Project Description:

This research project plans to investigate leading-edge software tools and develop, as necessary, interfaces to promote the rapid optimising of architectural layout and structure based on parametric models. The term *parametric* in this context refers to the relationships among and between all elements of the model which will enable the coordination that the team wants.

Progress:

Beginning with a relatively simple rectangular building, and with architecture and engineering knowledge of various *rules of thumb* already in use by industry partners, the project team has worked with parametric descriptions of building projects during the early sketch design stage to determine how a wide range of user requirements can be assessed from this simple outline. It has examined the methods for defining parametric models within the three major architecture, engineering and construction CAD systems plus Catia (a leading parametric modeller), and a popular category of mixed-use commercial/residential multi-storey developments has been chosen for analysis and implementation.

Future Directions:

Successful completion of this project will allow designers to assess a wider range of alternatives in architectural and structural design in a shorter time. This will assist in providing buildings that are better, cheaper, and more environmentally friendly through being able to retain the early design information, constraints and client requirements, and re-use it in the detailed design stage. This project will provide a prototype of the software interfaces necessary to assist in the transition from early to detailed design.

Project Leader:

John Crawford
CSIRO

Project team:

Arup Australasia
Peter Bowtell, John Legge-Wilkinson

Woods Bagot
Stephan Langella, David Marchant

CSIRO
Miles Anderson, Robin Drogemuller

RMIT
Mark Burry

Research Project 2002-063-B

Sustainable Subdivisions – Energy Efficient Design

Project Leader:

Michael Ambrose
CSIRO

Project team:

Brookwater JV
David Henry, Dayan Jayasekera

DEM
Peter Droege

Queensland Department of Public Works
Michael Ball

CSIRO
Angelo Delsante, Anne Miller, Selwyn Tucker

Queensland University of Technology
John Bell, Nur Demirbilek, Elspeth Mead, Ned Wales

Project Duration: October 2003 – September 2004

Project Description:

This is an investigative study which brings an integrated team together to identify the energy-efficiency demands of dwellings from a subdivision viewpoint as well as that from an individual dwelling. It will highlight challenges likely to fall mainly on the national housing industry with release of new energy codes, and canvas the technologies available to housing for on-site electricity generation as a basis for developing of solar suburbs.

Progress:

The project team has identified subdivisions on which houses in four separate categories will be built: project homes, individual houses (one and two storey), medium density-housing and SOHO (small office–home office). Plans have been obtained for an appropriate sample of dwellings in each category from which assessments and comparisons to the new and current energy-efficiency standards in subtropical climate zones have been made. Interviews have occurred with those who undertake subdivision planning, design and statutory compliance activities, and criteria are being developed for possible future energy-efficiency tools with priority weightings.

Future Directions:

The outcomes of this project will include an appraisal of a new assessment tool which includes ventilation for house energy-efficiency ratings, and criteria for possible future tools for determining the performance and means for achieving energy-efficient design in subdivisions and dwellings. The Australian property and construction industry will have access to a connection of *housing technology* to *subdivision technology* in sustainable subdivisions and access to a new assessment tool which includes a more appropriate ventilation model for rating energy-efficiency of dwellings. This project will inform industry on adequacy of current design options in the context of an emerging energy code for residential buildings.

Research Project 2002-075-B

Integrated Sustainable Housing Development

Project Leader:

Jay Yang
Queensland University of Technology

Project team:

Brookwater JV
David Henry, Dayan Jayasekera, Brad Tindale, Andrew Whitson

Queensland Department of Public Works
Michael Ball

CSIRO
Selwyn Tucker

Queensland University of Technology
Sarah Alder, John Bell, Jon Bunker, Nur Demirbilek, Yin Foong, Jim Gall, Matthew Humphreys, Kame Khouzam, Peter Richards, Paul den Ronden, Mark Thomson

Queensland Department of Housing
Craig Atfield

Construction Training Queensland
Peter Roebig

Project Duration: July 2003 – June 2005

Project Description:

With a long-term goal of promoting the integration of smart and sustainable features in Australian housing development, the DISCOVER project aims to bring together developers, builders, legislative authorities, construction training bodies, and university researchers and students to initiate, design, develop and implement smart and sustainable housing on the basis of a residential housing infrastructure in subdivisions, instead of on an ad-hoc basis for stand-alone homes. It will provide content for education and training opportunities, as well as a computer-based tool to aid the adoption of sustainable housing principles.

Progress:

A student competition has been undertaken for the design of the sustainable house, and negotiations with the house developer, and a Scoping Study and report, have been completed.

Future Directions:

This project will provide internet access to a knowledge base giving students, building trainee educators, home buyers and the general public an opportunity to focus on sustainability building principles when pursuing urban housing infrastructure development. It will also provide universities, TAFE and industry groups with direction on the development of courses for designers and builders of sustainable houses.

Program C: Delivery and management of built assets

Program Director: Tony Sidwell **Deputy Program Director: Gerry Shutt**

Research Project 2001-003-C

Value Alignment Process for Project Delivery

Project Duration: October 2001 – December 2003

Project Description:

The Australian property and construction industry will have access to a new decision tool that goes beyond published reports, and maps ideas for improving national construction industries. Rather than providing generalised advice based on broad principles, it provides specific advice about actions taken on projects that were successful, carefully matched to the specific needs and circumstances of individual clients and their project teams. This will be achieved via a software-based decision tool that asks users questions about their project. The answers are used by the decision tool to create a profile of the project's inherent difficulty based on its size, complexity, predictability and the objectives it aims to achieve. The decision tool then uses the project profile to tell the user the level of risk encountered on projects with similar profiles, and the level of coordination required to minimise those risks. This provides broad guidance for clients and project managers based on relevant advice from recent case studies of best practice.

Progress:

The literature review and the development of a best practice matrix decision-support tool have been completed. The Decision Support Tool prototype is complete and has been populated with 40 case studies from the industry and government project partners. The partners are currently trialling the prototype and will provide comments before future development work is undertaken.

Future Directions:

The Australian property and construction industry will have access to an interactive software-based tool that provides information, advice and recommended actions on exceptional project delivery to a project team. There is also an opportunity to follow up with a consultancy service which would use the tool to provide advice on projects regarding exceptional project delivery, and to recommend appropriate actions.

Project Leader:

Tony Sidwell
Queensland University of Technology

Project team:

John Holland
Chris Evans, Gerry Shutt

Queensland Department of Main Roads
Steve Hogan

Queensland Department of Public Works
John Collin, Keith Farr, Bob Giles, Ken Moschner, Michelle Porter, Ray Potts, Tony Sgroi

CSIRO
Paul Tilley

Queensland University of Technology
Albert Chan, Steve Rowlinson, Achim Weippert

RMIT
Derek Walker

The University of Newcastle
Swee-Eng Chen, Rod Gameson, Marcus Jeffries

Research Project 2001-008-C

Project Team Integration: Communication, Coordination and Decision Support

Project Duration: March 2002 – June 2004

Project Description:

This research team is examining the potential of information and communication technology (ICT) to integrate construction project teams. The research is focussing on online tools/systems which will provide decision support for the whole project life-cycle. It will evaluate the use of ICT, e-tendering, e-archiving, and cultural barriers in Project Management.

Progress:

All reports have been completed for dissemination and publication. The reports identify technology issues and processes that could lead to more effective use of technology-mediated communications, integration and decision support in the construction industry, particularly within project teams. Two industry booklets have been produced, one on ICT uptake and one on e-tendering.

Future Directions:

The Australian property and construction industry will benefit from industry-focussed booklets highlighting up-to-date knowledge on the ICT tools and processes currently in use in architecture engineering and construction (AEC) industries, how those tools can assist project management activities, and what cost–benefits are available through their use.

Project Leader:

Stephen Kajewski
Queensland University of Technology

Project team:

Queensland Department of Main Roads
Geoff Caldwell

Queensland Department of Public Works:
Mark Haug

CSIRO
John Crawford, Paul Tilley, Selwyn Tucker

Queensland University of Technology
Achim Weippert

The University of Newcastle
Graham Brewer, Swee Eng Chen, Rod Gameson, Richard Kolomy, Rui Martins, Willy Sher

Program C: Delivery and management of built assets

Research Project 2001-010-C

Investment Decision Framework for Civil Infrastructure Asset Management

Project Leader:

Arun Kumar
RMIT

Project team:

Arup Australasia
Bruce Johnson

John Holland
John Reddie

Queensland Department of Main Roads
Neil Robertson, John Spathonis

Queensland Department of Public Works
Dale Gilbert, Ten Hee Tan

Queensland University of Technology
Terry Boyd

RMIT
Anthony Piyatrapoomi, Sujeeva Setunge, Ashish Shah, Saman de Silva

University of Western Sydney
Alan Jeary

Project Duration: October 2001 – June 2004

Project Description:

This research team is developing an investment decision framework for asset management incorporating economic, environmental and social factors using multi-criteria analysis. In the long term, the framework will be developed into a software tool for data and monitoring techniques. The model will then be modified for application to infrastructures, such as buildings, roads, railways and bridges.

Progress:

Data has been collected to analyse the optimisation of pavement for two soil types (wet non-reactive soil and dry reactive soil) and a method for optimising the sample spacing for pavement deflection data collection in order to maximise return on data collection investment has also been developed. A report on the optimisation method providing details of the optimisation analysis has been completed, together with a methodology for risk-adjusted budget assessment. An assessment of risk-adjusted budget has been conducted for 5-, 10-, 15-, 20- and 25-year periods at a 95% level of confidence. This has taken into account the variability of pavement strength that has been investigated using the methodology developed, and risk-adjusted assessment detailing the analysis. Research on the building sector exploring *Calculation of residual service life* was undertaken from condition assessment data collected from selected Queensland Department of Public Works' buildings.

Future Directions:

The benefit of this research for the Australian property and construction industry, and in particular Australian infrastructure owners, is the ability to make effective investment choices and to identify and implement an investment decision framework for infrastructure asset management. An example of the usefulness of this model is that during the first 12 months of the project, the research team has been able to identify significant savings for private and public civil asset owners.

Research Project 2001-011-C

Evaluation of Functional Performance in Commercial Buildings

Project Leader:

Terry Boyd
Queensland University of Technology

Project team:

Arup Australasia
David Donnan, Emlyn Keane

Rider Hunt
Stephen Ballesty, Nick Ferrara

Queensland Department of Public Works
Mervyn Cowley, Keith van Eyk, Teng Hee Tan

Queensland University of Technology
Philip Kimmet, Stuart Ross, Marcello Tonelli

RMIT
Arun Kumar

University of Western Sydney
John MacFarlane

Project Duration: December 2001 – May 2004

Project Description:

This team is seeking to enhance commercial real estate performance within operational and investment contexts through the development of a model supporting improved decision making over the facility life-cycle.

Progress:

This project has completed a tool that is designed to enhance commercial real estate performance within both operational and investment contexts, and is aimed at supporting improved decision making. The model is based on a risk-adjusted discounted cash flow, providing a valuable toolkit for building managers, owners, and potential investors for evaluating individual building performance in terms of financial, social and environmental criteria over the complete life-cycle of the asset. The tool is being evaluated by *Construction Innovation* for commercialisation before any further development is considered.

Future Directions:

The Australian property and construction industry will benefit from this project through better capital investment decisions in buying, selling or refurbishing a property investment at the right time, with improved risk management by analysing the income, expenditure, environmental and social variables. The tool will assist in optimising the value of a property investment and portfolio by monitoring income and expenditure that has the potential to increase the value and lead to better decision making.

Recent feedback from the research team indicates that significant savings can be achieved for private and public assets holders.

Research Project 2002-005-C

Decision Support Tools for Concrete Infrastructure Rehabilitation

Project Duration: April 2003 – January 2005

Project Description:

The objective of the project is to develop a decision support tool to enable asset managers of concrete infrastructure to select the most suitable technique for rehabilitating aging concrete structures using Fibre Reinforced Polymer (FRP) composites. The decision support tool will assess the extension of economic life in compliance with the current design philosophy of the Australian Concrete Structures Code.

Progress:

The team has completed a review of 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. The team also reviewed the innovative and refined methods of structural strength calculation and simple evaluation techniques.

This integrated approach will facilitate the transfer of knowledge gained from the currently fragmented technical research and will add a whole-of-life value concept providing a unique tool suitable for asset managers. The general framework developed will be suitable for decision making in rehabilitation of structures under different scenarios.

Future Directions:

The Australian property and construction industry will have access to an integrated approach that will facilitate the transfer of knowledge gained from current fragmented technical research and will add a whole-of-life value concept providing a unique tool suitable for asset managers. The general framework developed will be suitable for decision making in rehabilitating of structures under different scenarios.

Project Leader:

Sujeeva Setunge
RMIT

Project team:

Arup Australasia
Bruce Johnson

Queensland Department of Main Roads
John Spathonis

Queensland Department of Public Works
Dale Gilbert

CSIRO
Lam Pham

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

University of Western Sydney
Alan Jeary

Research Project 2002-020-C

Tenant Risk Profiling

Project Duration: March 2003 – January 2005

Project Description:

This project investigates, uniquely, both the *hard* and *soft* issues which determine a tenant's selection of one tenancy over another. The assumption is made that imperfections and inefficiencies within the property market, the nature of individual and organisational decision making, and the human condition, necessarily impose a degree of irrationality into the process which makes tenants' decisions difficult to predict. This difficulty poses a significant threat to the veracity of performance forecasting and any subsequent investment and management decisions which may arise.

This research seeks to understand not only the issues which influence tenancy selection but the process itself. An understanding of both will permit the development of a tenant risk-profiling mechanism that will greatly enhance the predictability of tenant behaviour allowing property owners and managers to adopt suitable tenant risk management strategies that will enhance building performance through the investment cycle.

Progress:

The project comprehensively evaluated those factors which influence tenants in the selection of their tenancy and which impact upon any subsequent decision to relocate. The focus of the project has been on the decision maker.

Future Directions:

The project will assist in achieving improved market efficiencies by reducing existing market imperfections through improved owner–tenant–marketer communication flows.

Project Leader:

Stuart Ross
Queensland University of Technology

Project team:

Rider Hunt
Ian Kaye

Queensland Department of Public Works
Karen Lyon-Reid

Queensland University of Technology
Terry Boyd, Tony Sidwell

University of Western Sydney
John MacFarlane

Program C: Delivery and management of built assets

Research Project 2002-035-C

Linking Best Value Procurement Assessment to Outcome Performance Indicators

Project Leader:

John Dalrymple
RMIT

Project team:

John Holland
Gerry Shutt

Rider Hunt
John Oliver

Building Commission Victoria
Roger Frith

Queensland Department of Main Roads
John Spathonis, Mike Swainston

Queensland Department of Public Works
John Collin

Queensland University of Technology
Tony Sidwell

RMIT
Lionel Boxer, Peter Bryar, Warren Staples, Derek Walker

Project Duration: October 2003 – September 2004

Project Description:

This Feasibility Study tests the notion of developing a standard set of tender evaluation criteria based on best-value criteria (to which individual clients can attach their own weightings) with definition of outcomes performance indicators (OPI) that would be required to be reported on at the completion of projects. It will establish the viability of the link between the selection criteria and the need to evaluate how the project succeeded on a broader set of success criteria. This linkage could provide a set of direct cause-and-effect indicators that can be used as part of an improved post-project evaluation process and assist in gathering a lessons-learned knowledge base.

Progress:

The project team is in the final stages of developing a rigorous *best value* framework for clients and contractors, identified added cost to the procurement process without commensurate addition of value and performance measures and improvements of the small to medium-sized construction sub-contractors.

Future Directions:

The benefit of this project to the Australian property and construction industry is that it provides a set of direct cause-and-effect indicators that can be used as part of improved post-project evaluation and assist in gathering a lessons-learned knowledge base. Further, the OPIs identified could be used as a broader balanced scorecard approach to performance measurement thus providing leading indicators of likely success or impending problems.

Research Project 2002-052-C

Value in Project Delivery — Project Diagnostics

Project Leader:

John Tsoukas
Arup

Project team:

Arup Australasia
Melissa Cogzell, Sheldon Sherman

John Holland
Chris Evans

Queensland Department of Main Roads
Mike Swainston

Queensland Department of Public Works
John Collin

CSIRO
Paul Tilley

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

Project Duration: March 2003 – August 2004

Project Description:

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. This research focusses on the approach of assessing Critical Success Factors (CSFs) using Key Performance Indicators (KPIs) to ascertain the immediate *health* of a construction project. This approach is applicable to all phases of construction projects and many construction procurement methods. KPIs have been benchmarked on the basis of industry standards and historical data. The robustness of the KPIs to assess the immediate *health* of a project has been validated using Australian and international case studies.

Progress:

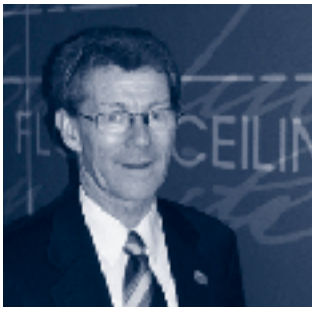
The project team has developed a diagnostic toolkit which is currently being trialled by industry partners.

Future Directions:

The benefit of the project to the Australian property and construction industry is the development of indicators that provide advanced warning into a Diagnostics Toolkit Protocol. These will include metrics to indicate when projects are going wrong, to diagnose why projects may be failing, and to suggest means of returning them to better *health,* with a direct linkage to improved business outcomes.

Research Project 2002-053-C

Way Finding in the Built Environment



Project Duration: September 2003 – May 2004

Project Description:

The project aims to identify 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 blind or 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.

Progress:

The team is in the final stages of the research report that highlights devices, technologies and embedded features in buildings that are either being used or could be used to assist the blind or vision impaired.

Future Directions:

The opportunity exists in the next phase to develop an application and monitor its ability to assist vision-impaired people successfully negotiate their way around a large facility.

Project Leader:

Dennis Hogan
Building Commission (Victoria)

Project team:

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 2002-056-C

Contract Planning Workbench

Project Duration: August 2003 – August 2004

Project Description:

This project will use the Industry Foundation Classes (IFCs) as the basis for developing a first draft construction schedule for buildings. It will also provide an interface to Microstation Scheduler to provide a 4D (3D + time) visual representation of the building process.

Progress:

The scope of the project in the initial phase is limited to structural elements, beams, columns, slabs, walls and footing systems. Once the viability of the deliverables is proven, the project may be extended to cover a wider range of building elements.

Future Directions:

The benefit to the Australian property and construction industry is access to a tool that can develop a construction plan for the entire project from IFC data that can then be presented to a human operator to allow them to analyse and improve the suggested schedule.

Project Leader:

Robin Drogemuller
CSIRO

Project team:

John Holland
Nick Windmeyer

Woods Bagot
Peter Hoskins

CSIRO
John Crawford, Cheryl McNamara, Gerardo Trinidad

The University of Newcastle
Guillermo Aranda-Mena, Rod Gameson, Willy Sher, Peter Ward

Project Leader:

Robin Drogemuller
CSIRO

Project team:

Rider Hunt
John Oliver

Woods Bagot
David Marchant

Queensland Department of Public Works
Thomas Fussell

CSIRO
Shawn Foo, Kevin MacDonald, Cheryl McNamara

Research Project 2003-037-C

Stage 2 – Managing Information Flows with Models and Virtual Environments

Project Duration: January 2004 – June 2004

Project Description:

Completion of a previous Project 2001-007-C *Managing Information Flows with Models and Virtual Environments* has demonstrated the feasibility of generating Bills of Quantities and estimates from 3D models of buildings for reinforced concrete and formwork. These are two of the most difficult trades. This stage of the project focusses on extending the quantity take-off and estimating process to cover other trades in a typical building project. This will involve extending the internal object model and rule sets for quantity take-off, and the development of some simple user interfaces into the building model to support the additional elements.

Progress:

The technology has been completed to alpha testing stage and is now being evaluated by industry partners.

Future Directions:

A major benefit of this research for the Australian property and construction industry includes improved efficiency in design and construction. The new technology developed through this research will enable designs to be analysed more thoroughly to ensure all details are constructed efficiently, within budget and on time. The other benefit will be better quality buildings, produced faster and at lower cost.

Project Leader Jay Yang (left) on location at Brookwater for the project *Integrated Sustainable Housing Development* *(see page 20)*

6 Education Program

Implementation

Construction Innovation has established several overriding principles to guide the development and implementation of its Education Program in fulfilling the Commonwealth Government's Cooperative Research Centre objectives. *Construction Innovation* seeks to enhance the value to Australia of graduate researchers, be recognised as a significant contributor to enhancing the collaborative culture of construction, attract students through the reputation of *Construction Innovation*'s education activities, and partner with organisations to develop educational and professional development courses based on outputs from *Construction Innovation*'s research outcomes.

Construction Innovation has prioritised elements to be considered in the implementation of its focussed Education Program. Firstly, as research outcomes develop, a priority must be placed on identifying opportunities which allow for continuous professional development of industry and research personnel. Secondly, it must maintain support for graduate students. This is intended to yield more successful collaboration between industry and research. Finally, *Construction Innovation* must influence curriculum development if its results and discoveries are to reach a wide variety of students, academic staff and industry professionals Australia-wide.

Given the commonality of input from research projects to deliver technology transfer *and* education outcomes, one committee — the Education, Training and Technology Transfer Committee — oversees these two programs.

Operational Plan

Construction Innovation has developed an operational plan to drive its activities in Education and Training. In summary the key activities are as follows:

1. *Construction Innovation* provides a scholarship program that currently has eight PhD, four Masters by Research and one Masters by Coursework students. *Construction Innovation* is also moving on a selection process to recruit 10 new scholars for the 2004–05 intake.

   Actions to date — *Construction Innovation* provides six-monthly mentoring workshops running over two days for scholars to learn about topics including IP management, commercialisation and academic rigour. In addition, scholars are highlighted in newsletter articles, promoted through awards programs and supported to participate in national and international research and industry events.

2. One-day public workshops run by *Construction Innovation* are proposed, based on industry feedback for selected themes.

   Actions to date — Themes for future workshops include Sustainability Tools based on *Construction Innovation* projects and partners' market research in this area and an ICT one-day workshop and booklet.

3. Develop short course material for delivery by industry associations or university partners, produce booklets that can be delivered during the short courses, and develop on-line courses as an option for the longer term.

   Actions to date — Themes for future short courses include commercial evaluation of non-residential buildings and indoor air-quality manual which may be converted to a short course delivered by an industry group.

4. Technical and Further Education (TAFE) and university curriculum development by capturing instances where course development is occurring from our project teams and encourage curriculum development through course coordinators at universities and TAFE.

   Actions to date — During the quarterly review process, project teams are asked to report on any instances where *Construction Innovation* research has influenced curriculum. This process has highlighted six instances where this has occurred. In addition, *Construction Innovation* has ongoing discussions with TAFE in Queensland, New South Wales and Victoria to identify opportunities to feed research outputs into curriculum. *Construction Innovation* has been asked to present to the National Advanced Building Studies and National TAFE Construction Conference for General Construction, both in September 2004.

March 2004, *Building Australia*


CRC promotes innovation

as it happens

THE BRITE PROJECT

Education

6

Scholars funded by CRC *Construction Innovation*

In response to recommendations from the Second Year Review, a scholar's workshop was conducted on 17 October 2003. The main aims of the workshop were to facilitate sharing of knowledge of scholars' research activities and focus on the quality and marketing of their research outputs. International Visitor, Roger Courtney, spoke to the scholars about his international experience as a broker of innovation in property and construction.

With an increased number of participating scholars, the second workshop was conducted on 26 and 27 May 2004. Presentations of research projects were given by 11 scholars. Learning sessions were provided on public speaking, media, qualitative and quantitative research methods and statistical analysis. The workshop was well supported through participation of academic and industry supervisors and four Board members at the workshop.

Applications were sought in June 2004 for another intake of scholars.

PhD Scholars: Queensland University of Technology — 3 RMIT — 1
University of Sydney — 2 University of Newcastle — 1 University of Western Sydney — 1

Masters by Research Scholars: Queensland University of Technology — 4

Masters by Coursework Scholars: RMIT — 1

Degree: PhD, The University of Newcastle
Commenced: February 2003
Supervision: *Academic*: Professor Swee-Eng Chen, The University of Newcastle
Industry: David Marchant, Woods Bagot

Cameron Beard

Title: Information and Communication Technology Integration in the Construction Industry

Research Focus (aligned to Project 2001-016-A): Cameron is exploring the integration of information and communication technology (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.

Biography: Cameron has recently completed a Bachelor of Construction Management at The University of Newcastle and in February 2003 commenced a postgraduate course. His final year dissertation explored the barriers to the implementation of ICT within the Australian Quantity Surveying profession. While undertaking this dissertation he worked part-time in a quantity surveying office and gained industry experience.

Degree: Masters by Coursework, RMIT
Commenced: December 2003
Supervision: *Academic*: Patricia McLaughlin, RMIT
Industry: Gerry Shutt, John Holland

Agustin Chevez

Title: Sources and Effects of Uncertainty in the Management of Construction Projects (Federation Square)

Research Focus (aligned to Project 2002-052-C): The motivation behind this research are the numerous delays and costs overruns on construction projects. Despite the state-of-the-art planning and controlling techniques that this industry has. Therefore, Agustin believes that there should be a *natural* factor embedded to 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.

Biography: Agustin began his Masters in Project Management in 2002 at RMIT, Melbourne. He graduated with a Bachelor of Architecture from the National Autonomous University of Mexico, Mexico City. He also has studies in Intelligent buildings, from the Mexican Institute of Intelligent Buildings. Soon after finishing his studies he co-founded obraenlinea.com, a leading Construction Project Management tool in Mexico where he realised that although technology can improve the performance and control of projects, there are still environmental variables that will unavoidably work against project objectives. Agustin believes that with multidisciplinary research the project management practice will improve its methods by understanding the environment under which projects are undertaken.

Merv Cowley

Degree: Masters by Research, Queensland University of Technology
Commenced: February 2003
Supervision: *Academic*: Professor Terry Boyd, Queensland University of Technology
Industry: Keith van Eyk, Queensland Department of Public Works

Title: Property Market Forecasting – Valuation Implications

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

Biography: After five years as an auctioneers assistant, Merv was employed as an Assistant Valuer. Registration as a Valuer was achieved in 1990 after completing a valuation qualification through the University of Queensland. In 1992, he was appointed to the Queensland Government and progressed to Valuer for the Brisbane CBD in 1998. Merv's current position is with the Department of Public Works as a Senior Property Analyst. The awards of a Bachelor of Applied Science (Property Economics) and Master of Property Economics were received in 1997 and 2003 respectively.

Garry Creedy

Degree: PhD, Queensland University of Technology

Commenced: March 2003

Supervision: *Academic*: Professor Martin Skitmore, Queensland University of Technology
Industry: Dennis Wogan, Queensland Department of Main Roads

Title: Matching Project Risk Profiles to Delivery Capabilities in Civil Infrastructure Projects

Research Focus (aligned to Project: 2001-003-C): This research project aims to assess the variances in client estimates of differing projects to that of the final cost at completion of highway infrastructure construction projects in order to ascertain the major risk assessments and other factors that contribute to substantial cost variables for differing project and contract delivery processes.

The project aims to assess different risk factors that need to be used in the preparation of client estimates for highway construction projects and to also determine quantitative links between these and the various aspects of client estimate accuracy. The project also seeks to identify best practice processes that encapsulate sound and systematic approaches to project risk assessment practices that are necessary for producing optimal project delivery outcomes.

The project methodology employs a quantitative approach in data analysis and data mining of historic project information from 1997 to 2003. It plans to use both factor analysis and multivariate regression analysis to formulate sets of project risk factors and contingency factors for use in future highway project estimates in order to improve client cost estimate processes and accuracy.

Biography: Garry joined 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 achieved a Graduate Diploma in Business Administration from Queensland University of Technology (QUT), 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. Garry commenced his PhD studies at QUT in March 2003 and has also been initially granted two years leave from the Department of Main Roads, Queensland to substantially advance the project.

Colin Greville

Degree: PhD, University of Western Sydney
Commenced: July 2003
Supervision: *Associate Academic*: Associate Professor Graham Miller, University of Western Sydney
Academic: to be confirmed
Industry: John Oliver, Rider Hunt

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 going to be serious about ESD, we need to know why people think about it the way they do. Statistically speaking, economics plays a very limited role in the development of environmentally sustainable residential homes. Why then do some people desire ESD and others do 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?

Biography: Col began his career in the bush working on properties in western Queensland and Western Australia. Here he noticed that contrary to popular perception, most farmers and graziers were highly concerned with sustainability as many properties affect generations of one family. 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. He remains committed to being hands-on in the building industry while focussing on his PhD studies.

Education

6

Scholars funded by CRC *Construction Innovation*

Degree: PhD, Queensland University of Technology
Commenced: February 2004
Supervision: *Academic*: Professor Terry Boyd, Queensland University of Technology
Industry: to be confirmed

Mike Hefferan

Title: Contemporary Demand for Office Accommodation

Research Focus (aligned to Project 2001-011-C): This research seeks to better qualify the changing demand for office buildings by new generation, *knowledge intensive* businesses. Through research and survey, the initiative investigates the *value proposition* for commercial property assets in the contemporary environment whereby property assets can be seen not simply as a cost to business but integrated in the strategic and operational life of the company – establishing a creative environment, a place for staff and an expression of the ethos and direction of the company to the external environment.

Mike Hefferan is an Adjunct Professor at QUT and an Executive Director of the Department of State Development and Innovation. He has a Masters of Applied Science and other postgraduate and undergraduate qualifications. On behalf of government, he has managed a range of commercial property assets and development projects. Over more than a decade, he has lectured at undergraduate and postgraduate level at QUT in a range of asset management and related subjects.

Degree: Masters by Research, Queensland University of Technology
Commenced: April 2003
Supervision: *Academic*: Professor Mahen Mahendran, Queensland University of Technology
Industry: Rob Ball, Delfin Lend Lease

David Luxmore

Title: Evaluation of GreenSmart Housing

Research Focus (aligned to Project 2002-075B): Three GreenSmart houses are being constructed at Springfield Lakes within Ipswich City Council. These houses will be 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 will be completed by March 2004 and will provide mainstream builders and the general public with examples of healthy comfortable homes with substantially reduced environmental impact.

Biography: David, who trained as a Land Surveyor in Adelaide in 1975, has been involved for some 30 years with the land development industry. He worked with consultant surveyors until 1990 when he joined a land development company as their Project Manager. He was involved in the creation of several master planned projects of up to 5000 lots. David is now the Director of his consultancy company, Sustainable Development Strategies Pty Ltd, which he formed in 1999.

Degree: PhD, RMIT
Commenced: August 2002
Supervision: *Academic*: Professor Derek Walker, RMIT
Industry: Gerry Shutt, John Holland

Tayyab Maqsood

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

Research Focus (aligned to Project 2001-004-A): Innovation is being regarded as a key to improving the low productivity levels commonly witnessed in the construction industry. Tayyab's 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.

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). Tayyab's research interests include High Strength/High Performance Concrete, Fibre Reinforced Polymer (FRP) Bars/Plates as structural reinforcement, Project Management, Risk Management, Partnering, Knowledge Management, Information and Communication Technologies (ICT), Supply Chain Management, Information Visualisation and Virtual Reality.

Wei Peng

Degree: PhD, The University of Sydney
Commenced: February 2003
Supervision: *Academic*: Professor John Gero, The University of Sydney
Industry: David Marchant, Woods Bagot

Title: An Adaptive Design Tool that Learns

Research Focus (aligned to Project 2001-002-B): The research proposes to develop a computational model of an adaptive design tool that learns. This is motivated by an attempt to apply the cutting edge of ICT — the agent technology to an existing design tool in order to assist the design process. This research focusses on developing a situated agent that extends an existing design tool to model interactions, from which the agent is able to learn its experiences. Via the agency provided, the tool would be able to embody learning and adaptive behaviour to assist designing. The research project will explore issues of concepts formation, situated agency and interaction modelling within the multidisciplinary scope of design science, artificial intelligence, cognitive science, machine leaning etc. The outcome of this research will be a prototype exemplary system that may assist in filling the gap between a recognised deficiency in design tools and the latest computing and cognitive science research findings.

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. Having been extensively involved in building project management, electrical engineering technical consultation in the construction industry for almost seven years, his major concern now is to apply the advances of ICT and build intelligent design tools for the construction industry. With his solid understanding of the domains and extensive knowledge in computing, he is dedicating himself to the research that will add value to the competitiveness of the Australian construction industry.

Tim Rose

Degree: Masters by Research, Queensland University of Technology
Commenced: July 2003
Supervision: *Academic*: Dr Karen Manley, Queensland University of Technology; Professor Keith Hampson, CRC for *Construction Innovation*; *Industry*: Don Allan, Queensland Department of Public Works

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

Research Focus (aligned to Project 2001-012-A): The appropriate implementation of financial incentive mechanisms in the contractual arrangements of construction projects can impact significantly on the motivation of contract agents and hence project performance, and have been argued to improve the efficiency of the Australian construction industry. Although financial incentive mechanisms are used in many commercial building projects in Australia, there has been little research into the performance of these incentives, particularly in relation to motivational principles. This research project aims to contribute to current knowledge by investigating the effectiveness of financial incentive mechanisms in Australian commercial building projects and how their implementation can be optimised to increase the level of contractor motivation and assist in the attainment of client-defined project goals.

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. Through a study leave program, Tim commenced his Masters studies at QUT in July 2003.

Marcello Tonelli

Degree: Masters by Research, Queensland University of Technology
Commenced: August 2003
Supervision: *Academic*: Professor Terry Boyd, Queensland University of Technology
Industry: to be confirmed

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

Research Focus (aligned to: 2001-011-C): Due to the inadequacy of existing econometric models in explaining and forecasting commercial property cycles, this study aims to adopt a system dynamics approach to do so. In examining the characteristics of the commercial property market cycles, Marcello will explore a number of questions related to the prediction of supply and demand, which will hopefully lead to the identification of policies necessary to forecast cycles and eventually reduce their amplitude.

Biography: Marcello commenced his Masters by Research candidature at Queensland University of Technology (QUT) in September 2003. In 1996 he graduated in Business Administration from the University of Pacific (UOP) in USA and worked as a consultant on management information systems with a focus on model- and data-driven Decision Support Systems (DSS) and Executive Support Systems (ESS). In 2002, Marcello achieved a Master of Information Technology from James Cook University. Marcello's research focusses on the application of dynamic modelling to translate the abstract ideas of systems theory into tools for better understanding of economic and organisational change.

Scholars funded by CRC *Construction Innovation*

Degree: PhD, Queensland University of Technology
Commenced: February 2002
Supervision: *Academic*: Professor John Bell, Queensland University of Technology
Industry: John Byrne, 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 Ned has been researching a body of work that addresses principles for incorporating ecological sustainability into master planned communities. The work looks at various case studies that have incorporated ESD principles into their planned communities with different degrees of commitment and success. Currently Ned is working on 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. Previous work involved collecting data to determine feasibility for the economic, social and physical principles that contribute towards a holistic approach for sustainable built environments.

Biography: Born in Los Angeles, Ned grew up on the northern beaches of Sydney. After matriculating from High School he left Australia to undertake tertiary studies at the University of California at Berkeley where he completed a double degree in Architecture and Environmental Design. After graduating, Ned worked for a number of years in the San Francisco Bay Area as a City Planner. In the early 1990s he moved to New York to attended Cornell University. There he graduated from the Masters Program in Urban Design and moved back to California to work on design and planning projects in Hollywood. In the mid 1990s, Ned was elected to public office with the California State Legislator Special District and served a four-year term on the board of trustees in Sonoma County. During this time he also completed a Masters degree in Political Science and Public Administration. In 2000, he returned to Australia to undertake a PhD at QUT.

Degree: PhD, The University of Sydney

Commenced: February 2003

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): This research is motivated by the lack of wayfinding support in virtual worlds. Slowly virtual worlds technology is starting to be integrated into the construction industry world wide in various stages of design which include conceptual design task 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 been focussed primarily on static worlds. Consequently wayfinding information becomes obsolete as it does not reflect the changes made in the world. Hence this research focusses on resolving the issue using swarm intelligence.*

** Swarm intelligence — the design of algorithms or distributed problem-solving devices inspired by the collective behaviour of social insect colonies and other animal societies.*

Biography: Ji Soo began his PhD candidature in 2003. He 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. Ji Soo hopes to make both theoretical and practical contributions to design computing by applying abstract research to real-life situations to solve problems for the construction industry.

Construction Innovation awarded Garry Creedy the prize for the best scholars' poster presented at the July 2003 Research Conference. Garry won attendance at a one-week residential CRC Leadership and Career Development Course at the University of Melbourne. The course covers knowledge and skills in leadership, motivation, communication and influence and team processes.

Garry Creedy (pictured far left, middle row) with other participants in the course

Collaboration

7

Internal linkages

Robust internal linkages are critical to the ongoing success and cohesion of this CRC. The breadth of our partner network spans across client, design consultant, constructor and facility manager responsibilities across five centres of activity around Australia. Integrating the effort across 306 individuals working on *Construction Innovation* activities is a significent effort.

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

- Research Program Workshops (meets four times each year)
- Commercialisation, Education and Technology Transfer Reference Group (meets twice per year) — industry forum for two-way communication of these critical CRC activities
- Research Leadership Team (meets every two weeks) — core industry, researcher and headquarters executive team reviewing research idea 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 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 (meets annually) with 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 engagement and identify opportunities for the future
- special initiative groups (meets as required, for example International Conference Coordination currently meets monthly)
- Intranet — allows each project team to share information within their project team and if they choose, across all CRC personnel.

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, drives national collaboration across the supply chain ensuring an applied industry focus. Clearly, achieving our vision of leading the Australian property and construction 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.

External linkages

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

- partner and industry newsletter (every two months) — updating industry of CRC initiatives.
- strategic partnership with Australian industry associations — research user requirements and technology diffusion through the Australian Construction Industry Forum (ACIF) and other industry associations including Housing Industry Association (HIA), Australian Procurement and Construction Council (APCC) and Civil Contractors Federation (CCF). The industry association networks provide critical outreach for CRC outcomes and continue to ensure our research remains industry-relevant.
- *Construction 2020* — leading engagement, research focus and technology transfer. For details on this major *Construction Innovation* initiative, see page 35.
- 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. Through the next six months these forums will be trialled on a cost recovery basis.

  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 11.
- membership of industry associations — *Construction Innovation*'s Senior Management Team, Project Directors and Program Leaders have active engagement at a formal level with key industry associations in property and construction. Some examples include: John McCarthy chairs the Australian Sustainable Built Environment Council (ASBEC) and the Senior Leaders Forum of the Facility Management Action Agenda and is a Director of the Australian Building Codes Board (ABCB) and Association of Consulting Engineers Australia (ACEA). Dr Keith Hampson contributes to the Facility Management Action Agenda on their Innovation Working Group, serves on the Association of Consulting Engineers Australia National Award and Judging Panel and Engineers Australia 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 a Director of ASBEC. John McCarthy and Peter Newton are also Directors of the International Council for Research and Innovation in Building and Construction (CIB) Board.
- joint project engagement — external engagement on research projects is encouraged for mutual benefit. For example, Environment Australia participates in our sustainability research, Queensland Building Industry Redundancy Trust (BIRT) and the National Occupational Health and Safety Commission (NOHSC) serve on our Occupational Health and Safety (OH&S) Project Reference Group. Queensland Housing and Construction Training Queensland are represented on two of our environmentally sustainable development (ESD) projects and the 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.

Collaboration

7

Other CRCs

Construction Innovation occupies a unique space in servicing the property and construction industry. Benefit can also be gained from specific engagement with other CRCs — particularly in the area of contributing leading-edge technologies to integrate with *Construction Innovation*'s process improvement focus. Accordingly discussions have been held with a number of CRCs, including the CRC for MicroTechnology, the Australasian CRC for Interaction Design, Enterprise Distributed Systems Technology and the Centre for Integrated Engineering Asset Management. It is expected that a significant joint project will be confirmed this next period.

International

The context 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 2003−04, the ICALL network has 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 will provide a strong grounding for significant international attendance at this important *Construction Innovation* initiative. The *Clients Driving Innovation* theme provides the opportunity for leveraging 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 will provide a focus for the renewal of this CRC.

In February 2004, the Dutch Government sponsored a visiting study team to gather comparative international information for its national program for construction change, bringing together the major stakeholders in the Dutch construction industry: clients, contractors, suppliers, consultants, research institutions and universities, with the aim of securing a step-change in industry performance through process and system innovation. In recognition of *Construction Innovation*'s international credibility, the CRC coordinated the Dutch team's discussions with industry, government and research partners and other Australian participants. In particular, the collaborative research model represented by the CRC for *Construction Innovation* in bringing together industry, government and research partners nationally over a seven-year period to drive organisational and industry innovation was highly regarded. A full report of the Dutch team's visit to Australia and other countries was forwarded to all Australian participants.

In March 2004, *Construction Innovation*'s Governing Board Chair, John McCarthy, was elected to the International Board of the CIB – the first industry representative from Australia to serve on this leading global network. 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.

International visitors

To ensure international relevance of our research activity and to leverage from key international experts, the CRC for *Construction Innovation* supported visits from academic and industry research leaders throughout 2003–04.

Roger Courtney, International *Construction Innovation* Consultant, served as international visitor from 9 to 24 October 2003 in Melbourne, Sydney and Brisbane. Roger presented workshops, and assisted in project reviews and in identifying commercialisation options. He met with CRC participants and project teams and provided *Construction Innovation*'s Senior Management Team with opinions of our activities in comparison with other international applied research centres.

Professor Peter Brandon (University of Salford, UK) worked with our Centre throughout the year in developing the *Construction 2020* questionnaire and workshop program, gathering information on the future of the Australian property and construction industry and the applied research required. He spent time in Australia throughout the period 6 November to 7 December 2003 with the Centre's CEO convening the first series of *Construction 2020* national workshops; and 18 June to 16 July 2004 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.

Alan Crane, Chair, *Rethinking Construction, UK* presented at our Inaugural Research Conference, 29–30 July 2003 on the integration of various UK industry initiatives. Alan is an industry professional with a key responsibility for leading innovation and technological change in the UK property and construction industry. He also provided input to a number of our research projects, met with our industry partners, and served on our Second Year Review (Stage 1) Panel.

Professor Ron Wakefield, Virginia Polytechnic Institute and State University, USA, served on our Second Year Review (Stage 1) Panel and is expected to provide ongoing support to our IT projects in the future.

Professor Carmine Bianchi visited *Construction Innovation* in February 2004. Carmine is a professor at the Faculty of Political Sciences, University of Palermo, Professor of Planning and Control Systems and Business Strategy at CUSA (Centro Universitario Studi Aziendali), Palermo. He is a partner in a consulting firm and also a scientific coordinator of CUSA-*System Dynamics Group,* a research and consulting area of Centro Universitario Studi Aziendali which applies System Dynamics to business growth management. He presented a seminar for property and construction SMEs titled *Managing the Growth of Your Business.*

Construction 2020

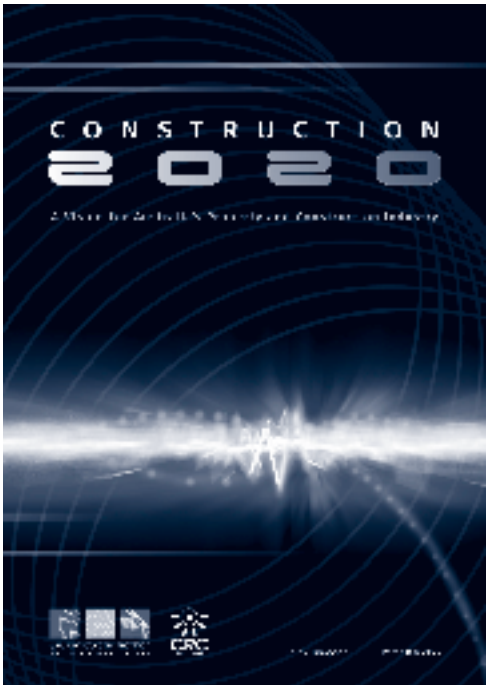
The *Construction 2020* initiative is leading industry engagement, research focus and technology transfer on a truly national basis. A comprehensive national study of issues impacting the industry was required to provide an update on studies carried out through the Action Agenda process of the late 1990s. *Construction 2020* began with a series of workshops held from November 2003 to February 2004 in each capital city of Australia, seeking the views of hundreds of industry leaders and members. Through a questionnaire and workshop process, respondents considered a time frame to the year 2020. They identified their visions for the industry, barriers to implementation and the research required to achieve their vision. They were also asked to define their *best dreams* and *worst nightmares* for the industry.

Through extensive analysis, three principal themes highlighting the ways in which the Australian property and construction industry can improve its competitiveness, performance and image emerged:

- improving the business environment
- addressing sustainable development and the full life cycle of assets
- harnessing the power of new information communication technologies.

Other issues run through these major themes. They include the image of the industry, the way the industry is structured, the lack of education in some sectors, the diminishing skill base, and the financial environment in which organisations are expected to work.

A culture of self-improvement, mutual recognition, respect and support underpins the ambitions of Australia's property and construction industry. By 2020, the vision is for industry to be taking more responsibility for leading and investing in research and innovation. It will be the responsibility of the property and construction Industry as a whole to ensure its ongoing future by exploiting research and innovation to continuously improve itself in line with international competition and to meet the increasing demands of clients and the community. *Construction Innovation* will continue its work with industry to refine demands for applied research consistent with ongoing development of our national applied research centre.



The *Construction 2020* Vision Report

best dreams

collaboration cohesion communication cooperation

"Dirt and danger replaced by decency and delight."

"Design: paperless, visual, automated and testable!"

"Long life, loose fit, low energy – our mantra!"

worst nightmares

division deception degradation domination

"Adversarial climate deepens the bunkers we live in!"

"Short term-ism creates long-term losers."

"Fragmented industry with no clear vision."

Dr Keith Hampson addressing a *Construction 2020* workshop.

8 Management and operating

The national headquarters team of the CRC for *Construction Innovation* and the majority of the QUT researchers continue to operate effectively from the QUT-based national headquarters. The opportunity to have consolidated space for administrative and research staff has provided an effective environment to encourage critical mass for a vibrant and energised national research centre.

9 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 03/04	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 **	The University of Newcastle	50%	0%	Program Director, Research Committee
Dr Peter Newton	CSIRO	50%	48%	Program Director, Research Committee
Professor Tony Sidwell	Queensland University of Technology	50%	95%	Program Director, Research Committee, Project Leader
Mr Robin Drogemuller	CSIRO	50%	79%	Platform Director, Research Committee, Project Leader
Mr Don Allan	Queensland Department of Public Works	20%	12%	Deputy Program Director, Research Committee
Mr Ken Stickland	Arup Australia	20%	8%	Deputy Program Director, Research Committee
Mr Gerry Shutt	John Holland	20%	19%	Deputy Program Director, Research Committee
Professor Mary Lou Maher	The University of Sydney	50%	52%	Research Committee, Project Leader
Ms Jeanette Clough	Rider Hunt	20%	8%	Deputy Platform Director, Research Committee
Professor Derek Walker	RMIT	50%	53%	Research Committee, Project Leader
Professor Arun Kumar	RMIT	50%	52%	Research Committee, Project Leader
Professor Swee-Eng Chen	The University of Newcastle	50%	10%	Project Team Member
Professor Jane Marceau	University of Western Sydney	10%	2%	Project Team Member
Mr John Oliver	Rider Hunt	22%	20%	Rider Hunt Projects Coordinator, Chair–Research Committee
Mr John Spathonis	Queensland Department of Main Roads	50%	27%	QDMR Projects Coordinator, Research Committee
Mr Dale Gilbert	Queensland Department of Public Works	10%	11%	QDPW Projects Coordinator, Research Committee

**no longer employed by The University of Newcastle from August 2003

University of Sydney student and Woods Bagot staff member conducting an interview (left) and using surveillance software to record a designer's collaborative session (right) for the project *Team Collaboration in High Bandwidth Virtual Environments* (see page 18)

Arup Australasia

Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
Tony Fallah	R	0.2%	-	0.2%	-	0.2%	-	-	-	-
Matthew Higgs	R	0.7%	-	-		0.7%	-	-	-	-
Richard Hough	R	10.8%	2.2%	3.2%	0.7%	10.8%	-	-	-	-
Sheldon Sherman	R	14.5%	-	-	14.5%	14.5%	-	-	-	-
David Singleton	R	1.9%	-	-	-	0.2%	-	-	-	1.8%
Ken Stickland	R	8.3%	-	1.3%	-	8.3%	-	-	-	-
PC Thomas	R	0.9%	-	-	-	0.9%	-	-	-	-
John Tsoukas	R	2.4%	-	-	-	2.4%	-	-	-	-
TOTAL CONTRIBUTED (% of PERSON YEARS)		**39.7%**	**2.2%**	**4.5%**	**15.3%**	**37.9%**	**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. (%)	Commercial-isation (%)	CRC Admin. (%)
Graham Carter	R	0.2%	-	0.2%	-	0.2%	-	-	-	-
Mark McSweeny	R	1.1%	-	-	1.1%	1.1%	-	-	-	-
Caroline Noller	R	0.2%	-	0.2%	-	0.2%	-	-	-	-
Gavin Stubbs	R	2.3%	-	-	-	2.3%	-	-	-	0.9%
Matthew Yates	R	0.2%	-	0.2%	-	0.2%	-	-	-	-
TOTAL CONTRIBUTED (% of PERSON YEARS)		**4.0%**	**0.0%**	**0.6%**	**1.1%**	**4.0%**	**0.0%**	**0.0%**	**0.0%**	**0.9%**

Brookwater JV

Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
David Henry	R	0.8%	-	-	-	0.1%	0.2%	0.3%	0.1%	0.1%
Dayan Jayasekera	R	3.9%	-	-	-	2.1%	0.3%	0.5%	0.2%	0.8%
Brad Tindale	R	5.4%	-	-	-	2.5%	0.3%	0.8%	0.3%	1.5%
Andrew Whitson	R	0.8%	-	4.5%	-	0.1%	0.2%	0.3%	0.1%	0.1%
TOTAL CONTRIBUTED (% of PERSON YEARS)		**10.9%**	**0.0%**	**4.5%**	**0.0%**	**4.8%**	**1.0%**	**1.9%**	**0.7%**	**2.5%**

DEM

Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
Peter Droege	R	2.9%	0.02%	-	2.9%	2.9%	-	-	-	-
Nanette Illing-Kelly	A	0.2%	-	-	-	-	-	-	-	0.2%
David Slinn	A	0.1%	-	-	-	0.1%	-	-	-	-
Anne Warren	R	0.5%	-	0.5%	-	0.5%	-	-	-	-
TOTAL CONTRIBUTED (% of PERSON YEARS)		**3.7%**	**0.02%**	**0.5%**	**2.9%**	**3.5%**	**0.0%**	**0.0%**	**0.0%**	**0.2%**

Specified personnel

John Holland

Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
Peter Adlem	R	2.3%	-	-	0.5%	1.5%	-	-	-	0.8%
David Balmer	R	1.3%	-	-	0.8%	1.3%	-	-	-	-
Dean Cipolla	R	8.3%	2.5%	-	-	6.8%	-	-	-	1.5%
Chris Evans	R	4.5%	-	-	3.2%	4.2%	-	-	-	0.3%
Jeff Horsley	A	0.5%	-	-	-	0.5%	-	-	-	-
Glenn Palin	A	5.0%	-	-	-	0.4%	-	-	-	4.6%
John Reddie	R	0.8%	-	-	0.8%	0.8%	-	-	-	-
Gerry Shutt	R	18.8%	1.0%	-	0.3%	10.3%	-	-	-	8.5%
Chris Stanley	A	1.2%	-	-	-	1.2%	-	-	-	-
Janelle Stephens	R	0.3%	-	-	0.3%	0.3%	-	-	-	-
JH Miscellaneous	R	2.8%	-	-	1.5%	2.8%	-	-	-	-
TOTAL CONTRIBUTED (% of PERSON YEARS)		**45.8%**	**3.5%**	**0.0%**	**7.4%**	**30.1%**	**0.0%**	**0.0%**	**0.0%**	**15.7%**

Kennards Hire

** no longer participating as of 30 September 2003*

Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
		-	-	-	-	-	-	-	-	-
TOTAL CONTRIBUTED (% of PERSON YEARS)		**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**

Rider Hunt

Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
John Oliver	R	20.4%	-	-	20.4%	20.4%	-	-	-	-
Stephen Ballesty	R	1.7%	-	-	1.7%	1.7%	-	-	-	-
Jeannette Clough	R	7.8%	-	-	7.8%	7.8%	-	-	-	-
Nicholas Ferrara	R	1.2%	-	-	1.2%	1.2%	-	-	-	-
Gavin Goh	R	0.3%	-	-	0.3%	0.3%	-	-	-	-
Roger Hogg	R	6.5%	-	-	6.5%	6.5%	-	-	-	-
Mimy Huynh	R	0.7%	-	-	0.7%	0.7%	-	-	-	-
Ian Kaye	R	1.5%	-	-	1.5%	1.5%	-	-	-	-
Greg Nowak	R	0.4%	-	-	0.4%	0.4%	-	-	-	-
Nathan Satara	R	1.0%	-	-	1.0%	1.0%	-	-	-	-
Dorothy Soh	R	6.7%	-	-	6.7%	6.7%	-	-	-	-
Reginald Streifler	R	5.4%	-	-	5.4%	5.4%	-	-	-	-
Tim Forster-Wright	R	0.1%	-	-	0.1%	0.1%	-	-	-	-
TOTAL CONTRIBUTED (% of PERSON YEARS)		**53.7%**	**0.0%**	**0.0%**	**53.7%**	**53.7%**	**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. (%)	Commercial-isation (%)	CRC Admin. (%)
Domenic Alvaro	R	0.3%	-	0.3%	-	0.3%	-	-	-	-
Fergus Hohnen	R	1.0%	-	1.0%	-	1.0%	-	-	-	-
Peter Hoskins	R	1.3%	-	0.3%	1.0%	1.3%	-	-	-	-
Nik Katalis	R	0.2%	-	0.2%	-	0.2%	-	-	-	-
David Marchant	R	17.4%	1.4%	13.6%	0.8%	17.4%	-	-	-	-
Kanyarat Namprempree	R	6.4%	-	5.1%	-	5.1%	-	-	-	1.3%
Ivan Ross	R	3.3%	0.4%	-	-	1.0%	-	2.3%	-	-
Megan Traynor-Boyland	R	0.8%	-	-	0.3%	0.8%	-	-	-	-
TOTAL CONTRIBUTED (% of PERSON YEARS)		**30.7%**	**1.8%**	**20.5%**	**2.1%**	**27.1%**	**0.0%**	**2.3%**	**0.0%**	**1.3%**

Australian Building Codes Board

Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
Brian Ashe	R	5.6%	-	0.4%	1.8%	5.6%	-	-	-	-
Matthew Patterson	A	1.2%	-	-	-	1.2%	-	-	-	-
TOTAL CONTRIBUTED (% of PERSON YEARS)		**6.8%**	**0.0%**	**0.4%**	**1.8%**	**6.8%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**

Brisbane City Council

Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
Vince Aisthorpe	A	0.11%	-	-	-	-	-	-	-	0.11%
David Bell	A	0.96%	-	-	-	-	-	-	-	0.96%
Helen Caswell	A	0.14%	-	-	-	-	-	-	-	0.14%
David Cox	A	0.45%	-	-	-	-	-	-	-	0.45%
Medha Gokhale	A	3.13%	-	-	-	-	-	-	-	3.13%
Jergen Hannish	A	0.06%	-	-	-	-	-	-	-	0.06%
David Jackson	A	0.14%	-	-	-	-	-	-	-	0.14%
Judy Kraatz	A	8.31%	-	-	-	-	-	-	-	8.31%
Phillip Lord	A	0.49%	-	-	-	-	-	-	-	0.49%
Sunil Madan	A	0.11%	-	-	-	-	-	-	-	0.11%
Brian Mahon	A	4.75%	-	-	-	-	-	-	-	4.75%
Jenni Mulligan	A	2.02%	-	-	-	-	-	-	-	2.02%
Anthony Penissi	A	0.11%	-	-	-	-	-	-	-	0.11%
Frank Riley	A	0.34%	-	-	-	-	-	-	-	0.34%
Karen Thorpe	A	0.11%	-	-	-	-	-	-	-	0.11%
Murray Wilson	A	0.17%	-	-	-	-	-	-	-	0.17%
TOTAL CONTRIBUTED (% of PERSON YEARS)		**21.40%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**21.40%**

Building Commission

Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
Rob Enker	A	4.2%	-	0.6%	-	3.7%	-	-	-	0.5%
Roger Frith	R	13.2%	8.6%	0.2%	1.8%	12.3%	-	-	0.9%	-
Dennis Hogan	R	14.2%	-	-	9.6%	13.3%	-	-	0.9%	-
Peter Nassau	R	5.3%	-	-	-	4.4%	-	-	0.9%	-
Jeff Norton	R	6.5%	2.3%	3.0%	-	6.5%	-	-	-	-
Technical Advisor	A	0.5%	-	-	0.5%	0.5%	-	-	-	-
TOTAL CONTRIBUTED (% of PERSON YEARS)		**43.9%**	**10.8%**	**3.8%**	**11.9%**	**40.7%**	**0.0%**	**0.0%**	**2.7%**	**0.5%**

Queensland Department of Main Roads

Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
Geoff Caldwell	R	6.4%	2.0%	-	4.4%	6.4%	-	-	-	-
Alan Carse	R	1.5%	-	1.3%	0.2%	1.5%	-	-	-	-
Raju Chamala	R	2.2%	2.2%	-	-	2.2%	-	-	-	-
Louise Chandler	R	2.8%	-	-	2.3%	2.3%	-	-	-	0.5%
Lidia Czosnowska	A	0.6%	0.7%	-	-	0.7%	-	-	-	-
Peter Evans	R	0.1%	0.1%	-	-	0.1%	-	-	-	-
John Fenwick	R	0.9%	-	-	0.9%	0.9%	-	-	-	-
Ross Guppy	A	1.1%	1.1%	-	-	1.1%	-	-	-	-
Arthur Hall	R	0.5%	-	0.5%	-	0.5%	-	-	-	-
Jocelyn Handley	R	1.2%	-	1.2%	-	1.2%	-	-	-	-
Melita Hannan	R	2.4%	-	2.4%	-	2.4%	-	-	-	-
Dion Harle	R	0.2%	-	0.2%	-	0.2%	-	-	-	-

cont.

Queensland Department of Main Roads *cont.*

Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
Mike Harris	R	0.5%	0.1%	-	0.4%	0.5%	-	-	-	-
Steve Hogan	R	17.7%	-	-	17.7%	17.7%	-	-	-	-
Greg Hollingworth	R	8.7%	-	-	8.7%	8.7%	-	-	-	-
Raian Koirala	R	1.0%	-	-	1.0%	1.0%	-	-	-	-
Lisa Lewis	R	0.1%	-	-	0.1%	0.1%	-	-	-	-
Kevin Mahoney	A	1.7%	-	1.0%	-	1.7%	-	-	-	-
Mano Manoharan	R	0.3%	-	-	-	0.3%	-	-	-	-
Jenny McMillan	R	0.1%	0.1%	-	-	0.1%	-	-	-	-
Larry Mudge	R	0.8%	-	-	0.8%	0.8%	-	-	-	-
Daniel Nash	A	0.1%	-	0.1%	-	0.1%	-	-	-	-
Ian Reeves	R	1.3%	-	-	-	1.3%	-	-	-	-
Neil Robertson	R	5.0%	-	-	5.0%	5.0%	-	-	-	-
Mark Rogers	R	0.1%	0.1%	-	-	0.1%	-	-	-	-
Amanda Sargeant	R	0.1%	-	-	-	0.1%	-	-	-	-
Graham Shardlow	R	0.3%	0.3%	-	-	0.3%	-	-	-	-
Julia Schular-Peters	R	14.3%	-	13.1%	1.2%	14.3%	-	-	-	-
Gurjit Singh	A	3.4%	-	3.4%	-	3.4%	-	-	-	-
Derek Skinner	R	1.6%	-	1.6%	-	1.6%	-	-	-	-
John Spathonis	A	27.2%	0.7%	1.1%	5.6%	7.4%	-	-	-	19.7%
Ian Steger	A	1.5%	-	-	1.5%	1.5%	-	-	-	-
Alan Stone	A	0.1%	0.1%	-	-	0.1%	-	-	-	-
Mike Swainston	R	11.5%	5.7%	-	5.8%	11.5%	-	-	-	-
Nick Ukalovic	A	0.1%	0.1%	-	-	0.1%	-	-	-	-
John Ward	R	1.3%	-	-	-	1.3%	-	-	-	-
Justin Weligamage	R	26.0%	-	-	26.0%	26.0%	-	-	-	-
Dennis Wogan	R	3.0%	-	-	-	-	-	-	-	3.0%
TOTAL CONTRIBUTED (% of PERSON YEARS)		**147.7%**	**13.3%**	**25.9%**	**81.6%**	**124.5%**	**0.0%**	**0.0%**	**0.0%**	**23.2%**

Queensland Department of Public Works

Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
Don Allan	A	12.4%	2.1%	-	-	5.0%	1.8%	0.3%	0.3%	5.0%
Ron Apelt	R	1.5%	-	-	0.8%	1.5%	-	-	-	-
Michael Ball	R	4.6%	-	4.6%	-	4.6%	-	-	-	-
Selwyn Clark	R	1.1%	-	-	-	1.1%	-	-	-	-
John Collin	R	3.7%	-	-	3.7%	3.7%	-	-	-	-
Mervyn Cowley	R	4.0%	-	-	3.2%	4.0%	-	-	-	-
Keith Eaton	R	0.1%	0.1%	-	-	0.1%	-	-	-	-
Keith Farr	A	0.3%	-	-	-	0.0%	-	-	-	0.3%
Thomas Fussell	R	2.7%	-	-	1.6%	2.7%	-	-	-	-
Dale Gilbert	A	11.4%	-	2.7%	1.3%	9.5%	0.4%	0.6%	0.1%	0.8%
Bob Giles	R	2.3%	-	-	0.7%	2.3%	-	-	-	-
Mark Haug	R	2.0%	-	-	2.0%	2.0%	-	-	-	-
Teng Hee Tan	R	0.9%	-	-	-	0.9%	-	-	-	-
Delwyn Jones	R	59.0%	-	56.7%	-	57.9%	-	-	0.1%	1.0%
Ken Moschner	R	6.0%	0.2%	-	2.7%	5.3%	0.2%	0.3%	-	0.2%
Craig Pearman	A	0.7%	-	-	0.6%	0.7%	-	-	-	-
Michelle Porter	R	3.8%	2.1%	-	-	2.1%	-	-	-	1.7%
Ray Potts	R	2.0%	-	-	0.9%	2.0%	-	-	-	-
Roy Sargent	R	5.5%	4.1%	-	0.4%	5.5%	-	-	-	-
Mat Tiley	A	0.6%	0.6%	-	-	0.6%	-	-	-	-
TOTAL CONTRIBUTED (% of PERSON YEARS)		**124.6%**	**9.2%**	**64.0%**	**17.9%**	**111.5%**	**2.4%**	**1.2%**	**0.5%**	**9.0%**

Queensland Department of State Development and Innovation

Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
Terry Gibson	R	1.0%	-	-	-	0.5%	-	0.5%	-	-
Mike Hefferan	A	5.8%	-	-	-	-	-	3.5%	-	2.3%
Sue Mackenzie-Smith	A	7.5%	-	-	-	-	-	4.5%	-	3.0%
Neal Muller	R	0.1%	-	-	-	-	-	-	-	0.1%
Brendan Richardson	R	0.5%	0.5%	-	-	0.5%	-	-	-	-
Rob Wilcox	R	6.6%	6.3%	-	-	6.3%	-	-	-	0.3%
TOTAL CONTRIBUTED (% of PERSON YEARS)		**21.5%**	**6.8%**	**0.0%**	**0.0%**	**7.3%**	**0.0%**	**8.5%**	**0.0%**	**5.7%**

CSIRO

Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
Michael Ambrose	R	40.3%	-	39.8%	-	39.8%	-	-	-	0.5%
Miles Anderson	R	50.3%	-	50.3%	-	50.3%	-	-	-	-
Steven Brown	R	3.3%	-	3.3%	-	3.3%	-	-	-	-
Ivan Cole	R	11.1%	-	10.9%	-	10.9%	-	-	-	0.2%
John Crawford	R	88.6%	-	33.8%	54.8%	88.6%	-	-	-	-
Angelo Delsante	R	11.4%	-	11.4%	-	11.4%	-	-	-	-
Lan Ding	R	60.0%	-	55.2%	4.8%	60.0%	-	-	-	-
Robin Drogemuller	R	78.5%	0.3%	27.0%	40.8%	78.5%	-	-	-	-
Greg Foliente	R	0.8%	0.8%	-	-	0.8%	-	-	-	-
Shawn Foo	R	60.0%	-	-	60.0%	60.0%	-	-	-	-
Wayne Ganther	R	8.0%	-	8.0%	-	8.0%	-	-	-	-
David Johnston	R	73.7%	-	73.7%	-	73.7%	-	-	-	-
Larry Little	A	1.7%	-	-	-	1.0%	-	-	-	0.7%
Grace Mitchell	R	12.0%	-	12.0%	-	12.0%	-	-	-	-
Stephen McFallen	R	41.4%	16.8%	12.1%	12.5%	41.4%	-	-	-	-
Cheryl McNamara	R	60.9%	-	0.2%	60.7%	60.9%	-	-	-	-
Peter Newton	R	47.8%	-	33.5%	-	47.8%	-	-	-	-
Lam Pham	R	1.9%	-	-	1.9%	1.9%	-	-	-	
Todd Remmers	R	34.8%	-	-	34.8%	34.8%	-	-	-	-
Steven Shaw	R	27.0%	-	-	27.0%	27.0%	-	-	-	-
Paul Tilley	R	22.2%	-	-	20.5%	20.5%	-	-	-	1.7%
Gerry Trinidad	R	70.1%	-	23.8%	46.3%	70.1%	-	-	-	-
Selwyn Tucker	R	55.6%	-	53.1%	0.8%	53.9%	-	-	-	1.7%
Angela Williams	R	15.3%	-	15.3%	-	15.3%	-	-	-	-
TOTAL CONTRIBUTED (% of PERSON YEARS)		**876.7%**	**17.9%**	**463.4%**	**364.9%**	**871.9%**	**0.0%**	**0.0%**	**0.0%**	**4.8%**

Specified personnel

QUT

Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
John Bell	R	18.4%	-	18.4%	-	18.4%	-	-	-	-
Martin Betts	R	2.5%	1.3%	-	-	2.5%	-	-	-	-
Terry Boyd	R	41.5%	-	-	40.3%	41.5%	-	-	-	-
Jon Bunker	R	1.8%	-	1.8%	-	1.8%	-	-	-	-
Albert Chan	R	4.5%	-	-	4.5%	4.5%	-	-	-	-
Ed Dawson	R	1.3%	1.3%	-	-	1.3%	-	-	-	-
Nur Demirbilek	R	15.9%	-	15.9%	-	15.9%	-	-	-	-
Brian Fitzgerald	R	1.3%	1.3%	-	-	1.3%	-	-	-	-
Jim Gall	R	1.0%	-	1.0%	-	1.0%	-	-	-	-
Matthew Humphreys	R	17.0%	-	0.5%	16.3%	17.0%	-	-	-	-
Stephen Kajewski	R	20.0%	-	-	20.0%	20.0%	-	-	-	-
Kame Kouzam	R	1.1%	-	1.1%	-	1.1%	-	-	-	-
Peter Richards	R	1.0%	-	1.0%	-	1.0%	-	-	-	-
Stuart Ross	R	15.0%	-	-	15.0%	15.0%	-	-	-	-
Steve Rowlinson	R	20.0%	14.4%	-	4.1%	20.0%	-	-	-	-
Tony Sidwell	R	95.4%	11.8%	-	24.9%	95.4%	-	-	-	-
Roland Simmons	R	2.5%	2.5%	-	-	2.5%	-	-	-	-
Debbie Smit	R	21.8%	10.0%	-	4.3%	18.0%	3.8%	-	-	-
Mark Thompson	R	1.8%	-	1.8%	-	1.8%	-	-	-	-
Ned Wales	R	1.9%	-	1.9%	-	1.9%	-	-	-	-
Jay Yang	R	30.8%	-	27.5%	-	28.3%	-	-	-	2.4%
TOTAL CONTRIBUTED (% of PERSON YEARS)		**316.1%**	**42.4%**	**70.7%**	**129.3%**	**309.9%**	**3.8%**	**0.0%**	**0.0%**	**2.4%**

RMIT

Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
Lionel Boxer	R	5.0%	-	-	5.0%	5.0%	-	-	-	-
Peter Bryar	R	7.5%	-	-	7.5%	7.5%	-	-	-	-
Mark Burry	R	5.0%	-	5.0%	-	5.0%	-	-	-	-
John Dalrymple	R	16.3%	-	-	16.3%	16.3%	-	-	-	-
Saman de Silva	R	31.3%	-	21.3%	10.0%	31.3%	-	-	-	-
Andrew Finnegan	R	15.0%	15.0%	-	-	15.0%	-	-	-	-
Tim Grant	R	5.0%	-	5.0%	-	5.0%	-	-	-	-
Libby Hess	A	5.0%	-	-	-	-	-	-	-	5.0%
Arun Kumar	R	51.9%	-	5.0%	41.3%	47.5%	0.6%	-	-	3.8%
Eric Pagliarella	A	7.5%	-	-	-	-	5.0%	-	-	2.5%
Leigh Peterson	A	3.8%	-	-	-	1.3%	-	-	-	2.5%
Sujeeva Setunge	R	31.3%	-	5.0%	26.3%	31.3%	-	-	-	-
Ashish Shah	R	60.0%	-	-	60.0%	60.0%	-	-	-	-
Kathryn Thomas	A	3.8%	-	-	-	-	-	-	-	3.8%
Derek Walker	R	52.5%	43.8%	-	8.8%	52.5%	-	-	-	-
Andrew Wilson	R	62.9%	62.9%	-	-	62.9%	-	-	-	-
TOTAL CONTRIBUTED (% of PERSON YEARS)		**363.8%**	**121.7%**	**41.3%**	**175.2%**	**340.6%**	**5.6%**	**0.0%**	**0.0%**	**17.6%**

The University of Newcastle

Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
Graham Brewer	R	50.0%	47.5%	2.5%	-	50.0%	-	-	-	-
Swee-Eng Chen	R	9.5%	3.5%	-	-	4.3%	3.8%	1.4%	-	-
Thayaparan Gajendran	R	23.8%	23.8%	-	-	23.8%	-	-	-	-
Rod Gameson	R	11.8%	-	3.9%	3.9%	9.1%	2.7%	-	-	-
Marcus Jeffries	R	18.7%	11.5%	5.2%	2.0%	18.7%	-	-	-	-
Kerry London	R	30.0%	15.5%	0.2%	2.6%	21.4%	2.2%	-	-	6.4%
Jamie MacKee	R	7.9%	7.5%	0.1%	-	7.6%	0.3%	-	-	-
Willy Sher	R	11.7%	-	4.4%	4.5%	8.9%	2.7%	-	-	0.1%
Peter Ward	R	2.4%	0.3%	-	-	1.3%	1.0%	-	-	0.1%
Tony Williams	R	6.0%	-	5.3%	-	5.3%	0.7%	-	-	-
TOTAL CONTRIBUTED (% of PERSON YEARS)		**171.8%**	**109.6%**	**21.6%**	**13.0%**	**150.4%**	**13.4%**	**1.4%**	**0.0%**	**6.6%**

The University of Sydney

Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
Kirsty Beilharz	R	14.1%	-	14.1%	-	14.1%	-	-	-	-
Ooi Lai Chui	A	2.3%	-	-	-	-	-	-	-	2.3%
Andy Dong	R	18.2%	-	14.6%	-	17.9%	0.3%	-	-	-
John Gero	R	39.9%	-	30.3%	-	31.8%	6.3%	0.6%	1.2%	-
Megan Haig	A	1.3%	-	-	-	-	-	-	-	1.3%
Mary Lou Maher	R	51.9%	-	35.0%	-	41.8%	5.6%	-	2.5%	2.0%
Gary Moore	A	4.9%	-	-	-	-	-	-	-	4.9%
Joe Nappa	A	3.8%	-	-	-	-	-	-	-	3.8%
Rabee Reffatt	R	2.5%	-	2.5%	-	2.5%	-	-	-	-
Suzanne Roberts	A	11.7%	-	-	-	-	-	-	-	11.6%
Mike Rosenman	R	18.8%	-	2.8%	15.0%	18.8%	-	-	-	-
Kerry Song	A	3.6%	-	-	-	-	-	-	-	3.6%
Matthew Storey	A	0.9%	-	-	-	-	-	-	-	0.9%
Ayca Tuzmen	R	7.5%	-	7.5%	-	7.5%	-	-	-	-
TOTAL CONTRIBUTED (% of PERSON YEARS)		**181.3%**	**0.0%**	**106.8%**	**15.0%**	**134.4%**	**12.2%**	**0.6%**	**3.7%**	**30.4%**

University of Western Sydney

Name	Main activity	Total % of time	Program A	Program B	Program C	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
Celine De Bellis	A	1.3%	-	-	-	-	-	-	-	1.3%
Alan Jeary	A	0.5%	-	-	-	-	0.5%	-	-	-
Mary Hardie	A	2.6%	-	-	-	-	-	-	-	2.6%
Jane Hobson	A	0.3%	-	-	-	-	-	-	-	0.3%
Jane Marceau	A	2.0%	-	-	-	2.0%	-	-	-	-
Graham Miller	A	15.8%	-	-	-	4.7%	6.5%	-	-	4.6%
Sue Strom	A	1.9%	-	-	-	-	-	-	-	1.9%
Jenny Turner	A	0.3%	-	-	-	-	-	-	-	0.3%
TOTAL CONTRIBUTED (% of PERSON YEARS)		**24.7%**	**0.0%**	**0.0%**	**0.0%**	**6.7%**	**7.0%**	**0.0%**	**0.0%**	**11.0%**

** Research total includes Research Administration in some cases*

Specified personnel

Staff Table 2 — CRC Paid Program Staff

Name	Employing organisation	Main activity	Total % of time	% spent on Research Program				% spent on Education Program	% spent on External Comm.	% spent on Commercial-isation	% spent on CRC Admin-istration
				Subprogram			Total on Research				
				A	B	C					
Sarah Alder	QUT	R	40	-	40	-	40	-	-	-	-
Guillermo Aranda-mena	UNC	R	100	-	-	100	100	-	-	-	-
Robert Bergman	QUT	R	7	-	7	-	7	-	-	-	-
Xaser Bilda	USYD	R	20	-	20	-	20	-	-	-	-
Aletha Blayse	UWS	R	60	60	-	-	60	-	-	-	-
Fanny Boulaire	CSIRO	R	25	-	-	25	25	-	-	-	-
Lionel Boxer	RMIT	R	15	-	-	15	15	-	-	-	-
Angela Bradbury	CSIRO	R	100	-	100	-	100	-	-	-	-
Peter Bryar	RMIT	R	15	-	-	15	15	-	-	-	-
Linda Candy	USYD	R	25	-	25	-	25	-	-	-	-
Li Chen	RMIT	R	100	-	100	-	100	-	-	-	-
Fiona Cheung	QUT	R	100	100	-	-	100	-	-	-	-
Melissa Cogzell	QUT	R	50	-	-	50	50	-	-	-	-
Betul Dahl	CSIRO	R	25	-	-	25	25	-	-	-	-
Phillip Douglas	RMIT	R	50	-	50	-	50	-	-	-	-
Stephen Egan	CSIRO	R	25	-	-	25	25	-	-	-	-
Shawn Foo	CSIRO	R	5	-	-	5	5	-	-	-	-
Veronica Garcia-Hansen	QUT	R	29	-	29	-	29	-	-	-	-
Peter Goldsmith	RMIT	R	75	75	-	-	75	-	-	-	-
Carole Green	CRC HQ	A	100	3.3	3.3	3.3	10	10	10	15	55
Tim Grant	RMIT	R	50	-	50	-	50	-	-	-	-
Andrew Hampson	UNC	R	60	60	-	-	60	-	-	-	-
Keith Hampson	CRC HQ	R	100	8.3	8.3	8.3	25	10	20	20	25
Karli James	RMIT	R	50	-	50	-	50	-	-	-	-
Julie Jupp	USYD	R	65	-	65	-	65	-	-	-	-
Vladamir Kazakov	USYD	R	15	-	15	-	15	-	-	-	-
Rosemary Kennedy	QUT	R	40	-	-	40	40	-	-	-	-
Mijeong Kim	USYD	R	20	-	20	-	20	-	-	-	-
Phillip Kimmet	QUT	R	40	-	-	40	40	-	-	-	-
Loretta Kivlighon	CSIRO	R	100	-	50	50	100	-	-	-	-
Pak San Liew	USYD	R	100	-	100	-	100	-	-	-	-
Weena Lokuge	RMIT	R	20	-	-	20	20	-	-	-	-
John Mabb	QUT	R	15	-	15	-	15	-	-	-	-
Isolde Macatol	UWS	R	40	40	-	-	40	-	-	-	-
Julie Macinerny	CSIRO	R	20	-	-	20	20	-	-	-	-
Karen Manley	QUT	R	100	100	-	-	100	-	-	-	-
Kathryn McCabe	UNC	R	25	25	-	-	25	-	-	-	-
Judith McCann	UNC	R	50	50	-	-	50	-	-	-	-
Kevin McDonald	CSIRO	R	18	-	-	18	18	-	-	-	-
Cheryl McNamara	CSIRO	R	40	-	40	-	40	-	-	-	-
John Mashford	CSIRO	R	25	-	-	25	25	-	-	-	-
Daniyal Mian	QUT	R	100	-	-	100	100	-	-	-	-
Ann Miller	CSIRO	R	80	-	80	-	80	-	-	-	-
Pene Mitchell	CSIRO	R	50	-	50	-	50	-	-	-	-
Otto Newhouse	CSIRO	A	20	-	20	-	20	-	-	-	-
Abe Nezamian	RMIT	R	100	-	-	100	100	-	-	-	-
Wei Peng	USYD	R	80	-	80	-	80	-	-	-	-
Julie Peters	RMIT	R	10	-	10	-	10	-	-	-	-
Anthony Piyatrapoomi	RMIT	R	100	-	-	100	100	-	-	-	-

cont.

Staff Table 2 — CRC Paid Program Staff *cont.*

Name	Employing organisation	Main activity	Total % of time	% spent on Research Program				% spent on Education Program	% spent on External Comm.	% spent on Commercial-isation	% spent on CRC Admin-istration
				Subprogram			Total on Research				
				A	B	C					
Todd Remmers	CSIRO	R	20	-	-	20	20	-	-	-	-
Julio Rosenblatt	USYD	R	100	-	100	-	100	-	-	-	-
Peter Scuderi	CRC HQ	R	100	20	20	20	60	10	10	10	10
Seongwon Seo	CSIRO	R	100	-	100	-	100	-	-	-	-
Stephen Shaw	CSIRO	R	5	-	-	5	5	-	-	-	-
Ashish Shah	RMIT	A	40	-	-	40	40	-	-	-	-
Paul Smith	QUT	R	40	40	-	-	40	-	-	-	-
Smith	USYD	R	25	-	25	-	25	-	-	-	-
Gitachari Srikanathan	RMIT	R	10	10	-	-	10	-	-	-	-
Warren Staples	RMIT	R	65	-	-	65	65	-	-	-	-
Marcello Tonelli	QUT	R	40	-	-	40	40	-	-	-	-
Ned Wales	QUTI	R	5	-	5	-	5	-	-	-	-
Phillipa Watson	CSIRO	R	50	-	50	-	50	-	-	-	-
Achim Weippert	QUT	R	100	10	-	90	100	-	-	-	-
Andrew Wilson	RMIT	R	50	50	-	-	50	-	-	-	-
Angela Williams	CSIRO	R	60	-	60	-	60	-	-	-	-
Andrew Wong	QUT	R	15	-	-	15	15	-	-	-	-
TOTAL CRC			3400	650	1350	1190	3190	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	24.9	3.4	8.3	8.9	22.7	0.5	0.2	0.1	1.6
TOTAL FUNDED BY CRC	34.0	6.5	13.5	11.9	31.9	0.3	0.4	0.5	0.9
GRAND TOTAL	58.9	9.9	21.8	20.8	54.6	0.8	0.6	0.6	2.5
Proportion of total professional staff resources	100%	17%	37%	35%	93%	1%	1%	1%	4%

In addition to personal presentations, displays at conferences are one way that *Construction Innovation* disseminates its research outcomes to a broader audience.

List of publications and patents

10

Books and refereed journal articles

- Blayse, A and Manley, K, 'Key Influences of Construction Innovation', *Construction Innovation,* Vol 4, No 3, pp. 1–12, 2004
- Boyd, TP, 'Model Consistency and Data Specification in Property DCF Studies', *Australian Property Journal,* Nov. pp. 553–9, 2003
- Hampson, KD; Messer, D and Manley, K, 'Driving collaboration and innovation in Australian property and construction' in Winch, G, 'Innovation Brokerage in Construction' (in print 2004)
- Hampson, KD and Brandon, PS, *Construction 2020 — A Vision for Australia's Property and Construction Industry* (including Executive Summary) Brisbane, 2004
- Hauck, AJ; Walker, DHT; Hampson, KD and Peters, JP, 'Project Alliancing at National Museum of Australia — Collaborative Process', *Journal of Construction Engineering and Management,* Jan/Feb 2004
- Jewell, M and Walker, DHT, 'Community of Practice Perspective Software Management Tools: A UK Construction Company Case Study'. *Knowledge Management in the Construction Industry: A Socio-Technical Perspective.* Kazi AS Helsinki, Finland, Idea Group Publishing, 2004
- London, K; Zhu, Y and Fox, D, 'Cross cultural communication and design management in the internationalisation process: Developing a sustainable business model', *Journal of International Business: Cross Cultural Communication* special edition
- Maqsood, T; Walker, DHT and Finegan, A, 'Biases and Heuristics in Judgment and Decision Making: The Dark Side of a Tacit Knowledge' (for *Journal of Informing Science* and under review), 2004
- Peansupap, V and Walker, DHT, 'Factors enabling information and communication technology (ICT) diffusion within Australian construction organisations', (for ECAM & under review)
- Peansupap, V and Walker, DHT, 'Factors Affecting ICT Diffusion: A Case Study of Three Large Australian Construction Contractors' (for *Journal of Construction Innovation* & under review)
- Peansupap, V and Walker, DHT, 'Diffusion of Information and Communication Technology: A Community of Practice Perspective'. *Knowledge Management in the Construction Industry: A Socio-Technical Perspective.* Kazi, AS, Helsinki, Finland, Idea Group Publishing, 2004
- Piyatrapoomi, N; Kumar, A and Setunge, S, 'Framework for Investment Decision-Making under Risk and Uncertainty for Infrastructure Asset Management', in: Bekiaris, E and Nakanishi, YJ, 'Economic Impacts of Intelligent Transportation Systems: Innovation and Case Studies', *Research in Transportation and Economics,* Vol. 8, 193–209, Elsevier Ltd, 2004
- Walker, DHT; Maqsood, T and Finegan, A, 'The Culture of the Knowledge Advantage (K-Adv): An Holistic Strategic Approach to the Management of Knowledge'. *Knowledge Management in the Construction Industry: A Socio-Technical Perspective.* Kazi, AS, Helsinki, Finland, Idea Group Publishing, 2004

Refereed conference papers

- Bell, J; Mabb, J; Garcia-Hansen, V; Bergman, B and Morawska, L, 'Occupant Health and Productivity: An Australian Perspective', 19–21 November, SASBE 2003
- Humphreys, MF; Mian, DM and Sidwell, AC, 'A Model for Assessing and Correcting Project Health' International Symposium of the CIB W92 on Procurement Systems, 7–10 January 2004, Chennai, India
- Jones, DG, Johnston, DR and Tucker, SN, 'Life cycle inventory for Australian building materials.' CIB 2003 International Conference on Smart and Sustainable Built Environment. Brisbane, 19–21 November 2003 (8pp.)
- Kennedy, RJ; Sidwell, AC; Bennett, J and Chan, APC, 'A value driven procurement decision tool', CIB W65 Symposium, 22–24 October 2003, National University of Singapore
- Kimmet, P, 'Socially Responsible Public Administration and the CBD', Vision 2020 Academic day of the International Public Administrators Association conference, Southbank Campus of Griffith University, Queensland, Australia, 26 November, 2003
- Kimmet, P and Boyd, T, 'An Institutional Understanding of Triple Bottom Line Evaluations and the use of Social and Environmental Metrics', Pacific Rim Real Estate Society conference, January 2004, Bangkok
- Kumar, A, 'Reflecting the Triple Bottom Line in Project Appraisal and Decision Making', 5 Dec 2003, National University of Singapore, Singapore
- Manley, K and McFallan, S, 'Innovation Rates and Drivers in the Road Industry: The Case of Queensland, Australia', Joint International Symposium of CIB Working Commissions W55, W65 and W107, Singapore, 22–24 October 2003
- Maqsood, T and Finegan, AD, 'Applying Models of Knowledge Management to an Industry Case Study', The Third International Conference on Knowledge, Culture and Change in the Organisations, Penang, Malaysia 11–14 August 2003
- Maqsood, T; Finegan, AD and Walker, DHT, 'A conceptual model for exploring knowledge channelisation from sources of innovation in construction organisations: Extending the role of Knowledge Management', ARCOM 2003: 19th Annual Conference, 3–5 September 2003, Brighton, UK
- Maqsood, T; Walker, DHT and Finegan, A, 'Knowledge Channelization and Innovation', Proceedings of 19th ARCOM 2003: 19th Annual Conference, September 3–5 2003, Brighton, UK, Vol. 2, 613–621
- Maqsood, T; Walker, DHT and Finegan, A, 'Investigating the Role of ICT in Improving Productivity in Construction Supply Chains in Australian Construction Industry', Second International Conference on Construction in the 21st Century (CITC-II),'Sustainability and Innovation in Management and Technology', 10–12 December 2003, Hong Kong
- Maqsood, T; Finegan, A and Walker, DHT, 'Extending Knowledge Management across the Supply Chains in the Construction Industry: Knowledge Sharing in Construction Supply Chains', Second International Conference on Construction in the 21st Century (CITC-II),'Sustainability and Innovation in Management and Technology', 10–12 December 2003, Hong Kong
- Maqsood, T; Walker, DHT and Finegan, A, 'Knowledge Management in the Construction Organisations: An illustration of roles and responsibilities', ARCOM Herriott-Watt University Scotland, 2004

- Maqsood, T; Finegan, A and Walker, DHT, 'A Soft Approach to Solving Hard Problems in Construction Project' Second International Conference on Construction in the 21st Century (CITC-II), 'Sustainability and Innovation in Management and Technology', 10–12 December 2003, Hong Kong
- Maqsood, T; Finegan, AD and Walker, DHT, 'Biases and Heuristics in Judgment and Decision Making: The Dark Side of Tacit Knowledge', Informing Science and IT Education Joint Conference, June 25–28 2004, Rockhampton, Queensland, Australia
- Nezamian, A and Setunge, A, 'Comparison between ACI 440 and FIB 14 Design Guidelines in Using CFRP for Strengthening of a Concrete Bridge Headstock', 4th International Conference on Advanced Composite Materials in Bridges and Structures, 20–23 July 2004, Calgary, Alberta
- Nezamian, A; Setunge; S, Kumar; A and Fenwick, J, 'Decision Support in Using Fibre Reinforced Polymer (FRP) Composites in Rehabilitation of Concrete Bridge Structures', 1st International Conference on Innovative Materials and Technologies for Construction and Restoration, 6–9 June 2004, Lecce, Italy
- Peansupap, V; Walker, DHT; Goldsmith, PW and Wilson, A, ' Developing Within-Company Information and Communication Technologies (ICT) Innovation Diffusion Networks: A Study Of Three Australian Major Contractors ', Proceedings of 19th ARCOM Conference, September 3–5 2003, Brighton, UK, Vol. 2, 673–683
- Peansupap, V; Walker, DHT; Goldsmith, PW and Wilson, A, ' Factors Influencing Information Communication Technology Diffusion – An Australian Study ', Proceedings of CIB W55, W65 and W107 Knowledge Construction Conference, October 22–24 2003, Singapore, Vol. 2, 415–427
- Peansupap, V and Walker, DHT, 'Understanding The ICT Innovation Diffusion Process of Large Australian Construction Contractors', SCRI International Symposium, Salford, UK, 2004
- Piyatrapoomi, N; Kumar, A; Robertson, N and Weligamage, J, 'A Probability-Based Analysis for Identifying Pavement Deflection Test Intervals for Road Data Collection' In: Proceedings of the International Conference on Highway Pavement Data Analysis and Mechanistic Design Application, Sept. 7–10 2003, Columbus, Ohio, USA, pp. 291–302
- Rowlinson, S and Cheung, FYK, 'A Review of the Concepts and Definitions of the Various Forms of Relational Contracting' International Symposium of the CIB W92 on Procurement Systems, 7–10 January 2004, Chennai, India
- Seo, S, Tucker, SN and Jones, DG, 'Identification of key environmental issues for building materials', CIB 2003 International Conference on Smart and Sustainable Built Environment. Brisbane, 19–21 November 2003 (8 pp.)
- Seo, S and Tucker, SN, 'Selection method for sustainable building'. CIB 2003 International Conference on Smart and Sustainable Built Environment, Brisbane, 19–12 November 2003 (8 pp.)
- Shah, A; Tan, T and Kumar, A, 'Asset management of public building infrastructure: Australian practices', CIB World Building Congress, May 2004, Canada
- Tonelli, M; Cowley, M and Boyd, T, 'Forecasting rental growth of office buildings – using a dynamic approach'. Pacific Rim Real Estate Society 10th annual conference, Bangkok, Thailand, 26–28 January 2004
- Tucker, SN; Ambrose, M D; Johnston, DR; Seo, S; Newton, PW and Jones, DG, 'Integrating eco-efficiency assessment of commercial buildings into the design process: LCADesign', CIB 2003 International Conference on Smart and Sustainable Built Environment, Brisbane, 19–21 November 2003 (8 pp.)
- Walker, DHT; Finegan, A and Maqsood, T, 'Using a Soft Systems Methodology Approach to Knowledge Elicitation – An Australian Case Study ', Proceedings of CIB W55, W65 and W107 – Knowledge Construction Conference, October 22–24 2003, Singapore
- Walker, DHT and Peansupap, V, 'Innovation Diffusion Through Strategy and a COP Approach – An Australian Construction Case Study', Proceedings of the 17th ANZAM Conference, 2–5 December 2003, Perth WA, (CD-ROM ISBN: 86308 108 9)
- Weippert, A and Kajewski, S, 'AEC Industry Culture: A Need for Change', CIB World Building Congress 2004: Building for the Future, May 2004, Toronto

Conference papers

- Kimmet, P, 'Socially Responsible Commercial Property Entities and the Allocation of Cultural Space', IASCP 2nd Pacific Regional Meeting, 7–9 September 2003, Customs House, Brisbane
- Walker, DHT and Peansupap, V, 'Adoption and Diffusion of ICT within Australian Construction Organisations', Project Management Institute Melbourne Chapter Seminar, 30 September 2003

Courses with project content

- The QUT School of Construction Management and Property has incorporated key findings of *Value in Project Delivery Systems: Facilitating a Change in Culture* into the Master of Project Management (CN77) – CNP 532 Innovation and Technology Management and CNP534 International Project Management. It has also developed content for delivery in 2004/05 into CNB 296 – Contemporary Issues, Bachelor of Property Economics/Bachelor of Applied Science – Property Economics and Construction Management and QUT, CNB 420 – Current Construction Issues, Bachelor of Applied Science – Construction Management and Quantity Surveying from the BRITE project.
- The QUT School of Design and Built Environment has incorporated key findings of *Indoor Environments: Design, Productivity and Health* into their course on Building Service into Unit ADB 025.
- The University of Newcastle, School of Architecture and Built Environment, has incorporated early research findings from a project focussed on internationalisation of consulting firms into the following courses:
  Bachelor of Science (Architecture)
  Architecture 3120 Professional Practice Study Area: Design Management
  Architecture 2120 Professional Practice Study Area: Design Management
- RMIT has incorporated findings from Noise management in Urban Environments to CIVE1110 – Transport Engineering 1 and Decisions support tools for Concrete infrastructure rehabilitation to CIVE1161 – High Performance materials, both in the school of Natural Resources, Faculty of Engineering.

Public presentations, public relations and communication

11

Keynote speaker

- Kumar, A, Maintenance and Rehabilitation of Civil Infrastructure, International Seminar on Road Construction Materials – the 50th Anniversary of the Hokuriku Road Research Association, 6–7 Nov 2003, Kanazawa University, Japan
- Tucker, SN, Overview of Building Environmental Evaluation Tools — Cutting Through The Confusion, Green Buildings Conference, 28–29 April, Sydney

Industry and academic presentations by CRC for *Construction Innovation*

Presentations by Project Personnel listed by project

2001-012-A Manley
- 26 February 04 – BRITE Launch, Brisbane

2002-022-A Rowlinson
- 13 October 2003 – Facilitating a Change in Culture Workshop 1, Brisbane
- 27 April 2004 – Facilitating a Change in Culture Workshops 2 & 3, Brisbane

2001-006-B Tucker
- Meetings with Victorian Department of Sustainability and Environment, Melbourne City Council, NSW Sustainable Environmental Development Authority, Brisbane City Council, John Holland
- May 2004 – *The LCADesign tool and LCA database,* BPIC Board meeting, Canberra
- May 2004 – *The CRC CI and Life Cycle Inventories,* FWPRDC Board meeting, Melbourne

2001-013-B Ashe
- July 2003 – State and Territory Government presentation
- August 2003 – ABCB National Technical Summit
- December 2003 – ABCB Building Codes Committee
- February 2004 – ABCB Board meeting

2001-010-C Kumar
- 5–6 August 2003 – *Reflecting The Triple Bottom Line In Project Appraisal and Selection* at 2nd National Infrastructure Summit, The Westin Sydney, Sydney, Australia organised by the Financial Review and AusCID (The Australian Council for Infrastructure Development), Australia
- September 2003 – John Holland, Melbourne
- September 2003 – RMIT, Melbourne
- November 2003 – RMIT, Melbourne. *Investment Decision Framework for Infrastructure Asset Management* attended by industry and research organisations with Professor Ewa, National University of Singapore
- November 2003 – Queensland Department of Main Roads, Brisbane — *CRC projects from an academic's perspective and Triple Bottom Line in the roads sector*
- November 2003 – *A Main Roads perspective on project 2001-010-05,* Queensland Department of Main Roads, Brisbane
- November 2003 – *Environmental issues in decision making in buildings,* Queensland Department of Main Roads, Brisbane
- May 2004 – *Benefits to Industry: Investment Decision Framework for Infrastructure Asset Management,* Queensland Department of Main Roads Workshop, Mercure Hotel, Brisbane

2002-052-C Tsoukas
- December 2003 – Arup Workshop, Brisbane
- 11 June 2003 – APM London
- 12 June 2003 – Construction Best Practice Program, Key Performance Indicators Workshop, Birmingham
- 13 June 2003 – Major Projects Association, Oxford
- 18 June 2003 – UCL, Faculty of the Built Environment, VR Centre, London
- 20 June 2003 – European Construction Institute, Loughborough University, Leicestershire
- 23 June 2003 – University of Salford
- September 2003 – CRC Workshop, Sydney
- May 2004 – CRC KPI Alignment Workshop, Brisbane

2001-011-C Boyd
- 21 May 2004 – Final seminar presentation, Brisbane

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

- 1 July 2003 – *The CRC for Construction Innovation: Partnering for Progress,* Honeywell, Australia
- 18 July 2003 – *CRC CI Partnering for Progress,* Presentation/Discussions with Brisbane City Council, CRC CI, Brisbane
- 22 July 2003 – *CRC CI: Partnering for Progress,* Building Executive Forum, Queensland Department of Public Works
- 23 July 2003 – *Applied Research in Property and Construction,* QUT Research Methods class, Brisbane
- 25 July 2003 – *CRC CI: A Valuable Partnership,* CRC CI Research, Brisbane


Construction

Australia's CRC for Construction Innovation is driving efficiencies and innovation in building and construction. Here the Centre outlines its Contract Planning Workbench, a research project which visualises construction through automation.

May 2004, *Innovation Australia*

- 30 July 2003 – *Going forward with Industry Innovation and Collaboration,* CRC CI Inaugural Research Conference, Gold Coast
- 18 August 2003 – *CRC CI: Partnering for Progress.* Environmental Protection Agency Meeting, Brisbane
- 28 August 2003 – *Leading the Australian P&C Industry in Collaboration and Innovation,* Australian Institute of Builders, Brisbane
- 12 September 2003 – *Leading Australian Procurement and Construction Council in Construction and Innovation,* Government Real Estate Group Conference, Brisbane
- 16 September 2003 – *Research Partnerships: Advancing Innovations,* Australian Building Codes Board Conference, Gold Coast
- 9 October 2003 – *Moving Ahead,* CRC CI Annual Retreat, Melbourne
- 21 October 2003 – *Innovation and Collaboration as a Framework for Growth,* Construction Beyond Cole Conference, Financial Review, Melbourne
- 22 October 2003 – *Australian CRC CI: Partnering for Progress,* John Holland Board Meeting, Brisbane
- 12 October 2003 – *Construction 2020 Leading Collaboration and Innovation,* Construction 2020 Workshop, Brisbane
- 13 October 2003 – *Leading Innovation and Collaboration through Applied Research,* Australian Construction Industry Forum Board Meeting, Brisbane
- 17 October 2003 – *Making a Difference through Applied Research,* Scholars' Day, CRC CI, Brisbane
- 20 November 2003 – *Sustainable Development Research with CRC for Construction Innovation,* CIB Smart and Sustainable Built Enviroment 2003 Conference, Brisbane
- 21 November 2003 – *What is happening in the CRC CI? Moving forward with Collaboration and Innovation.* Asset Management Workshop, Queensland Department of Main Roads, Brisbane
- 24 November – 4 December 2003 – *Construction 2020,* Construction 2020 Workshops, Hobart, Melbourne, Sydney, Canberra, Perth, Adelaide, Darwin
- 28 November 2003 – *Leading Collaboration and Innovation in the Australian CRC CI. Project Alliancing on the National Museum of Australia: Driving Cultural Change in Construction,* Sixth Japan Australia Building Housing Committee Meeting, Canberra
- 10 December 2003 – *Moving Forward with Construction and Innovation,* Seasonal Cocktails, CRC CI, Brisbane
- 17 February 2004 – *Leading Australia's Property and Construction through Applied Research,* Dutch Government Study Mission, Brisbane
- 26 May 2004 – *Making a Difference through Applied Research:* CRC Scholars' Day, CRC CI, Brisbane
- 9 June 2004 – *Challenges of Working Across a Large Number of Partners,* CEO Workshop, CRCA Annual Conference, Adelaide
- 10 June 2004 – *Managing Participants without Prozac.* CRC Association Annual Conference, Adelaide

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

- 1 July 2003 – *Update on research outputs,* Queensland Department of Public Works, Project Services, Brisbane
- 4 July 2003 – *Update on research outputs on objectives, management processes and potential research outcomes,* Queensland Department of Public Works, Project Services, Brisbane
- 2003–04 – *CRC for* Construction Innovation *briefing*
  Brisbane: QUT — Faculty of Science, Queensland Environmental Protection Agency, CRC for Infrastructure Asset Management, Queensland Master Builders Association, Australian Institute of Commercialisation, Australian Federation of Construction Industry Training Fund, Government Real Estate Group forum presentation, Queensland Department of Innovation and Information Economy, Queensland Department of State Development, Queensland Department of Treasury, Dupont, CRC for Microtechnology, Australian Institute of Builders, Queensland Department of State Development and Innovation – Information Industries Bureau
  Melbourne: Victorian Department of Primary Industries
  Sydney: Econtech, Department of Environment and Conservation, The Centre for International Economics, NSW Department of Commerce, NSW Department of Environment and Conservation
  Adelaide: CSSP
- 11 July 2003 – *CRC for* Construction Innovation *Technology Transfer briefing,* Australian Institute of Project Management, Queensland Chapter, Brisbane
- 22 July 2003 – *Building Executive Forum briefing,* Queensland Department of Public Works, Brisbane
- 29–30 July 2003 – *CRC for* Construction Innovation *Annual Research Conference,* Gold Coast
- 27 August 2003 – CSIRO Property Management, Brisbane
- 29 October 2003 – *CRC for* Construction Innovation *briefing relating to a potential partnership* with UTS Nano House, University of Technology, Sydney
- 12 November 2003 – *CRC for* Construction Innovation *briefing in relation to civil infrastructure projects,* Brisbane City Council, Brisbane
- 18 November 2003 – *CRC for* Construction Innovation *and University of Newcastle review,* University of Newcastle, Newcastle
- 19–21 November 2003 – *CRC for* Construction Innovation *Research Management Training,* QUT, RMIT, The University of Sydney, University of Western Sydney, CSIRO and The University of Newcastle
- 26 November 2003 – *Commercialistion opportunity,* Conviewer, Brisbane
- 2 December 2003 – *Commercialistion opportunity,* EyeDotEm KM Solutions, Brisbane
- 2 December 2003 – *Project Presentation, 2001-011-C Evaluation of Functional Performance for Commercial Buildings,* Property Council of Australia, Brisbane
- 3 December 2003 – *ICT Platform Workshop,* all partners, Sydney

Public presentations, public relations and communication

11

- 15 March 2004 – *CRC for* Construction Innovation *project briefings,* City of Melbourne, Melbourne
- 2003–004 – *CRC for* Construction Innovation *Education Program briefing*
  Brisbane: Queensland Department of Employment and Training, International Alliance of Interoperability – Australasian Chapter, Department of Public Works – Qbuild, School of Design and Built Environment QUT, Australian Greenhouse Office
  Melbourne: Royal Australian Institute of Architects – Archicentre, Holmesglen TAFE, Building Commission Victoria
  Sydney: Property Council of Australia, TAFE NSW
  Canberra: Australian Construction Industry Forum, Australian Procurement and Construction Committee, Master Builders Association
- 8 April 2004 – *CRC for* Construction Innovation *Program B briefing,* House of Representatives Environmental Committee, Brisbane
- 19 April 2004 – *CRC for* Construction Innovation *Education Program briefing* regarding TAFE, RMIT University, Melbourne
- 30 April 2004 – *CRC for* Construction Innovation *Research Program briefing,* University of Newcastle, Newcastle

Presentations by Carole Green, Business Manager of CRC for *Construction Innovation*

- 17 October 2003 – *IP Issues with a CRC,* CRC Scholars' Workshop, Brisbane
- 8 December 2004 – *The CRC for Construction Innovation,* 9th AsiaConstruct Conference, Sydney
- 17 February 2004 – *CRC for* Construction Innovation Overview, Dutch Government Delegation, Brisbane
- 8 April 2004 – *CRC for* Construction Innovation *Program B briefing,* House of Representatives Environmental Committee, Brisbane
- 26 May 2004 – *Intellectual Property Matters,* CRC Scholar's Workshop, Brisbane

Communication

Internal communication is ongoing through the monthly **newsletter** *The Bulletin* which reaches 250 people, and our **intranet** site continues to grow and meet the needs of our project teams.

New report style **guidelines** have been produced for distribution to all project staff including a word processing template for teams.

External communication is ongoing and becoming more targeted so that outcomes from *Construction Innovation* projects can reach the largest and most relevant audience. A high level of attention is given to maintaining the corporate look and *Construction Innovation* branding of our communication outputs.

Industry-focussed **seminars** are now being delivered to both our partners and to a wider audience including professional associations to communicate project outcomes.

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 encourage participants to contribute information and encourage use of the information in readers' in-house publications.

The *Construction Innovation* **website** is continually updated (with news, upcoming events, press releases, newsletters) and has been revised to include a search engine, a Members Only link to the intranet site and an 'archived' news page. It has links to the CRC's BRITE project and *Construction 2020* websites.

The *Clients Driving Innovation* conference website is operational and provides conference details updated as they come to hand.

Articles in **print, electronic and broadcast media** (listed below) are produced regularly for a number of outlets that have been identified as high priority.

Executive Report Cards are produced annually and tailored to address 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 each September/October, following the data collection for the Annual Report.

A series of information **brochures** and **posters** from CRC projects are being developed. *Construction Innovation* posters have been updated, and a new one summarises projects completed or nearing completion this calendar year.

The **brochures** *Building our Future* and *Strategic Plan and Executive Summary* have been updated and reprinted and distributed in **Information Kits,** now available to stakeholders and relevant personnel.

Communication of *Construction 2020*, an initiative based around industry engagement, has taken the form of a workshop series, website, the publication and launch of *Construction 2020 — A Vision for Australia's Property and Construction Industry* and its executive summary, the *Construction 2020* **video** and numerous articles and media releases.

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.

Print

2−8 July 2003 **Sustainability still a dirty word** *Australian Institute of Building Surveyors*

2–8 July **Public Service Medal** *Campus Review*

15 July 2003 **Students work on sustainable development and New Dean aims to build global links** *Inside QUT*

24 July 2003 **Energy rating not the only measure of green** *Australian Financial Review*

July/August 2003 **Students work on sustainable development** *Inside QUT*

August 2003 **Virtual flying squad: A new decision tool for better project delivery** *Building Australia*

August 2003 **Sustainable strategies: An Australian solution for commercial buildings** *Australian Institute of Building Surveyors*

August 2003 **Construction Innovation and Collaboration** *FM Magazine*

August 2003 **Construction Innovation student grapples with Greensmart** *National Building News Monthly*

August 2003 **Discover the Discover project** *Specifier*

'Green' calculator counts cost of building designs

THE construction industry has a huge effect on the environment, but architects often know very little about the environmental and health impact of the materials they use for their designs. A "green calculator" software package aims to change all that.

The software plugs into many of the computer-aided design (CAD) programs commonly used by architects. Some programs can already calculate a partial bill of materials, listing the bricks, pieces of timber and bags of cement needed to realise a design, and working out the cost. But with the green calculator installed, they get the environmental cost too.

Called Life Cycle Analysis of Design (LCADesign), the calculator uses information from online databases to calculate the annual

When cost to the environment?

It also estimates the quantities of chemicals emitted in their manufacture, and the impact this will have on the ozone layer. "Architects will be able to make trade-offs between costs and environmental performance automatically," says Peter Newton of the Cooperative Research Centre for Construction Innovation in Melbourne, where the software was developed.

"It's potentially very powerful," says Simon Carter, an expert in [illegible] design at [illegible]

help architects avoid the wrong choices when trying to build in a sustainable way. For example, you can go to great lengths to get rid of small amounts of a toxic material, and end up using large amounts of materials that are safer but have a greater net impact, he says. The software will soon be able to work out the impact of running a building and demolishing it, as well as constructing it.

Architectural firms Lend Lease and Ove Arup, both in Sydney, [illegible]

August 2003 **Rider Hunt developing 3D virtual reality system to improve design and construction** *Rider Hunt*

August 2003 **Sustainable strategies: An Australian solution for commercial buildings** *TABS – The Australian Building Surveyor*

August/September 2003 ***Construction Innovation* and Collaboration** *Bee Informed*

August/September 2003 **Sustainability still a dirty word in residential development** *Queensland Master Builder Magazine*

August/September 2003 ***Construction Innovation* researcher wins medal** *FM Magazine*

September 2003 **A Sustainable Career In A Sustainable Built Environment** *Construction Contractor*

September 2003 **High-Tech Way Finding Tools Under Investigation** *Building Australia Magazine*

September 2003 **Virtual Flying Squad: A New Decision Tool For Better Project Delivery** *Building Australia Magazine*

9 October 2003 **'Anarchic' Rules Stifle Developers** *Australian Financial Review*

15 October 2003 **Green Space Forum A 'Tree Huggers' Delight** *Property Review.com.au*

24 October 2003 **Green Space Organisations Want National Forum** *National Building News Monthly*

October 2003 **Research Into 'Smart Building' Will Make Workplaces Healthier** *National Building News Monthly*

October/November 2003 **Scaring The Daylight Out Of Workers: How Indoor Environments Affect Productivity** *Queensland Master Builder*

20 November 2003 **Good reason to be sick of work** *City News (Brisbane)*

November 2003 **Facing The Future Of Construction In Australia To Benefit All** *National Building News Monthly*

November 2003 **Green Space United National Forum** *National Building News Monthly*

December 2003 **What will the next buyer pay? The key to investing in property** *Queensland Property and Lifestyle* (Boyd, TP)

◄ January 2004 **'Green' calculator counts cost of building designs** *New Scientist*

February/March 2004 **Australian invention to revolutionise building design** *Master Builder*

March 2004 **BRITE project case studies 1 and 2** *Building Australia*

March 2004 **BRITE project shines light on innovation** *Beeline*

March 2004 **CRC promotes innovation as it happens** *Building Australia*

March 2004 **Green light for green talks** *Australian Financial Review*

March 2004 **Improving performance through innovation** *Contractor Construction*

March 2004 **Making a sustainable impact** *National Building News Monthly*

April (7–13) 2004 **Calculating environmental footprints** *Campus Review*

April 2004 **A word from the ASBEC Chair** *National Building News Monthly*

April 2004 **Industry survey into adoption of best practice** *Australian Glass & Glazing*

April 2004 ***Construction Innovation*** *NECA Communications*

April 2004 **Innovation in construction case studies** *RAIA e-news*

April/May 2004 **Solar suburbs** *Master Builder*

April/May 2004 **BRITE Innovation Survey Coming your way** *ACIF Update newsletter*

May 2004 **Detecting Defects in Concrete** *Engineers Australia*

May 2004 **Do you want more successful projects?** *National Building News Monthly*

May 2004 **Future Building** *Innovation Australia*

23–8 June 2004 **Advertisements for *Construction 2020* workshops** *The Canberra Times, Adelaide Advertiser, Hobart Mercury*

28 June 2004 **Green gauge for builders** *The Australian*

June 2004 **Constructing the future with 2020 vision** *National Building News Monthly*

June 2004 **Innovation survey — have your say** *National Building News Monthly*

June 2004 **Ground penetrating radar finds defects in bridge beams** *Concrete in Australia*

June 2004 **Motorway alliance drives performance improvement** *DMR Interface*

June/July ***Construction 2020* — a vision for the future** *Queensland Master Builder magazine*

Public presentations, public relations and communication

11

Radio

1 July 2003 **Way finding tool** ABC Adelaide Drive, ABC NT Drive. ABC Darwin Drive talking to Keith Hampson

3 July 2003 **Way finding tool** 666 ABC Canberra Mornings talking to Keith Hampson

18 June 2004 **C2020** 2UE radio Real Estate Program, Sydney interview with Keith Hampson

22 June 2004 **C2020** 2UE radio station interview with Keith Hampson

Press releases

16 July 2003 **Media Alert (Research Conference)**

23 July 2003 **The brave new world talks: scientists, government and industry collaborate**

29 July 2003 **Australia at the cutting edge,** Joint CRCA/CRC for *Construction Innovation* media release

19 September 2003 **Be heard! *Construction 2020.* The way forward**

23 September 2003 **Traditional, tried and tested: Communication confronted**

6 October 2003 **GreenSpace: a vision united**

10 November 2003 **As interest rates rise, Queensland property and construction workers look to the future**

24 November 2003 ***Construction 2020* hits Tasmania, *Construction 2020* hits Victoria, *Construction 2020* hits New South Wales**

28 November 2003 ***Construction 2020* hits Canberra, *Construction 2020* hits WA, *Construction 2020* hits SA, *Construction 2020* hits NT**

13 January 2004 **Green Calculator – An Invention to Revolutionise Building Design** (sent with CRCA)

12 February 2004 **Dutch Delegation Visits Australia**

22 June 2004 CRC Media Release

23 June 2004 CRC Media Release

23 and 29 June 2004 **Construction sector sees green** (CRC/CRCA Media Release)

23 June 2004 ABCB Media Release

Sponsorship

In 2003–04, *Construction Innovation* sponsored:

- the SASBE 2003 (Smart and Sustainable Built Environment) International Conference, 19–21 November 2003
- Asia Construct conference, 8–9 December 2003
- the AIB professional Excellence in Building Awards in May 2004 (jointly sponsored with QUT)

Green light for green talks

Agenda

Tina Perrotte

An amazing thing happened last week. An enormous range of people from all sides of the war zone over green property came together under one roof.

There were developers, builders, planners, insurers, government officials and environmentalists.

Not many relevant sectors were missing. Not yet, anyway.

How ambitious this meeting was can be judged by its vision: to get a single agreed agenda on the table for everyone interested in a greener built environment.

How dangerous it is can be judged by the criticism already emerging.

For now, this meeting of the fledgling Australian Sustainable Built Environment Council is still being hailed as a huge breakthrough.

Not many people quite believed it would happen, given the history of vitriol flung at environmental issues.

ASBEC's new chairman, John McCarthy, says: "It was somewhat of a surprise that there was such a great willingness to get together.

"Basically it was born out of the initiative of [illegible] operative

Opposite sides have met to get a single agreed agenda on the table for everyone interested in a greener built environment. Photo: PETER RICHES/photolos.com

organisations that lay claim to having an agenda for sustainability and collectively signing off on a series of actions."

McCarthy, who is also a director of the Australian Building Codes Board, says the great potential for ASBEC is in an educational role.

"Owners need to understand that there is a reward for embr[illegible]

crying out for more carrot than stick.

Of all the issues that worry property owners, the number of ratings tools coming onto the scene to measure sustainability is the most frightening for industry, McCarthy believes.

"One of my roles is as director of the Buildi[illegible]rd and it

if it's in the BCA, the industry will use it."

But critics worry about dumbing standards down. They say the BCA has never been more than minimum standards and this is not what is needed for green development.

They say the powerful Property Council of Australia's aim to make greener development mostly voluntary and market-led won't work.

They also worry that creating a single consultative forum has a downside: it's a great way for powerful groups such as the PCA to take the running and swing developments their way.

Not with Peter Szental, perhaps. He is one of the most outspoken professionals in the debate. Szental is a developer but also represents several sustainable industries bodies and has been a vociferous critic of developers, particularly the Green Building Council of Australia, which he says does not aim high enough and is developer-led.

The aim of green development is to "get the best building on the ground, not the cheapest", Szental says. If high standards are mandated for all, then "everyone is on a level [illegible] field".

4 March 2004, *Australian Financial Review*

Performance measures

12

Quality research

The CRC for *Construction Innovation*'s activities have been significantly broadened in 2003–04 with a strongly emerging education and technology transfer and commercialisation focus. 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	
2002–03	**2003–04**
1. Satisfaction of partners and users with research quality and value to industry	
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.	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.
2. Increase volume of research contribution to CRC	
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.	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.
3. Adoption of research results / Benefits of result by partners	
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.	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.

Quality research

QUALITY RESEARCH	
2002–03	**2003–04**
4. Increase national and international collaborations	
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.	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.
5. Increase in industry innovations and shifts in the knowledge base	
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.	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 demonstrability 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.
6. Increased recognition of the CRC's contribution to improved standards of design and construction	
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.	The ABCB's adoption of the CRC *Construction Innovation* project recommendations, including sustainability as a the theme for the Future Building Code of Australia, is clear indication of the ability of the CRC to directly contribute to improved standards of design. *Construction Innovation,* 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.

Quality research/Education and training

QUALITY RESEARCH	
2002–03	**2003–04**
7. Contribution by CRC participants in developing public policy initiatives	
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.	Public Policy makers in QDPW, QDMR, QDSDI, 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.
8. Strength of collaboration achieved in research development between researchers and industry	
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.	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.
9. External recognition of CRC for Construction Innovation as a leader in collaborative and innovative research in Australia	
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	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.
EDUCATION AND TRAINING	
2002–03	**2003–04**
1. Uptake of *Construction Innovation* inputs to curriculum	
With the establishment of the Education and Training Advisory Group in the next quarter, uptake of *Construction Innovation* inputs into curriculum will increase markedly.	For a listing of the courses at QUT, University of Newcastle and RMIT incorporating input from *Construction Innovation* see page 39.
2. Co-supervision of students by industry partners	
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.	All 13 PhD and Masters scholars either have industry supervisors or direct contact with industry in their areas of research.
3. Uptake of *Construction Innovation* Research Scholarships by quality candidates	
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.	Ten additional scholarships will be made available commencing August 2004 through to October 2004.

Education and training/External communication

EDUCATION AND TRAINING	
2002–03	**2003–04**
4. Growth in numbers of industry users involved in research training	
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.	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 (QDSDI). It is expected the next round of scholars will also have representation from our private industry partners.
5. Number of alliances delivering *Construction Innovation* research outputs to industry	
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.	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.
6. Growth in value of research training sponsorship awarded by government and industry for research and/or study related to CRC projects	
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 form the employers during the period of their scholarships.	Two of the 13 scholars receive top-up salaries from the employers during the period of the scholarship.
EXTERNAL COMMUNICATION	
2002–03	**2003–04**
1. Press releases raising profile of *Construction Innovation* and its partners in the promotion of collaboration and innovation	
13 press releases were distributed to specialist and general media, resulting in 25 articles and 7 radio interviews	20 press releases were distributed to specialist and general media, 6 radio interviews were conducted
2. Growth in impact of publications recognised as key by industry and academic partners	
24 articles/papers were published in industry-relevant publications in 2002-03. 1 book for industry was published in 2002-03.	*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.
3. Numbers of papers presented to national and international conferences and promotional activities	
11 refereed conference papers were presented.	30 refereed papers were presented, 23 papers at international conferences, and a further 7 papers were presented at national conferences.
4. Number of presentations to partners, industry and community groups	
53 presentations were made in 2002-03.	101 presentations of significance were made in 2003–04.

Commercialisation

COMMERCIALISATION	
2002–03	**2003–04**
1. Diffusion activities undertaken by CRC audience indicated by number of project-initiated seminars and workshops	
21 project-initiated seminars and workshops were held by 6 projects.	29 project-initiated seminars and workshops were held by 7 projects.
2. Invitations as keynote speaker to industry conferences, seminars, etc	
Researchers from three *Construction Innovation* projects were invited to present as keynote speakers.	Two project researchers were invited to deliver keynote presentations.
3. Increase in participation in industry, trade and academic conferences	
Representatives from CRC for *Construction Innovation* participated in 53 industry and trade conferences.	*Construction Innovation* was represented in 17 industry and trade conferences.
4. Increase in publications for industry users	
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.	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.
5. Increase in number of media clippings / appearances	
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.	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.
6. Growth in income and industry uptake from commercialisation of IP	
At this stage of establishment, no income has been received from commercialisation of IP.	No income has been received directly by the CRC from commercialisation of Intellectual Property. A number of our partners have had significant financial benefits though the improvement of internal processes.


National Building News Monthly

building innovations

Innovation survey- have your say

June 2004, *National Business News Monthly*

Administration

ADMINISTRATION	
2002–03	**2003–04**
1. Satisfaction of Participant and Commonwealth with financial and research management systems	
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.	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."
2. Effective Centre operations across all Commonwealth programs	
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.	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.
3. Collaborative transactions with industry or government partners, including research projects	
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.	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.
4. Growth in number of additional collaborations annually, particularly with industry	
We have brokered two consultancies between our Researchers and a Commonwealth Department.	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.
5. Growth in repeat collaborations with partners on projects and related activities	
Satisfaction level of partners is strong with existing partners confirming their on-going support and fresh interest from potential new partners.	Satisfaction level of partners is strong with existing partners confirming their ongoing support and fresh interest from potential new partners.

Acronym list

ABCB	Australian Building Codes Board
ACMM	Australian Cost Management Manual
ACEA	Association of Consulting Engineers Australia
ACIF	Australian Construction Industry Forum
AEC	Architecture Engineering and Construction
AIB	Australian Institute of Building
AIM	Australian Institute of Management
AIPM	Australian Institute of Project Management
APCC	Australian Procurement and Construction Council
ARCOM	Association of Researchers in Construction Management
ASBEC	Australian Sustainable Built Environment Council
ASCE	American Society of Civil Engineers
AusCID	The Australian Council for Infrastructure Development
AusPeBBu	Australian Performance Based Building initiative
BC	Building Commission (Victoria)
BCA	Building Code of Australia
BCC	Brisbane City Council
BIRT	Building Industry Redundancy Trust (Queensland)
BLL	Bovis Lend Lease
BoQ	Bill of Quantities
BPIC	Building Products Innovation Council
BRITE	Building Research, Innovation, Technology and Environment
BSRIA	Building Services Research and Information Association
CAD	Computer Assisted Design
CBL	Case Based Logic
CCF	Civil Contractors Federation
CFRP	Carbon Fibre Reinforced Polymer
CIB	International Council for Research and Innovation in Building and Construction
CRCA	Cooperative Research Centre Association
CPW	Contract Planning Workbench
CRC	Cooperative Research Centre
CSF	Critical Success Factors
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DSS	Decision Support System
EDM	Engineering Database Management
ESD	Environmentally Sustainable Development
ESS	Executive Support Systems
FRP	Fibre Reinforced Polymer
FWPRDC	Forest and Wood Products Research and Development Corporation
HIA	Housing Industry Association
IAI	International Alliance for Interoperability
ICALL	International Construction Research Alliance
ICT	Information and Communication Technology
IEAust	Institution of Engineers Australia
IFC	Industry Foundation Classes
IP	Intellectual Property
KPI	Key Performance Indicators
LCA	Life Cycle Analysis
NITS	Noise-Induced Hearing Threshold Shifts
NOHSC	National Occupational Health and Safety Commission
OH&S	Occupational Health and Safety
OPI	Outcomes Performance Indicators
QDMR	Queensland Department of Main Roads
QDPW	Queensland Department of Public Works
QDSDI	Queensland Department of State Development and Innovation
QUT	Queensland University of Technology
RMIT	Royal Melbourne Institute of Technology
R&D	Research and Development
SASBE	Smart and Sustainable Built Environment
SME	Small-to-medium-sized enterprise
SOHO	Small office–home office
SSM	Soft Systems Methodology
TAFE	Technical and Further Education
VET	Vocational Education and Training

CRC Construction Innovation
BUILDING OUR FUTURE

LEADERS IN PROPERTY AND CONSTRUCTION RESEARCH