



CRC for *Construction Innovation*

ANNUAL REPORT 2008-09

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



Table of Contents

1.0	EXECUTIVE SUMMARY	3
1.1	Context and major developments during the year	7
2.0	NATIONAL RESEARCH PRIORITIES	11
2.1	National research priority goal highlights	11
3.0	GOVERNANCE AND MANAGEMENT.....	15
4.0	RESEARCH PROGRAMS.....	19
4.1	Research activities and achievements	19
4.1.1	Key research achievements	19
4.1.2	Nature of major consultancies and their contribution to the CRC.....	20
4.1.3	Nature of any grants and how they contribute to the CRC	20
4.1.4	Any changes to future research directions.....	20
4.2	Research collaborations.....	25
5.0	COMMERCIALISATION AND UTILISATION.....	26
5.1	Commercialisation and utilisation strategies and activities	26
5.2	Intellectual property management	28
5.3	Communication strategy	28
5.4	End-user involvement and CRC impact on end-users.....	29
6.0	EDUCATION AND TRAINING.....	32
6.1	Extent to which the CRC is on target in terms of recruiting and supervising PhD and masters students	32
6.2	Involvement of industry in research supervision	32
6.3	Graduate destinations.....	32
6.4	Nature of end-user involvement in developing undergraduate courses	32
6.5	Nature of seminars/workshops/courses run for industry.....	32
6.6	Contribution to skill development in the industry	32
7.0	PERFORMANCE MEASURES (2000 ROUND CRC).....	35
8.0	GLOSSARY OF TERMS	50
Appendix 1	Publications.....	51
Appendix 2	Scholars Update	56
Appendix 3	Staff Tables.....	60

1.0 Executive Summary

Achievements and activities of the CRC in relation to research, commercialisation/ utilisation and education outcomes for the reporting period.

This year sees the winding up of the five projects operating under the three Extension Programs from 1 July 2007 to 30 June 2009 – Integrated Digital Modelling; Construction Safety; and Procurement and Dispute Avoidance. The Integrated Digital Modelling Program, the largest of the three programs has laid a solid foundation on which the research of the proposed Virtual Built Environment CRC will be based.

The *National Guidelines for Digital Modelling* and *National Guidelines for Digital Modelling: Case Studies* due for release in November 2009 are to be profiled to industry through a national road show in late November. These publications follow a series of 2008-09 open forums held nationally for Building Information Modelling (BIM) industry practitioners which compiled industry input into the development of the guidelines. The guidelines promote consistency in the implementation of digital models for building and infrastructure projects and address the whole building life cycle and the way project information is created, shared, used and amended through building models by all project participants. Lessons learnt from Australian case studies inform the guidelines and demonstrate the implementation of BIM technology in a range of project types and disciplines.

Since 2005, *Construction Innovation* has led safety-based research projects in an effort to address the alarming safety statistics generated by the construction industry. Our reputation in the field of applied safety research has continued to grow over the life of the CRC as has our commitment to disseminate our findings and assist skills development to the industry. This leadership continues through the *Safety Effectiveness Indicators Project Workbook* and CD published in August 2009. This tool is a further practical outcome associated with the award-winning Construction Site Safety Culture project and describes how to provide best-practice approaches to delivering Safety Management Tasks. The tool allows for companies to measure safety on site, and its effective implementation should further improve workplace safety.

The Dispute Avoidance and Resolution project is identifying and communicating to key industry stakeholders recommended change management strategies to avoid dispute between clients, contractors and other industry stakeholders, and where dispute cannot be avoided, to manage disputes more effectively. An industry publication is currently being finalised and due to be launched in Canberra on 17 November 2009. The Secretary of the Department of Infrastructure, Transport, Regional Development and Local Government, Mike Mrdak has confirmed his willingness to launch and provide leadership to the Australian industry. This event and the subsequent national workshops throughout November and December will be convened in conjunction with the Association of Consulting Engineers Australia (ACEA), Civil Contractors Federation (CCF), Australian Procurement and Construction Council (APCC) and Australian Constructors Association (ACA).

The Interoperable Standards Development project developed and implemented a prototype standard that set the format for comprehensive interoperable digital information models in the areas of roads, site works, underground services and landscaping. The final report was delivered to the buildingSMART International Technical Committee at the Berlin meeting on 21–22 September 2009 for their consideration in future interoperable standards development, thus, allowing our CRC project to contribute to international standards.

The Collaboration Platform project has reviewed and analysed the current capability of model servers leading to an open software specification catering for interoperable digital models accessible through a web interface. This project has resulted in at least one model server provider, ActiveFacility, (an Australian SME) re-designing its user interface and software capability on the basis of the findings of this research. The final report was also delivered to the buildingSMART International Technical Committee in Berlin on 21–22 September 2009 for their consideration.

In an example of research into practice, the *Your Building* web portal was transferred to the Property Council of Australia (PCA) in February 2009 which took full responsibility for the site in August 2009. With a network of 55,000 property industry professionals, the PCA is ideally placed to enhance and promote the *Your Building* site. *Your Building* is a portal to the best advice on greening the performance of commercial property and connects building investors, designers, managers and occupants to smart ideas and know how. It places a world of valuable insights and information within reach of every property professional's green fingertips. The PCA has enhanced the *Your Building* portal with the latest thinking on green building trends, easy-to-use decision-making tools and helpful case studies.

The *Construction Innovation Achievements 2001-09* brochure was developed to promote the key achievements of the CRC to industry and government. The brochure brings together information from the major research areas supported by *Construction Innovation*: Sustainability, Safety, Digital Modelling, Infrastructure, Procurement and Skilling, Tools and Outreach. This brochure has been distributed to industry, government and research stakeholders nationally and internationally.

In 2008-09, *Construction Innovation* hosted a busy program of workshops delivered to several hundred practitioners across the country. These workshops conducted by experienced facilitators and industry professionals represent practical examples of our CRC's commitment to deliver *research into practice* – improving industry practices to benefit our community. They covered topics ranging from BIM, sustainable buildings and safety, to relationship management in project delivery.

Sustainability workshops targeted to the industry broadly and to specific groups (e.g. the Federal Government's Department of Parliamentary Services' staff) covered topics including Developing the Business Case, Life Cycle Costing, Valuing and Facility Management of Sustainable Commercial Buildings, and derived their content from the *Your Building* website.

A two-day masterclass run in partnership with Engineering Education Australia focuses on breaking down traditional 'adversarial' environments that many projects endure, introducing fresh knowledge that will guide the implementation of strong collaborative relationship management approaches. It was presented to several government departments (e.g. Queensland departments of Public Works and Main Roads, WA Government) and companies (e.g. John Holland Group, Laing O'Rourke). Content is based on the research findings from *Value in Project Delivery Systems: Facilitating a Change in Culture*.

In May 2009, the CIB Task Group 58 *Clients and Construction Innovation* hosted a workshop titled "Leveraging Innovation for Sustainable Construction" in Edmonton, Canada with CEO Professor Keith Hampson as co-coordinator and keynote speaker. The focus was on documenting international examples of leveraging innovation in sustainability in the construction industry. The discussion and resulting workshop proceedings brought together international industry, government and researcher assessments of the challenges facing the construction industry today and leading pathways for tomorrow's innovations.

Construction Innovation projects *Automated Estimator* and *National Guidelines and Case Studies* featured at a buildingSMART workshop called Cost Estimation using BIM on 17 March 2009. This workshop was hosted and sponsored by the Sydney Opera House and was one in a series held in preparation for the national buildingSMART Conference, Sydney.

Construction Innovation, Stanford University and Stanford Australia Association arranged four sponsorships at Stanford University's Center for Integrated Facility Engineering (CIFE), two-day *Virtual Design and Construction (VDC) Summer Program* and the five-day Virtual Design and Construction Certificate paper. The program was held at Stanford University, California in September 2008. The courses cover VDC modelling, the business opportunities and management issues in each phase and the managerial and technical development processes. The sponsorship also assisted the successful candidates to visit a number of leading technology and construction companies in California, including PB and Arup.

In addressing the complex issues of importance in achieving best practice, innovation, sustainability and productivity, *Construction Innovation's* links with key industry associations are critical. They enable our dissemination of applied research for the improvement of construction practice — this has been and remains of utmost importance to this CRC. The following provides an example of the type of industry association linkage that has been developed. The Australian Construction Industry Forum (ACIF) and APCC proposed *Industry Performance Dashboard* is being operationalised through a Queensland University of Technology-led project – providing measurement and evaluation metrics. The outcomes of this project will provide an ongoing national industry reporting framework to be delivered to industry in an industry partnership.

In addition to the above-mentioned industry associations, and with numerous other associations such as ACA, ACEA, AGIC (Australian Green Infrastructure Council), AIA (Australian Institute of Architects), AIRAH (Australian Institute of Refrigeration, Air Conditioning and Heating), AIPM (Australian Institute of Project Management), ASBEC (Australian Sustainable Built Environment Council), EEA (Engineering Education Australia), FMAA (Facility Management Association, Australia), IAI (International Alliance for Interoperability), MBA (Master Builders Australia), PCA (Property Council of Australia), AIB (Australian Institute of Building) and UDIA (Urban Development Institute of Australia), we maintain relationships that enable mutual opportunities for the dissemination of critical industry information through a range of channels including conferences, workshops, forums, newsletters, trade journals and industry publications.

Risks, opportunities and responses to the above.

The development of the Scoping Projects Program consisting of three new small projects followed the notification that our CRC had been unsuccessful in the 2008 11th Round CRC Program Selection process. The rationale for the Scoping Projects Program was to continue active engagement of existing participants by identifying significant areas of research to be undertaken should the new Sustainable Built Environment CRC be established. It has also allowed new participants that expressed interest in our 2008 bid to join, giving them the opportunity to become familiar with the CRC environment. This has allowed us to jointly prepare for the 2009 12th Round CRC Program Selection process.

Our challenge is maintaining the momentum of this key group and our well established relationships with industry associations, with the industry under considerable stress due to the global financial crisis. Our response has been to continue to plan a new centre effective from 1 January 2010 and to undertake preliminary work in the July – December 2009 for the program activities being developed for the successor to the CRC for *Construction Innovation* – the *Sustainable Built Environment* National Research Centre. This Centre will work in conjunction with the *Virtual Built Environment* CRC, if the bid for this CRC is successful in the 12th Round.

Given the commitment of our Centre's partners to maintain strength in applied research and knowledge transfer activities, an additional risk is the potential loss of key experienced staff. The future *Sustainable Built Environment* National Research Centre will significantly benefit from a continuity of personal and organisational linkages. This risk is particularly important to address to ensure ongoing research support from an industry that is not traditionally based on strong industry/research relationships.

Impediments to achievement of the CRC's objectives experienced during the year and strategies adopted to address these.

The global financial crisis has meant that the industry challenges to maintain work volume and staffing continuity have been significant. A number of industry employees have been retrenched and those still engaged are under considerable stress to meet current work commitments. This has made it difficult to engage industry at the level required by industry Project Leaders and in most cases headquarters staff or contract staff have been engaged either full or part-time to undertake project management, research, administration and coordination activities. The Industry Taskforce approach has continued to add value for the three Extension Programs. As the Taskforce

members are senior executive representatives from industry and professional associations and their time is provided as a service to industry. CRC headquarters personnel oversee the operation of the Taskforces.

Awards, special commendations

National Category Winner, State Category Winner, 2008 Australian Institute of Project Management Achievement Awards in the Project Manager Category Awarded to Dr Karen Manley, QUT (BRITE Project Leader) (14 October 2008)

Queensland Environmental Protection Agency (EPA) Sustainable Industries Awards 2008, LCADesign was a finalist in the Innovation in Sustainable Technologies Award Category (31 October 2008)

CRC highlights

Below are some of the highlights of our CRC for 2008-09.

Construction Innovation was an auspicing society for Australia's first World Sustainable Building 08 conference in Melbourne in September 2008. Around 300 delegates attended the CRC's SB08 forum 'Integrating and innovating for sustainability' which featured international speaker Bruce Rauhe (Walt Disney Imagineering, California), Peter Bowtell (Arup) and Tony Stapledon (Leighton Contractors). Our CRC enjoyed significant profiling over the four days of SB08 with over 2,000 delegates in attendance and our CRC Chair, John McCarthy AO, co-chairing the conference. In his opening address, the Honourable Peter Garrett, Australia's Minister for the Environment, Heritage and the Arts launched our environmental impact 'calculator' for commercial properties, *LCADesign*, describing it as the software that 'will provide industry with the information necessary to design buildings that are ecologically and economically sustainable'.

Construction Innovation, in collaboration with the PCA produced "re-Living" design and construction solutions for existing buildings, via the *Your Building* website. Re-Living is the process whereby existing buildings undergo significant refurbishment or transformation in order to extend their useful life. Re-Living featured in a panel session at Australia's Green Cities conference titled "Management is the New Green".

eContracting – Risks and recommendations solutions chart provides a 'snapshot' of the critical security and legal risks that may arise when construction contracts are formed, administered and recorded within an electronic environment, and has recommended steps that may be taken to resolve or minimise these risks. The publication is an outcome of the CRC project *Electronic Contract Administration – Legal and Security Issues*.

The edited book publication *Technology, Design and Process Innovation in the Built Environment* embodies the results of a major six-year research program by members of the CRC and its global partners, presented for an international audience of construction researchers, senior professionals and post-graduate students. It covers five themes, applied to both regeneration and new build, within the overall theme of innovation – materials, design, construction, facility management and innovation capture. This publication is printed and distributed by leading international publisher Spon Research by Taylor and Francis.

Our long-term Chair and CIB board member John McCarthy AO was a key organiser and co-chair of the World SB08 conference which was commended by the CIB Programme Committee, he received an Officer of the Order of Australia (AO) in the General Division in recognition of his service to the property and construction industry in the Australia Day Honours List and was appointed a member of the Built Environment Industry Innovation Council (BEIIC) established to consider industry innovation challenges and make recommendations to the Minister for Innovation, Industry, Science and Research.

Our safety publications were featured in the Office of the Federal Safety Commissioner (OFSC) 2007–08 Progress Report which focuses specifically on building and construction's industry's occupational health and safety performance. The report highlights Tom Fisher's support of the CRC as then Federal Safety Commissioner through his launch of and involvement with *A Practical Guide to Safety Leadership*.

In February, 2009, Mr Peter Scuderi, Chief Operating Officer, Research and Commercialisation was invited to present the *Virtual Design Construction Master Class*, Sustainable Buildings and Retrofit at the Commissioning Conference in Bangkok.

The BEIIC commissioned a report from our CRC, *Innovation Practices in the Australian Built Environment Sector: An Information Resource for Industry*, which was successfully delivered in May 2009. This report forms the basis for ongoing discussions in government about funding for industry knowledge exchange.

1.1 Context and major developments during the year

A brief outline of the industry context in which the CRC operates (e.g. has there been a change in market conditions; have these changes impacted on the ability of the CRC to meet its objectives?).

2008-09 has been a year of stark contrasts. The initial period was characterised by demand outstripping supply in labour, capital, materials and equipment. Infrastructure and building were, in many analysts' opinions, overheated.

The Australian reported on 28 August 2008, 'building firms are still winning new construction projects faster than they can complete the ones on their books' with a backlog of building work in the pipeline standing at \$51.3 billion – \$10.6 billion or 26 per cent more than a year ago. Access Economics analysis shows there are investment projects worth \$162 billion under construction with commitments made for projects totalling a further \$80.1 billion. The ABS survey of building and construction shows the big engineering firms completed \$13.8 billion of work in the June quarter, 8.2 per cent more than in the same period last year and 42.5 per cent higher than the level of three years ago. This rate of growth placed real constraints on the industry across all levels of staff to meet this demand.

By March 2009, the industry was in a severe crisis with private organisations shedding staff and a freshly launched Federal Government stimulus package, focussed on national revival through investment in infrastructure and buildings. The nation's built environment industry has entered a period of unprecedented restructure as it: minimises costs to reduce carbon pollution and adapt to climate change; maximises national returns from infrastructure investment and economic stimulus packages; and maintains competitive advantage during the global financial crisis and beyond.

This industry contributes the greatest value-add to GDP of any industry, making it the most efficient conduit for national economic growth. Government stimulus investments positioning the industry at the forefront of the nation's recovery strategy must be used effectively, efficiently and sustainably to mitigate long-term underinvestment in nation-building infrastructure. These challenges also increase pressure on the industry's predominant SME base to improve traditionally poor innovation, safety and productivity rates and build new skills and business opportunities in the emerging sustainable built environment economy.

Another significant challenge is the need to respond to climate change in an industry which is responsible for a significant national and global contribution. 'Climate change and the need to reduce greenhouse gas (GHG) emissions, in particular CO₂, is probably the most important and urgent issue facing mankind. Because buildings contribute about 40% of total emissions, they should be at the frontline of the fight against global warming.' (The Dollars and Sense of Green Buildings 2008, AGBC) Given the construction of new building and infrastructure is extremely

costly in environmental terms, there is an increasing focus on five and six green star ratings. The other dimension to this is the need to re-Life existing buildings. This is potentially less costly in terms of GHG production, yet it is an essential element of the urban solution to long-term GHG reduction. A stronger focus on 'green infrastructure' is emerging as a key industry driver.

The global financial crisis has particularly impacted the property development sector of the industry with the value of major real estate investment funds and trusts suffering reductions of up to one third. The mining sector was also seriously impacted with global demand for resources reduced abruptly.

Recent positive economic news is beginning to have an encouraging effect on confidence in the local property market. Increased consumer confidence in the private sector, coupled with significant stimulus and infrastructure funding in the public sector, coupled with ongoing (though slowing) growth in one of Australia's largest international resource customers, China, has reversed the negative trend. After a quiet second half of the 2008-09 year, 2010 is appearing in a more favourable light as off-shore investors, real-estate investment trusts, developers and contractors are positioning themselves for the next phase of the property cycle.

These changes in the industry context have placed challenges on the ability of the end-users to be engaged in our CRC projects due to the level of uncertainty within the industry. However, this deterrent has been largely overshadowed by the need to be engaged in leading industry R&D to meet the industry challenges.

A brief outline of the value of outcomes to date as compared to the expectations outlined in the Commonwealth Agreement or in your original funding application.

Our Commonwealth Agreement variation dated 9 January 2004 defined outcomes for the research programs which are stated below. For the majority of projects which continued to be active in 2008-09, the value of outcomes matched the original expectations of the CRC. Specific examples are provided below.

Program A outcomes – *to improve the long-term effectiveness, competitiveness and dynamics of a viable construction industry in the Australian and international contexts through:*

- *Greater innovation in business processes,*
- *Strengthened human relations and ethical practices, and*
- *More effective interactions between industry and its clients.*

During the reporting period, research from this program has continued to be implemented into industry practice, through tertiary curriculum and continuous professional development. For example, the Construction Safety Competency Framework has now been implemented across 11,000 site staff nationally. Training is being undertaken in such organisations as Queensland Department of Transport and Main Roads, Sydney Water, Melbourne Airport and is being specified as a requirement in the NSW Road and Transport Authority tender documents. The BRITE publications continue to be referred to in government reports and the relationship management courses have been delivered to industry in most states.

Program B outcomes – *to 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 design performance prior to documentation, construction and use, and*
- *Assessing human health and productivity benefits of smart indoor environments.*

LCADesign has been trialled on a number of projects in Australia, Europe and the USA providing design options to reduce the environmental footprint for built assets. The tool has been used as an exemplar eco-profiling tool in the environmental policy for the United Arab Emirates government. Its national launch by Minister Garrett in September 2008 is testament of its importance and potential for reducing environmental impact of materials used in the built environment. The Victorian Health Department has also trialled the tool for relevance to the reduction of environmental impact of hospitals.

Program C outcomes – *to deliver project value for stakeholders for the whole-of-life, from business need, design and construction through to ownership, asset management and reuse through:*

- *Improved communication and use of knowledge,*
- *Increased productivity and value, and*
- *Effective delivery and management of whole-of-life assets.*

The facility management (FM) work undertaken with the Sydney Opera House continues to raise awareness of the importance of FM as a business enabler and that BIM can more effectively facilitate the data exchange, storage and retrieval to increase productivity in the project life cycle. The industry publication has been widely used and cited both by industry and academia across the world.

The CRC's work in digital modelling has provided a base for the Australian Department of Industry, Innovation, Science and Research in its development of policy on the importance of digital modelling for the built environment industries. The CRC has provided important input into the strategy and policy development of the Minister's BEIC through knowledge gained in our CRC's procurement and digital modelling research.

Extension Program outcomes (in Commonwealth Agreement variation dated 8 January 2008)

Integrated Digital Modelling outcomes – to provide industry practitioners with standards and guidelines that promote effective data sharing between disciplines, trial it in an on-line, real-time context and show industry the benefits of this paradigm shift in business processes by:

- *Contributing to international standards for data sharing in roads, site works, underground services and landscaping,*
- *Developing a National Manual and User Guidelines for sharing data between disciplines based on case-studies of projects using BIM, and*
- *Developing a model server specification that allows sharing of data to facilitate effective on-line collaboration between disciplines in the construction supply chain.*

Construction Safety outcomes – to improve construction safety by bringing a national approach to safety competencies and integrating improved practices in the construction supply chain.

Procurement and Dispute Resolution outcomes – to minimise the cost of litigation in the industry by providing a detailed understanding of the factors that facilitate the effective, efficient and timely performance of projects and the root causes and costs of disputes.

The extension program has delivered on three important industry issues – productivity through the use of digital modelling, measuring the effectiveness of safety interventions and raising the awareness of the cost of disputation and recommending actions to reduce these industry and community losses.

The digital modelling work has contributed to the further development of international standards for data modelling, particularly in the civil engineering area. It has also provided important user needs analysis to software vendors in this field. One Australian SME has redesigned the software interface to meet these needs. The third contribution to digital modelling research has been the first national guidelines backed up with case studies for the development of robust interoperable digital

models for buildings. This has generated interest throughout the industry, in particular through attendances at workshops in most states. It has raised awareness of the journey required by consultants and contractors evolving from two-dimensional, paper-based drawings to integrated multi-dimensional digital modelling.

Following the development of the Construction Safety Competency Framework, industry requested a set of indicators that would allow contractors to measure and monitor the effectiveness of the framework implementation on construction sites. Thirteen indicators have been developed through trials on construction sites throughout the country.

The dispute avoidance research has highlighted that there are readily available opportunities to improve the performance of construction projects that could annually deliver an additional \$7 billion of value to the Australian economy. This is equivalent to six desalination plants, or eight Royal North Shore Hospitals, or three North-South Bypass Tunnels in Brisbane. This research will produce awareness-raising publications and a toolkit for industry to eliminate or minimise the causes of disputes within different phases of the project delivery process.

Education Program outcomes – 22 PhD and Masters completions, short courses, and input into curriculum for both undergraduate and postgraduate programs.

Since 2001, the total sum provided for scholarships, amounts to \$1.6 million. During the CRC's tenure, the Scholars' Program offered 28 scholarships of which 22 have completed to date. Over the life of the CRC, approximately 11,000 people from the design, construction and facility management industry have attended seminars, in-house training and workshops developed from the research undertaken by the CRC. This has impacted on the knowledge and skills of workers in safety, environmental sustainability, innovation, procurement, productivity and digital modelling.

Commercialisation/Utilisation Program outcomes – dissemination through end-user participants, trade and professional journals, conferences, and the commercialisation of IP. Over the life of the CRC, approximately 2,000 people from the design, construction and facility management industry have attended international conferences and learned from our world-leading researchers in safety, environmental sustainability, innovation, procurement, productivity and digital modelling.

The *Your Building* website has now been taken over by PCA and will be maintained and added to with content providing the industry with leading industry sustainability practices in the design, construction and operation of commercial buildings

Over the life of the CRC, 40 industry publications have been developed from the research outputs of the centre. Approximately, 20,000 of these have been distributed throughout the industry in Australia and internationally. The publications have now been archived for future industry reference on the QUT library webpage.

An explanation of any major developments or initiatives

The commitment from a majority of CRC for *Construction Innovation* partners is to maintain the national and international applied research momentum through the *Sustainable Built Environment* National Research Centre. The business plan for *Sustainable Built Environment* (SBE) outlines a strategy for targeted research investment to transform the delivery and operations of infrastructure and buildings in Australia. Environmental, social and economic sustainability have been identified by national industry stakeholders as the key areas that will drive productivity and industry development in this sector over the next 10 years. SBE offers an exciting opportunity to continue the momentum created by the CRC with a new research and knowledge exchange portfolio geared to emerging industry priorities. It is proposed that SBE commence operations from 1 January 2010 as the CRC for *Construction Innovation* is wound up on 31 December 2009.

This strategy captures the unique strength and collaboration of a network of leading industry, government and research partners across Australia. The centre aims to further develop this network through continued growth in its national and international partner membership and increased funding for sustainable built environment research through delivering ongoing value to its partners.

2.0 National Research Priorities

2.1 National research priority goal highlights

An Environmentally Sustainable Australia

Your Building is a key online resource at www.yourbuilding.org. The *Your Building* web portal is helping owners, tenants, developers, builders, designers and facility managers create more sustainable commercial buildings by providing case studies and practical advice about energy-saving design and technologies, recycling and water efficiency, reducing GHG emissions and other sustainability topics incorporating environmental, business and social outcomes.

Not only does *Your Building* provide up-to-date and reliable information that is comprehensive and relevant, it has a user-friendly and interactive, wiki-style interface. In December 2008, The PCA signed an agreement with the CRC for *Construction Innovation*, taking ownership of the content and agreed to make the content freely available to the industry through its own web portal.

Sustainable Subdivisions – Ventilation

Sustainable Subdivisions - Ventilation, as part of a broader Sustainable Sub-divisions research agenda, addresses the role of natural ventilation in reducing the use of energy required to cool dwellings. The specific objectives of this project were to acquire the data identified in Sustainable Subdivisions: Energy Project, and thereby:

- Quantify and verify or challenge the role natural ventilation has in cooling residences in subtropical climates; through monitoring wind speed and direction in a range of sub-divisional settings throughout South-east Queensland (SEQ).
- Establish the degree of degradation in natural ventilation imposed by increasingly densely constructed suburban environments.
- Compare this data with Bureau of Metrology (BOM) monitoring stations in SEQ.
- Apply a ventilation factor to the existing Sustainable Energy Development Authority (SEDA) lot-rating methodology.

The following important outcomes were deduced through this research project:

- Case study wind speed and direction reductions due to sub-divisional factors were considerably greater than expected compared to BOM city wind speeds.
- Case study site wind direction measurements showed reasonable correlation with city BOM data during the summer period. However, the wind directions measured at the case study sites in spring showed much more variability with little or no correlation with the BOM wind directions.

Promoting and Maintaining Good Health

Construction Innovation has created an unprecedented alliance of industry, government and researchers committed to saving lives and preventing injuries on Australia's construction sites. It has committed to improving safety on construction sites by providing a consistent, national approach to implementing safety leadership in large and small organisations.

Improving safety culture

A Practical Guide to Safety Leadership: Implementing A Construction Safety Competency Framework is the second key outcome focusing on safety. It is designed for safety managers and senior managers to create a positive safety culture by ensuring that key staff such as project managers, supervisors, Occupational Health and Safety (OHS) advisors and engineers can effectively execute tasks needed to better manage OHS.

This step-by-step guide instructs users on how to implement the award-winning Construction Safety Competency Framework. It explains the safety critical positions and safety management tasks that companies should implement to achieve a positive safety culture. This work has been further extended through the development of some of the key Safety Effectiveness Indicators.

Safety Effectiveness Indicators

Based on current workers' compensation claims and incidence of injury there is a clearly demonstrable need to achieve higher levels of competency for key personnel on construction sites in order to enhance safety performance and productivity.

Previous CRC research identified essential leadership attributes, communications and desired safe behaviours as necessary elements of safety culture (Cipolla et al. 2006). It also identified the measurement of safety effectiveness as a requirement for measuring safe behaviours and safety performance. As well as requiring positive safety behaviours, these need to be measured according to the positive safety actions they generate.

There are currently no national or international standard performance indicators available to measure performance with the exception of number of activities undertaken rather than impact of actions.

This project undertook a consultative process to develop 13 Safety Effectiveness Indicators (SEIs) through a pilot and field trials on a number of construction projects throughout Australia. The results are contained in the *Safety Effectiveness Indicators Project Workbook*. The SEIs provide a national standard for measuring impact on the application of the safety competency framework developed by the CRC. This framework outlines (1) who needs to be able to do which safety tasks and (2) the knowledge, skills and behaviour that are required to complete the tasks effectively. The SEIs complement *A Practical Guide to Safety Leadership: Implementing A Construction Safety Competency Framework* and assist measurement of the impact of safety behaviour change.

Frontier Technologies for Building and Transforming Australian Industries

Procurement toolkit — optimising strategies

Choosing the appropriate procurement system for construction projects is a complex and challenging task for clients. To assist the decision-making process, a range of best-practice aligned procurement selection techniques have been consolidated into the *Procurement Method Toolkit*.

The resources focus on promoting the principles that underlie best-practice procurement, rather than simply identifying a particular delivery method. Accordingly, users gain a better understanding of procurement principles. Resources include information on case studies and lessons learnt to allow participating organisations to access actual examples of construction projects that illustrate best practice procurement selection principles. The *Procurement Method Toolkit* was developed for the Western Australian Government and piloted through its building procurement program.

Knowledge management checklist

This checklist system enables managers to identify knowledge management issues encountered when handling a variety of external contracts. Improving such processes will be of particular value

when these contracts build upon knowledge not residing with the organisation. The system operates by mapping knowledge boundaries of government agencies and how they interface with the knowledge requirements for different contracts. The project provided useful 'lessons learned' for the West Australian and Queensland Departments of Main Roads.

Multi-outcome construction policies

By examining information contained in construction procurement contracts implementing government policy to support training, this project provided valuable feedback to government regarding the limitations of current policy of leveraging social outcomes from the procurement of public works.

Specifically, this research project sought to answer the following research questions:

- What are the current socio-economic policies 'leveraged' within procurement policies?
- What is the rationale for 'leveraging' contracts to achieve these social policies (i.e. the policy intent)?
- What are the identifiable costs and benefits associated with this 'leveraging' (financial and non-financial)?
- What are the costs associated with these social policies, and who are paying for these policies?
- What are the benefits of these social policies, and who is benefiting from them?
- Do the costs outweigh the benefits of such an approach?

A secondary objective was the development of a mechanism for assessing future proposals for the inclusion of social policies in construction projects.

Building Information Model (BIM) national guidelines

In order to obtain national consistency in the development of digital models, other countries have developed their own national guidelines. National guidelines ensure that developers of digital models start the model in a consistent format, including the required attributes for objects. In this way, data sharing between disciplines is possible and data analysis is also possible for testing the design against various performance requirements such as structural design, environmental performance and acoustics.

This project produced national guidelines for digital modelling derived from lessons learnt from organisations and projects that have implemented guidelines for well-structured digital models that will allow the sharing of data between disciplines. The project also incorporated outputs of the Australian Institute of Architects Integrated Practice Taskforce that highlights the progression firms needs to undertake from 2D CAD to integrated digital modelling, sharing data between the project stakeholders.

Interoperable Standards Development

This project developed and implemented a prototype standard that set the format for comprehensive interoperable digital information models in the areas of roads, site works, underground services and landscaping. The prototype provides a clear information specification which details what objects and their associated information are required for information models in the area of site works, roads, underground services and landscaping. The specification is in the format of a spreadsheet documentation to meet these information requirements. The project also undertook a pilot implementation of the prototype standard within 12D software (an Australian civil engineering design software tool) to assess its two-way interaction with other software (e.g. Graphisoft, ArchiCAD) for appropriate exchange scenarios with industry.

The final report was delivered to the buildingSMART International Technical Committee in September 2009 for their consideration in future interoperable standard development.

Collaboration Platform

Collaboration platforms offer a set of software components and software services that enable individuals to find each other and the information they need and to be able to communicate and work together to achieve common business goals. They have been in use for about 10 years particularly for very large projects. Generally the tools are used for on-line document management. Examples include Aconex, inCITE and ProjectCentre.

With the increased interest and usage of digital models there is a potential for collaboration tools to be expanded to digital model server capabilities. In this environment a single digital model can be used and accessed by all disciplines through a check-in, check-out process. A future vision would move towards an on-line, real-time simulation where CAD and non-CAD users, client and contractors in building and infrastructure could access data through a CAD viewer.

Virtual models providing performance testing (e.g. cost, time, construction, safety) with multi-disciplinary input at the early stages of projects will facilitate effective decision-making at a time when the cost impacts are less. Design time will be reduced through a collaboration platform as stakeholders will be able to openly discuss constructability and buildability (material selection, work method statements) generating creative solutions and efficiencies through a process of visualisation, clash detection and more effective consultation.

The project reviewed and analysed the current capability of model servers leading to an open software specification catering for interoperable digital models accessible through a web interface. The project gathered data from literature, industry consultations and laboratory testing of proprietary model server software to document industry's needs in appropriate collaboration platforms. At least one model server provider (ActiveFacility, an Australian SME) has re-designed its user interface and software capability on the basis of the findings of this research project. The final report was delivered to the buildingSMART International Technical Committee for their consideration in future interoperable standard development.

Table 1: National Research Priorities and CRC Research

NATIONAL RESEARCH PRIORITIES	CRC RESEARCH (%)
AN ENVIRONMENTALLY SUSTAINABLE AUSTRALIA – <i>Transforming the way we use our land, water, mineral and energy resources through a better understanding of environmental systems and using new technologies</i>	
Water – a critical resource	11%
Transforming existing industries	10%
Responding to climate change and variability	21%
PROMOTING AND MAINTAINING GOOD HEALTH – <i>Promoting good health and preventing disease, particularly among young and older Australians</i>	
Strengthening Australia's social and economic fabric	10%
FRONTIER TECHNOLOGIES FOR BUILDING AND TRANSFORMING AUSTRALIAN INDUSTRIES – <i>Stimulating the growth of world-class Australian industries using innovative technologies developed from cutting-edge research</i>	
Smart information use	25%

3.0 Governance and Management

CEO, Governing Board Members and Committee Members

Name	Position/ Organisation	CRC Position / Role
<p>John McCarthy AO</p> <p>Key skills:</p> <ul style="list-style-type: none"> Highly experienced chair having chaired many national groups, including currently – AEH Property Pty Ltd and Chairman of CentreCare (NSW) Property Committee. Board member of CIB – International Council for Research and Innovation in Building and Construction – and Chair of CIB's Marketing and Communication Committee 	<p>Chair</p> <p>AEH Property Pty Ltd</p>	<p>Chair, Board</p> <p>Chair, Remuneration Committee</p>
<p>Josh Baker</p> <p>Key skills:</p> <ul style="list-style-type: none"> Construction management Financial management Risk management Member AICD 	<p>General Manager – Group Operational Services</p> <p>Leighton Contractors</p>	<p>Director, Board</p>
<p>Professor Daine Alcorn</p> <p>Key skills:</p> <ul style="list-style-type: none"> Research Research management IP management Finance, audit and risk management Graduate AICD 	<p>Pro Vice-Chancellor (Research and Innovation)</p> <p>RMIT University</p>	<p>Director, Board</p>
<p>David Golightly</p> <p>Key skills:</p> <ul style="list-style-type: none"> Multi-discipline Construction Pre-contracts skills Risk & Commercial Management International construction exposure & experience 	<p>General Manager - Engineering & Estimating</p> <p>John Holland Group</p>	<p>Director, Board</p>
<p>Ross Guppy</p> <p>Key skills:</p> <ul style="list-style-type: none"> Industry knowledge Management experience Infrastructure procurement Registered Practicing Engineer 	<p>Executive Director (Road and Delivery Performance)</p> <p>QDTMR</p>	<p>Director, Board</p>
<p>Andrew Johnson</p> <p>Key skills:</p> <ul style="list-style-type: none"> Research management experience Research development Member AICD 	<p>Associate Director Research Division (Business Development)</p> <p>UN</p>	<p>Director, Board</p> <p>Member, Audit & Compliance Committee</p> <p>Member, Board Performance Committee</p>

Name	Position/ Organisation	CRC Position / Role
Mark Le Pla Key skills: <ul style="list-style-type: none"> • Industry knowledge • Management experience • Organisational Management • Registered Practising Engineer 	Director - Capability Directorate PB	Director, Board
John Oliver Key skills: <ul style="list-style-type: none"> • Organisational management • Financial management • Industry experience • Experience in contractual and cost planning matters 	Senior Consultant Rider Levett Bucknall	Director, Board Chair, Audit & Compliance Committee Chair, Board Performance Committee Member, Remuneration Committee Chair, Research Committee
Max Smith Key skills: <ul style="list-style-type: none"> • Organisational management • Financial management • Public sector procurement requirements • Fellow of IE Aust. • Fellow of AICD • Fellow of AIB 	Deputy Director-General QDPW	Director, Board Member, Remuneration Committee
Tony Tate Key skills: <ul style="list-style-type: none"> • Organisational management • Financial management • Research management 	Director Research and Development Curtin	Director, Board Member, Board Performance Committee
Ian Wade Key skills: <ul style="list-style-type: none"> • Organisational management • Financial management • Industry experience 	Executive General Manager Thiess Business Services Thiess	Director, Board Member, Research Committee
Rod Wissler Key skills: <ul style="list-style-type: none"> • Research policy and management • IP management and knowledge transfer • Doctoral education • Graduate AICD 	Dean of Research and Research Training QUT	Director, Board Member, Audit & Compliance Committee Member, Remuneration Committee
Keith Hampson, CEO	CRC for <i>Construction Innovation</i>	Invitee, Board Ex officio Member, Research Committee
Carole Green <i>Graduate Diploma in Company Secretarial Practice. GAICD</i>	CRC for <i>Construction Innovation</i>	Secretary, Board Secretary, Audit and Compliance Committee Secretary, Board Performance Committee Ex officio Member, Research Committee
Paul Akhurst	SOH	Member, Research Committee
Brian Ashe	ABCB	Member, Research Committee
Mick Davis	QBSA	Member, Research Committee
Andy Dong	US	Member, Research Committee

Name	Position/ Organisation	CRC Position / Role
Robin Drogemuller	QUT	Member, Research Committee
Tom Fussell	QDPW	Member, Research Committee
Richard Hough	Arup	Member, Research Committee
Kerry London	UN	Member, Research Committee
Peter Love	Curtin	Member, Research Committee
David Marchant	Woods Bagot	Member, Research Committee
Dean Morse	BCC	Member, Research Committee
Peter Nassau	BC	Member, Research Committee
Michael Pearson	WADHW	Member, Research Committee
Sven Ollmann	Mirvac	Member, Research Committee
Peter Scuderi	CRC for <i>Construction Innovation</i>	Secretary, Research Committee
John Spathonis	QDMR	Member, Research Committee
Claudelle Taylor	NexusPoint	Member, Research Committee
Lambert Van der Heide	Leighton Contractors	Member, Research Committee
Ron Wakefield	RMIT University	Member, Research Committee

Program Leaders

The role of Program Leaders has not been necessary in the 2008-09 year as the projects have been well development and significantly progressed. For the Extension Program, the projects are being overseen by the Chief Operating Officer, Research and Commercialisation together with specific Industry Taskforces brought together for this purpose. The members of the Industry Taskforces are executive level, highly respected industry personnel. For example, our Dispute Avoidance and Resolution project operates with an Industry Taskforce chaired by Aurecon's Chief Executive – Asia Pacific, Tony Barry and consisting of the former Royal Commissioner into the Building and Construction Industry Justice Terrence Cole AO, and representatives from the Civil Contractors Federation, Queensland and Western Australia Departments of Main Roads, ACEA, ACA and the APCC.

Governing Board

The Governing Board retains responsibility for strategic and policy matters relating to the activities of the CRC and ensures these are carried out in accordance with the provisions of the Commonwealth and Centre Agreements. The Board has continued to meet at bi-monthly intervals at capital city venues across Australia, based on participant locations. It met six times in 2008-09. The Board consists of 11 directors plus the independent Chair, Mr John McCarthy AO. Of the 11 Board members, 4 were private sector and 3 government agencies, thus giving the majority of Board positions to research end-users as required by the Commonwealth Agreement.

There has been one change in Board membership in 2008-09. Mr Ian Wade, Thiess, resigned from the Board in June 2009 in line with Thiess's engagement with the CRC ceasing at 30 June 2009. Professor Alcorn, RMIT and Dr Johnson, The University of Newcastle Board membership also ceased at 30 June 2009 aligned to RMIT University and The University of Newcastle ceasing their membership effective as of 30 June 2009.

Research Committee

The Research Committee's role changed in 2008 to focus more on the outputs of the projects rather than the development and ongoing monitoring of projects which was its main focus previously. Our CRC held its final Research Committee meeting on 16 July 2008 with responsibility for the ongoing monitoring of projects being passed back to the Board. John Oliver, Rider Levett Bucknall, a private sector member of the Governing Board chaired the committee.

Audit and Compliance Committee

The Audit and Compliance Committee assists the Board in fulfilling its responsibilities relating to accounting and reporting practices; improving the credibility and objectivity of *Construction Innovation's* financial and other reports; and strengthening the systems of internal controls, risk management and compliance with the Centre Agreement, and applicable laws and regulations. Members of the Audit and Compliance Committee are John Oliver, Rider Levett Bucknall (Chair); Rod Wissler, QUT; Andrew Johnson, The University of Newcastle; Keith Hampson, CEO, and Carole Green, Chief Operating Officer - Business, *Construction Innovation*. The committee met five times during 2008-09 and has three meetings scheduled in the period to 31 December 2009.

Board Performance Committee

The Board Performance Committee reviews the performance of the Board. Members of the Board Performance Committee are John Oliver, Rider Levett Bucknall (Chair); Tony Tate, Curtin University and Andrew Johnson, The University of Newcastle; Keith Hampson, CEO and Carole Green, Chief Operating Officer – Business, *Construction Innovation*. The final Board Performance Committee meeting was held on 6 April 2009.

Remuneration Committee

The Remuneration Committee meets in conjunction with the Board meetings and provides advice regarding employment matters for senior centre staff. The Committee members are John McCarthy AO (Chair); John Oliver, Rider Levett Bucknall; David Golightly, John Holland Group; and Rod Wissler, Queensland University of Technology. Three of the four members are from the private sector.

Changes to Participants

Participants Name	Commonwealth Approval (✓, Y (Yes) N (No))
CSIRO – retired 30 June 2008	Yes
Springfield Land Corporation – retired 30 June 2008	Yes
The University of Sydney – retired 30 June 2008	Yes
DEM – retired 30 June 2008	Yes
PB – joined 1 July 2008	Joined by Deed of Accession, Included in Commonwealth Variation dated 25 June 2009.

4.0 Research Programs

4.1 Research activities and achievements

4.1.1 Key research achievements

In addition to the achievements identified previously in Section 2.1 National Research Priority goal highlights the following has been achieved.

Construction Industry Business Environment (CIBE)

This project has delivered valuable outputs, including reports, conference papers, journal articles and submissions to government inquiries around the theme of increasing regulation between various jurisdictions. This extensive approach to examining policy harmonisation in the construction industry has not been done before in Australia. The case studies selected are specifically relevant to the Australian industry and were conducted to explore the regulatory relationships between jurisdictions, and identified barriers for coherent policy-making and productivity gains. The five themed case study areas are training and skill development, occupational health and safety, eBusiness (including eTendering and building information modelling) procurement, and environmental sustainability (particularly focussed on energy and water).

Submissions have also been made to the Productivity Commission and to the House of Representatives (Standing Committee) and Environment and Heritage (Standing Committee) Inquiry into Sustainable Cities.

The project produced an introduction to public policy for people not familiar with this industry. It also developed a hierarchy of harmonisation mechanisms based on the literature. The outcomes of this project are informing policy makers and the industry to create a more unified policy environment – reducing inefficiencies in government and the industry.

Dispute Avoidance and Resolution

A building or construction project necessarily involves a complex and dynamic process to plan, implement and deliver the project in accordance with the client's specified requirements in a timely and cost effective manner. This project identified and communicates to key industry stakeholders, recommended change management strategies to avoid disputes between clients, contractors and other industry stakeholders, and where disputes cannot be avoided, to manage disputes more effectively.

This project developed a series of papers/publications on relevant topics in a format that is suitable for education, dissemination and publication, setting out, where appropriate, practical recommendations for change (including, for example, initiatives for organisational and cultural change) by public and private sector clients, contractors and other industry stakeholders.

Australian Construction Industry KPIs

The purpose of this project was to identify the metrics which might be used to assess the Australian industry's progress towards national targets, together with the data sources and methodologies which would underpin the assessment of the metrics. The project also examined international approaches to the measurement and reporting of KPI's for the construction industry, particularly in the USA, Canada and the United Kingdom. This project did not conduct the baseline research against the KPIs, nor report on any KPI progress to date. This was envisaged as informing a subsequent research project, which would be subsequently undertaken based on the methodology advanced in this project, and accepted by ACIF and APCC.

Victorian Schools Plan Exemplar – Scoping Study

This project covers three areas of activity with the Victorian Department of Education and Early Childhood Development (VDEECD). This project provided scoping studies to enable the VDEECD provide for education, health and welfare of multicultural populations in their care. The areas of research proposed included:

1. Participatory Design for Community Education Precincts: Social Infrastructure Re-investment;
2. Supporting Facility Management through Building Information Modelling;
3. Construction System Selection Strategies to Minimise Clustering of Future Expenses, and
4. Sustainable School Interiors: Digital Classroom EcoSpecifications.

New Perth Children's Hospital – Scoping Study

This project provided resources to scope future research to enable New Perth Children's Hospital to be the subject of an exemplar research project for the Western Australian Government.

The project combined recommended case studies, research and existing interview data to determine best practice in hospital sustainability and its feasibility for this planned new hospital. It has provided indicative best-practice options for a sustainable hospital and has developed specifications for how these best-practice characteristics can be fed into the contractual process for the hospital project.

Specifically, this project has determined the detailed metrics for a hospital to be carbon-free; use less water, recycled and toxic-free materials; aligned to public transport usage; 100 per cent waste recycled; community identity features; digital management features and has calculated the economic benefits and costs between a standard hospital and a sustainability-based hospital.

Gold Coast Light Rail – Scoping Study

The aim of this report was to scope research projects through activities that generate best practice for the Gold Coast Rapid Transit Project in environmental sustainability, innovation, safety, skills development, productivity, procurement and economic security.

It represents a major initiative to showcase and facilitate knowledge exchange on a high profile transport related capital works project. The aim is to work hand-in-hand with the Gold Coast Rapid Transit Project, a major national infrastructure project estimated to have a capital cost of about \$1.9 billion.

4.1.2 Nature of major consultancies and their contribution to the CRC

There have been no consultancies.

4.1.3 Nature of any grants and how they contribute to the CRC

There have been no new grants.

4.1.4 Any changes to future research directions

The Commonwealth Agreement Deed of Variation dated 25 June 2009 extends our CRC until 31 December 2009. No new projects will commence during this period. The focus will be completing existing projects and ensure the appropriate distribution of the outputs of those projects.

A list of refereed publications is provided as an Appendix 1.

Research activities and achievements outputs and milestones

Our three main research programs have completed in 2008-09. Brief comments are provided below regarding the final outputs of projects active in 2008-09. This is provided in lieu of milestone report as there were no milestones for this period for these projects. Specific comments regarding each project have been provided previously in this report.

Research Program A: Business and Industry Development

There were three Program A research projects active during the 2008-09 year. These projects were slightly delayed but all milestones have been completed and projects were within budget.

1. Construction Industry Business Environment
2. Multi-outcome Construction Policies
3. Managing Knowledge in an Outsourcing Environment

Research Program B: Sustainable Built Assets

There were two Program B research projects active during the 2008-09 year. These projects were slightly delayed but all milestones have been completed and projects were within budget.

1. Sustainable Subdivisions – Ventilation
2. Your Building

Research Program C: Delivery and Management of Built Assets

There was one Program C research projects active during the 2008-09 year. This project was slightly delayed but all milestones have been completed and the project was completed within budget.

1. Procurement Method Toolkit

Research Program – Extension Program 1: Integrated Digital Modelling

Output / Milestone Number	Description	Contracted Achievement Date	Achieved (Yes or No)	Reasons why not achieved (if applicable)	Strategies to achieve unmet milestones
1.5 Interoperable Standards Development	Incorporation of relevant IFC model objects and data types into 12D software	12/09/2008	No	Completed 31/07/2009.	
1.6 Interoperable Standards Development	Pilot implementation report of the prototype IFC model within 12D software to assess its two-way interaction with other IFC-compliant software (e.g. Graphisoft, ArchiCAD) for appropriate exchange scenarios with industry partners	28/11/2008	No	Completed 31/07/2009.	
2.2 National Manual and	A National Manual which includes: Guidelines for	National Manual Draft 2: 26/09/2008	No	Will be completed by 30/11/2009.	Additional resources have been provided to

Output / Milestone Number	Description	Contracted Achievement Date	Achieved (Yes or No)	Reasons why not achieved (if applicable)	Strategies to achieve unmet milestones
Case Studies	<p>well-structured IFC compliant digital models that will allow the sharing of data between disciplines</p> <p>IT standards used for offsite fabrication and manufacture in Australia and facilitate the use of numerical control equipment in the industry.</p> <p>Standard processes providing the right data filters for the disciplines specified by Project Partners and achievable within an 18-month timeframe.</p> <p>Outputs of the AIA Integrated Practice Taskforce included where appropriate.</p>	Final: 28/11/2008		Currently being edited for Industry Publication.	the project team.
2.3 National Manual and Case Studies	A development and implementation guide derived from the lessons learnt from organisations and projects that have implemented integrated digital modelling	Draft 2: 26/09/2008 Final: 28/11/2008	No	Will be completed by 30/11/2009. Currently being edited for Industry Publication.	Additional resources have been provided to the project team.
2.4 National Manual and Case Studies	An industry publication documenting four case studies of organisations or projects that have implemented IFC (or parallel schema) digital models nationally and internationally where possible.	14/12/2008	No	Will be completed by 30/11/2009. Currently being edited.	Additional resources have been provided to the project team.

Output / Milestone Number	Description	Contracted Achievement Date	Achieved (Yes or No)	Reasons why not achieved (if applicable)	Strategies to achieve unmet milestones
2.5 National Manual and Case Studies	Selected softwares tested for compatibility with the National Manual and the International Alliance for Interoperability (IAI) and software vendors informed regarding their respective softwares' IFC compatibility and availability in Australia.	14/12/2008	No	Completed 30/06/2009.	
3.3 Collaboration Platform	An industry report specifying collaboration scenarios and 'view' definitions as well a "reachability" diagram that links the model server work with the case-studies in Project 2007-002-EP	Interim Report: 13/06/2008 Final Report 28/11/ 2008	No	Completed 31/07/2009.	
3.4 Collaboration Platform	A proof of concept model server that incorporates the collaboration scenarios and 'view' definitions as specified in the industry report.	28/11/2008	No	Completed 31/07/2009.	
3.5 Collaboration Platform	A short summary brochure with executive summary style text and graphics of a maximum of four pages for promotional and marketing purposes.	14/12/2008	No	Completed 31/07/2009.	

Research Program – Extension Program 2: Construction Safety

Output / Milestone Number	Description	Contracted Achievement Date	Achieved (Yes or No)	Reasons why not achieved (if applicable)	Strategies to achieve unmet milestones
2 Safety Effectiveness Indicators	A toolkit comprising of all the Safety Effectiveness Indicators with	28/12/2008	No	Completed by 30/08/2009.	

Output / Milestone Number	Description	Contracted Achievement Date	Achieved (Yes or No)	Reasons why not achieved (if applicable)	Strategies to achieve unmet milestones
	explanations on how they can be implemented in companies.				
2 Safety Effectiveness Indicators	Industry Symposium to disseminate the Safety Effectiveness Indicators and the findings from the pilot projects.	31/03/2009	No	No longer relevant. Publication will be distributed to key industry and government leaders during August 2009.	

Research Program – Extension Program 3: Procurement and Dispute Resolution

Output / Milestone Number	Description	Contracted Achievement Date	Achieved (Yes or No)	Reasons why not achieved (if applicable)	Strategies to achieve unmet milestones
1 Procurement Dispute Resolution	The reports on the various topics nominated in the research agenda developed as described in Stage 2 of the research process	30/09/2008 onwards	Yes		
1 Procurement Dispute Resolution	A series of papers suitable for education, dissemination and publication, setting out the key findings of the research process and, where relevant, practical recommendations for change including for example, drivers or initiatives for organisational and cultural change throughout industry.	30/09/2008 onwards	No	Completed by 30/09/2009 with dissemination workshops occurring in November 2009.	Additional resources have been provided to the project team.
1 Procurement Dispute Resolution	Recommendations for industry diffusion of the changes to be delivered in partnership with industry and government.	28/11/2008	No	Completed by 30/09/2009 with dissemination workshops occurring in November 2009.	Additional resources have been provided to the project team.

4.2 Research collaborations

This year saw the start of an additional four projects under what we have called a Scoping Projects Program planned for six months from 1 January 2009 to 30 June 2009. This Extension Program has been highly supported by our Participants and has encouraged the engagement of two additional Participants – VDEED and Swinburne University of Technology. These projects focussed on three potential exemplar projects – Gold Coast Rapid Transit, Victorian Schools Plan and the new Perth Children’s Hospital project – and have scoped the research gaps to innovation. The fourth project has scoped a research framework focused on industry-based key performance indicators and collaboration has occurred with ACIF, APCC and the Canadian Construction Sector Council. Having been unsuccessful in the 2008 CRC Program Selection Round, we feel this level of engagement clearly demonstrates the recognition our CRC has received in the planning, design, property, construction and facility management industries in which we work as being a key facilitator of research and development across the industry. Previously, this level of collaboration did not exist. The Project Scoping Program has provided a focus for the engagement of the existing and new Participants in planning for future research programs centred on industry relevant case studies of nationally significant infrastructure projects.

Our Extension Program, the focus of our research for 2007-08 and 2008-09, consisting of five projects has continued with a work program due for completion in October 2009. Industry Taskforces were established to oversee the work to ensure that industry continued to provide peer review of our work and to engage with the dissemination activities.

The Integrated Digital Modelling Program Industry Taskforce chaired by Andrew Gutteridge of the Australian Institute of Architects has led the development of international standards for the digital modelling of roads, site works, underground services and landscaping; producing a national manual of guidelines for well-structured international standard compliant digital models for buildings that will allow sharing of data between the design, construct and facility management sectors of the industry; and, documenting for industry’s reference suitable information technology platforms that allow for on-line collaboration between design and construct project team members. The guidelines will be available in late 2009.

The Construction Safety Program continued the previous highly successful work in the safety by identifying lead measures for Safety Effectiveness Indicators of the Safety Management Tasks relating to safety competencies previously identified. *Safety Effectiveness Indicators Project Workbook* was released in September 2009.

The third Taskforce chaired by Tony Barry, Chief Executive – Asia Pacific, Aurecon and representing the ACEA oversees the Procurement Dispute Resolution Program which is analysing the costs to the community resulting from contractual disputes in construction and the systems for effectively resolving disputes. The Dispute Avoidance and Resolution guidelines will be rolled out nationally during November 2009 through the ACEA, CCF, ACA and the APCC. The Australian Coordinator General and Secretary of the Department of Infrastructure, Transport, Regional Development and Local Government, Mike Mrdak has confirmed his willingness to launch these guidelines in Canberra on 17 November 2009.

The engagement of the Industry Taskforce members has provided a senior level of national collaboration with industry that gives industry credibility and personal commitment to our work. It also assists in the dissemination of the research to both industry organisations and the professional organisations which support our industry.

In addition, a further six projects continued through 2008-09, the majority of which have completed their research activities or will complete by the end of calendar year 2009. These projects have seen keen ongoing commitment from our original participants.

Our international industry and research collaboration has achieved significant recognition. *Construction Innovation’s* Chair, John McCarthy AO, continues to sit on the Board of CIB, a global

network for international exchange and cooperation in research and innovation in building and construction. Mr McCarthy AO Board position has been elevated to be one of four core leadership team. He is also Chair of the CIB Marketing and Communication Committee.

Construction Innovation's CEO Keith Hampson leads the international CIB Task Group 58 – Clients and Construction Innovation and COO Research and Commercialisation Peter Scuderi serves internationally on CIB Task Group 66 – Energy Efficiency.

Construction Innovation collaboration continues to strengthen with buildingSMART International Alliance for Interoperability (IAI), the organisation which established the international open standard IFC for object-based software in construction and facilities management. *Construction Innovation's* Chief Operating Officer, Research and Commercialisation, Peter Scuderi, is a member of buildingSMART Board and holds the position of International Education Coordinator and is a member of the buildingSMART International Council. Mr Scuderi attended International Council meetings in Stockholm presenting progress reports on the international standard development, model server specifications and the national guidelines.

Mr Scuderi has also been actively engaged in the development of the AGIC which will develop Australia's first sustainability rating tool for infrastructure projects.

One of the key strategies our CRC has invested in for a number of years is to work with relevant industry associations as a way to inform industry of our research outputs. These relationships have continued to strengthen through 2008-09. During 2008-09, approximately 11,000 people attended workshops throughout the country on such *Construction Innovation* topics as BIM, Safety, Relationship Management and Sustainability.

5.0 Commercialisation and Utilisation

5.1 Commercialisation and utilisation strategies and activities

Construction Innovation's Commercialisation/Technology Transfer Program is designed to enhance the transfer of research outputs into commercial or industry outcomes of economic, environmental or social benefit to Australia. The three guiding principles in achieving this are:

- to ensure Intellectual Property (IP) management and strategies for commercialisation are targeted to potential commercial opportunities
- to transfer public good research outcomes to *Construction Innovation* participants, the construction industry and the broader Australian community
- to ensure that smart and streamlined systems are utilised to effectively manage research activities in a focused and targeted manner, allowing easy identification and exploitation of commercialisation opportunities.

Construction Innovation's project agreements address a process for commercialisation and/or utilisation of the outputs at the commencement of a project. Each six-monthly project review considers the commercialisation and/or utilisation opportunities with, where appropriate, a more focused strategy being developed six to nine months from the completion of the research. Education and communication activities are considered for the project and legal and technology development professionals are engaged, as required, to develop appropriate licence agreements. Market analysis and economic impact reports are sourced externally.

Our first preference for commercialisation partners are our *Construction Innovation* participants. In all projects it is a requirement that at least two research-users participate in the project. Therefore, potential initial adopters of the technology are likely to be the industry participants involved early in the specific project.

Construction Innovation has concentrated on undertaking collaborative research among its participants and has not been involved in any contract research activities. In an industry where a

research culture is still developing, our participants have gained considerably through their involvement in the research process and in incorporating the learnings as projects progress into their daily activities. The utilisation of research results has been a real success for this CRC. The primary examples during 2008-09 has been:

- The *Your Building* portal has now been taken over by the PCA for ongoing management and operation of the site for upgraded and effective industry use.
- Implementation of *Safer Construction* by companies and industry associations. The best-practice guidelines are being used by the EEA and ACEA in their continuing professional development courses delivered throughout Australia. Clients with projects like BlueWater Desalination Plant, West Gate Bridge and Myer National Support Office are implementing the principles into the design and construction of their facilities.
- Implementation of Construction Safety Framework with the development of *A Practical Guide to Safety Leadership* has been implemented in construction large and medium construction companies such as John Holland, Bovis Lend Lease, Joss Group, and Laing O'Rourke. Approximately 11,000 construction workers have undertaken safety training based on the framework.
- LCADesign, an eco-profiling tool developed by *Construction Innovation* and licensed to Ecquate Pty Ltd an Australian SME, has now been trialled on a Victorian hospital project and has been made available to 40 students at the Illawarra Institute of TAFE.
- Outputs from Extension Program research projects will be made available to industry associations for their delivery to SME members throughout Australia. These include a national guidelines and case studies for digital modelling and a change management strategy for dispute avoidance on construction projects.
- Sustainable Subdivisions Ventilation has created a guide for developers in subtropical areas to optimise subdivisions and housing by examining lot orientation to maximise solar access and the benefit of natural ventilation. This report and its recommendations has provided important insights into the challenges of using such environmental tools as AccuRate, providing value to urban designers and greenfield land developers.
- Procurement Method Toolkit piloted by the Western Australian Government allows the user to choose the appropriate procurement system for construction projects. It is a complex and challenging task for clients, particularly when professional advice has not been sought. To assist the decision-making process, a range of best-practice aligned procurement selection techniques has been consolidated into the Procurement Method Toolkit.
- *Managing Knowledge in an Outsourcing Environment* project produced the Knowledge Management Checklist which has enabled governments in Australia to identify knowledge management issues encountered when handling a variety of external contracts. Improving such processes will be of particular value when these contracts build upon knowledge not residing with the organisation. The system operates by mapping knowledge boundaries of government agencies and how they interface with the knowledge requirements for different contracts.

There have been no spin-off companies established by *Construction Innovation*. No patents, including provisional patents, have been lodged in Australia or overseas.

Commercialisation and Utilisation Outputs and/or Milestones

In the latest Commonwealth Variation no milestones were included for the 2008-09 year. However, we have continued to monitor our IP closely and reviewed commercialisation strategies. Industry workshops based on our CRC's safety, procurement and sustainability research outputs have been held during 2008-09.

5.2 Intellectual property management

Construction Innovation's project agreements address a process for commercialisation and/or utilisation of the outputs at the commencement of a project. Each six-monthly project review considers the commercialisation opportunities. Legal and technology development professionals are engaged, as required, to develop appropriate licence agreements. Market analysis and economic impact reports are sourced externally.

IP is managed according to the terms and conditions of the Centre Agreement and in the specific agreements at the project level. These processes are reviewed annually to ensure continued adherence to the National Principles of IP Management. To facilitate the day-to-day management of IP and strategies for commercialisation, *Construction Innovation* also educates and trains key personnel.

To ensure IP arrangements will accrue maximum national benefits to Australia, our first preference for commercialisation partners are our *Construction Innovation* participants. In all projects it is a requirement that there are at least two research-users. Therefore, potential initial adopters of the technology are likely to be the industry participants involved early in the specific project. This greatly assists the dissemination of project outputs as the majority of those projects have significant knowledge generated of immediate use to the participants.

Our CRC's publications have been made available free of charge, if downloaded from our website. Alternatively, printed versions are available for sale and many have been distributed free of charge at CRC events or CRC sponsored events.

5.3 Communication strategy

Construction Innovation is highly focused and successful in disseminating key outcomes of our research activities. *Construction Innovation's* communication strategy seeks to advise and inform our participants and private and public industry stakeholders and the community of the beneficial outcomes derived from our applied research. We undertake a range of communication activities which include both internal and external communication and include our intranet site, corporate and project websites, industry-directed publications and brochures, regular eNewsletter, media and publicity, launches, workshops, and international conference and event sponsorships.

Through numerous industry associations, the CRC maintains relationships that enable mutual opportunities for the dissemination of critical industry information through a range of channels including conferences, workshops, forums, newsletters, trade journals and industry publications.

Another mechanism *Construction Innovation* is using to ensure broad distribution of our research outputs is working with the National Library of Australia for use on their *PANDORA Archive*. This allows our publications to be made accessible as hardware and software changes over time. The National Library will catalogue our publications and add the records to the National Bibliographic Database (a database of catalogue records shared by over 1,100 Australian libraries), as well as to their own online catalogue. This will increase national and international awareness and use of our publications among academic and industry users.

Media releases:

Stitch in time: software tracks buildings' metal health (July, 2008)

World first real-time environmental building calculator launched (September, 2008)

TAFE Head Teacher making his mark on an industry first (June, 2009)

We have continued to aim at publication in industry professional journals and other trade journals. This, in some cases targets organisations and in many cases individuals as many associations require individual registration. This also significantly assists in dissemination to SMEs. In 2008-09, articles have appeared in publications including *ANC Magazine*, *Anthill*, *Australian Financial*

Review, Australian Innovation, Australia's Best Building, Brisbane Business News, Construction Contractor, Courier Mail, Environmental Management News, Facility Perspectives, Geelong Advertiser, Mining and Construction, National Building News, Property Australia, Sydney Morning Herald, The Australian, The Age, Western Australian.

In the 2008-09 period, *Construction Innovation* provided sponsorship to:

- World Sustainable Building Conference, SB08, 12-25 September 2008
- Australian Institute of Project Management Annual National Conference, 12-15 October 2008.
- Australian Institute of Building, Construction 2009 Conference, 26-28 February 2009
- Australian Consulting Engineers Association, Annual National Conference, 19-20 March 2009
- Australian Institute of Architects, Parallax Conference, 30 April-2 May 2009

5.4 End-user involvement and CRC impact on end-users

It is a requirement for all our projects that at least two of our end-user participants are actively engaged in each project. This gives the partners early opportunity to implement the findings of the research projects. Beyond our immediate participant group we work actively to ensure others in the industry can also benefit from our research. This is achieved by actively working with professional associations including ACIF, ASBEC, AIB, MBA, FMAA, PCA, EA and ACA to provide articles for their publications, to present at their conferences both as keynotes and from project output perspectives and to provide sponsorship to allow the brand of our CRC to become familiar in these markets.

Our Extension Program, the focus of our research for 2007-08 and 2008-09, is across three areas with Industry Taskforces established to oversee the work to ensure that industry is intimately engaged in the strategic oversight and dissemination of the research. Firstly, the Integrated Digital Modelling Program Taskforce is chaired by Andrew Gutteridge of the AIA. This program is contributing to international standards for the digital modelling of roads, site works, underground services and landscaping; producing a national guideline for digital building models that will allow sharing of data between the design, construct and facility management sectors of the industry; and documenting suitable information technology platforms that allow for on-line collaboration between design and construct project team members.

The Construction Safety Program continues our previous highly successful work in safety with a focussed project in developing safety effectiveness indicators. The third area has an Industry Taskforce chaired by Tony Barry, Chief Executive – Asia Pacific, Aurecon on behalf of ACEA overseeing the Procurement and Dispute Resolution Program which is analysing the costs to the community resulting from contractual disputes in construction and improving systems for more effectively avoiding and resolving disputes.

The engagement of these senior industry executives has assisted greatly in the uptake of the outputs of these projects through their ownership of the project outputs throughout their development and senior-level engagement across industry.

End-user Involvement in CRC Activities

End-user name	Relationship with CRC (e.g. Industry, Participant, International)	Type of activity and end-user location	Nature / scale of benefits to end-user (e.g. exports increase, productivity, employment)	Actual or expected benefit to end-user (\$ terms)
Queensland Government Departments of Infrastructure and Planning and Transport and Main Roads	Government agency (end-user)	Utilisation of research findings (Queensland – Gold Coast Light Rail project)	Findings from the scoping project provide government with focus for future research in infrastructure projects.	This provides the Gold Coast Light Rail project team with a focus on areas of research that will drive innovation in materials life cycle, noise mitigation and depot operational logistics.
Queensland Department of Public Works	Government agency (end-user)	Utilisation of research findings (Queensland)	Implementing digital modeling on design and construction of projects to pilot the technology, guidelines developed the <i>Construction Innovation</i> and educating the industry through pilot projects.	Improved productivity through the use of digital modelling which provides design and construction optimisation solutions.
Queensland Department of Transport and Main Roads	Government agency (end-user)	Utilisation of research findings (Queensland)	Implementing the Construction Safety Competency Framework and training through 2500 employees.	Improved construction site safety through skills development of employees.
Victorian Department of Education and Early Childhood Development	Government agency (end-user)	Utilisation of research findings (Victoria)	Findings from the scoping project provide government with focus for future research in the design and construction of education facilities.	Better targeted research providing value for the government.
WA Department of Treasury and Finance	Government agency (end-user)	Utilisation of research findings (Western Australia)	Findings from the scoping project provide government with focus for future research in the design and construction of a new children's hospital in Perth.	Provides a description of current and emerging technologies for sustainable design of hospitals.
12D	Project Participant	Utilisation of research findings (International)	Currently incorporating information gained from project	Proof of concept for their further development of an IFC compatible

			involvement into their software for trialling a partial IFC interface to the 12D software.	version of 12D software. This will increase their market to other non-road focused clients.
AbiGroup Australand Bovis Lend Lease Clough Hooker Cockram John Holland Group Laing O'Rourke Leighton Contractors McConnell Dowell St Hilliers Thiess Watpac	Project Reference Group	Utilisation of research findings (Australian)	Participated in focus groups and field trials for safety indicators on construction sites.	Personal, community and economic savings by improving OHS performance by creating and maintaining a safety culture throughout the organisation.
ActiveFacility	Project participant	Utilisation of research findings (International)	Currently re-designing capability of software tool from project involvement and gained out of the development of technical requirements.	Provides ActiveFacility with an opportunity to respond specifically to industry need and increase marketability from asset management tool to a design and construction collaboration tool.
WADHW – Procurement method toolkit	Government Agency (End user)	Utilisation of research findings (Western Australia)	After piloting the Procurement Method Toolkit on projects, it is now forming part of the department's approach to identifying the appropriate procurement system for a given project.	More appropriate procurement system used for government projects.
WADHW/WAMR Managing Knowledge in an Outsourcing Environment	Government Agency (End user)	Utilisation of research findings (Western Australia)	Provided the departments with a process to capture knowledge in an outsourcing environment.	Implementing a strategy to capture knowledge and increase productivity.
WADHW Multi Outcomes Procurement Policies	Government Agency (End user)	Utilisation of research findings (Western Australia)	Providing the department with a cost benefit analysis methodology to enable better policy development.	Development of social policies that do not adversely affect building procurement.

6.0 Education and Training

As reported in last year's annual report, at the end of the 2007-08 financial year we transferred financial oversight of the remaining scholars' stipends and expense allowances back to their respective universities at the end of this reporting period.

6.1 Extent to which the CRC is on target in terms of recruiting and supervising PhD and masters students

While the financial and educational aspects have been transferred, the ongoing progress of the scholars' research and their industry supervisor arrangements has continued to be overseen by the CRC's Education and Training Officer. A summary of the status of our scholars is provided in Appendix 2.

6.2 Involvement of industry in research supervision

All scholars for this reporting period have an allocated, active and relevant industry supervisor. See Appendix 2 for details.

6.3 Graduate destinations

One scholar graduated in the 2008-09 year.

6.4 Nature of end-user involvement in developing undergraduate courses

Curriculum Content	Who	Number of students	Project/Publication Reference
Diploma and Advanced Diploma Sustainable Building Design	Scott Beazley	850 per year	Building Information Modelling National Guidelines and Case Studies

6.5 Nature of seminars/workshops/courses run for industry

17 industry presentations outlining the Safety Effectiveness Indicators were conducted throughout Australia with 314 people attending the presentation.

Other industry presentation include:

Ballesty SP., Rider Levett Bucknall & IFMA Foundation, '*Total Asset Management (TAM): the Sydney Opera House experience*' (keynote) and '*Sustainability in FM: a view from downunder*' (keynote), Rock the Foundation 2009 tour – Malaysian Stopover for the Construction Industry & Development Board (CIDB), Kuala Lumpur, Malaysia, 9-10 June 2009.

Ballesty SP., Rider Levett Bucknall, FMA Australia & IFMA Foundation, '*Facilities Management in Australia: Managing the Built Environment*' UNSW construction management students, University of NSW, Sydney, Australia, 25 August 2008.

6.6 Contribution to skill development in the industry

In 2008-09 we continued our strategy to deliver to industry the outputs of our research in the form of national workshops. We worked with training providers to deliver the courses. This has been highly successful and valued by industry as demonstrated by the attendance and the support from the industry professional associations.

The CRC's Education and Skills Development Program continued to offer workshops to industry from October 2008 until April 2009.

Details are listed below.

Who	What	Presenters	When	Number Attending
EEA/CRC Public Workshops Perth & Sydney	2 day Relationship Management in Project Delivery	Jeff Cowan	25/26 Nov 08 2/3 Dec 08	15
Public Workshops in Brisbane, Sydney, Melbourne & Perth	½ day Practical Guide to Safety Leadership	Louise Quinn	11 Nov 08 17 Nov 08 20 Nov 08 2 Dec 08	22 10 2 3
Public Workshops in Melbourne, Brisbane, Sydney, Perth	3 hr Digital Modelling Workshop	Scott Beazley, Robin Drogemuller, Tom Fussell, Peter Scuderi	14 Oct 08 15 Oct 08 20 Oct 08 5 Nov 08	42 67 47 55
In-house workshops for Downer EDI Perth, Qld Dept of Public Works	2 day Relationship Management in Project Delivery	Jeff Cowan & Graham Scott	27 & 28 Jan 09 12 & 13 Mar 09	25 16
In-house Workshop for Dept of Parliamentary Services, Canberra	1 day Sustainability Workshop	Richard Reed	4 Mar 09	25
EEA/CRC Public Workshops in Brisbane, Sydney, Melbourne	1 day Safer Construction Workshop	EEA Provider	Jun 09	50
In-house presentations & Safety Leader Foundations	Various up to 3 days	Louise Quinn	Throughout 2008-2009	11,000

Education and Training Outputs and/or Milestones

In the Commonwealth Variation dated 8 January 2008, there were no Education and Training Outputs and/or Milestones stated for the 2008-09 period. However, as the focus of the Education and Training continued through 2008-09, we have reported further outputs against previous milestones.

Output / Milestone Number	Description	Contracted Achievement Date	Achieved (Yes or No)	Reasons why not achieved	Strategies to achieve unmet milestones
Educational Training packages developed and marketed	Workshops 2008-09 – Education and Skills Development program including workshops listed above	30 Jun 09	Yes		
Educational Training packages delivered to industry	<ul style="list-style-type: none"> Sustainability Workshop Series (14) Relationship Management workshops (4) Safety Leaders workshop (1) 	30 Jun 09	Yes		

Output / Milestone Number	Description	Contracted Achievement Date	Achieved (Yes or No)	Reasons why not achieved	Strategies to achieve unmet milestones
PhD students – recruit, orientation, commercialisation and training	<ul style="list-style-type: none"> • Not applicable as administration and professional development handed back to universities • CRC continues to receive annual progress reports 	30 Jun 09	Yes		
Student involvement in conferences and publications	<p>Articles & Papers authored or co-authored and presented at national and international conferences include:</p> <ul style="list-style-type: none"> ▪ ARCOM 2008 Cardiff (3) ▪ CRCCI Conference 2008 Gold Coast (6) ▪ InCID Conf 2008 Kuala Lumpur ▪ Joint CIB 2008 W102 Helsinki ▪ CIB SB08 Melbourne ▪ ICS&S 2008 Auckland ▪ CIB 2009 Delft ▪ BCC Living in Brisbane 2008 ▪ CIB 2008 Dubai 	30 Jun 09	Yes		
<i>Construction Innovation</i> dissemination strategies	<ul style="list-style-type: none"> ▪ BIM Workshops ▪ Safety Effectiveness Industry Presentations ▪ Dispute Avoidance Resolution workshops 	30 Jun 09	Yes		
Industry workshops	<ul style="list-style-type: none"> ▪ Industry workshops conducted in Brisbane, Sydney, Melbourne and Perth as roll-outs from research projects 	30 Jun 09	Yes		

7.0 PERFORMANCE MEASURES (2000 Round CRC)

The performance measures and indicators addressed in this Annual Report are those agreed in the January 2004 Commonwealth Agreement Variation. No Objective/Target was specified in the Variation. However, where appropriate, based on our internal planning for the 2007-08 year an objective or target has been included. The same objectives/targets are again used for this year's reporting purposes.

Progress on Performance Measures (2000 Round CRCs)

PERFORMANCE INDICATOR	OBJECTIVE / TARGET	2007-08 PROGRESS / ACHIEVEMENT	2008-09 PROGRESS / ACHIEVEMENT
Objective of the Centre			
1. To create and commercially exploit tools, technologies and management systems to deliver innovative constructed assets to further the financial, environmental and social benefit to the construction industry and the community.	n/a	Of the 18 research projects active during 2007-08, 13 projects have either completed or neared completion, all have delivered at least one output of significant benefit to the industry. The most broadly applicable to industry are: Safer Construction – publication A Construction Safety Competency Framework – publication Your Building – web portal LCADesign – a software tool eContract Administration – publication Legal and Security Issues – publication	All but the five Extension Program Projects were completed by 30 June 2009. The following four collaborative projects delivered research reports and toolkits for industry use: Sustainable Subdivisions – Ventilation delivered a research report providing industry and government with lessons learned regarding the calculation of ventilation in natural cooling of residential buildings in SEQ Procurement Method Toolkit – developed a toolkit for the WA Government allowing the identification of appropriate procurement systems for construction projects. Knowledge Management – checklist providing government agencies with a proactive tool that enables managers to identify knowledge management issues when handling external contracts.
Quality and Relevance of the Research Program			
1. Satisfaction of partners and users with research quality and value to industry.	Continuity and expansion of partner engagement particularly private sector.	A Commonwealth Agreement Variation dated 2 January 2008 formalised the joining of 8 new participants, 5 of which were from the private sector. The variation also extended our CRC for 12 months with only 4 of the original partner group deciding not to continue. Overall, there has been a strengthening of the private sector engagement	Our CRC continues to be supported with a further variation being agreed at the 25 June 2009 to extend this CRC to 31 December 2009 to provide the opportunity for a bid to be submitted to the 12 th selection round of the CRC Program and explore other ways of continuing the valuable applied research service to industry.

PERFORMANCE INDICATOR	OBJECTIVE / TARGET	2007-08 PROGRESS / ACHIEVEMENT	2008-09 PROGRESS / ACHIEVEMENT
		demonstrating the value of this CRC within the industry.	
2. Increase volume of research contribution to CRC.	Level of cash and in-kind commitment.	Since execution of the Variation, an additional \$506,000 cash or 30 per cent has been committed for the 2008-09 financial year by participants and external project parties.	For the period July – December 2009, the CRC Program has provided \$388,000 to assist with salary costs for this period. The remainder of the funds for this period are from a planned carryover from the 2008-09 year. Funding has been available to undertake three small scoping studies to a total value of \$75,000 to position the CRC for the 12 th round CRC and explore other ways of continuing the service to industry.
3. Adoption of research results/Benefit of results to partners.		<p>WADTF – 2006-034-C Procurement Method Toolkit [Davis, Curtin] Implementing the procurement toolkit to enable better selection of procurement systems for given projects.</p> <p>WADHW – 2006-036-A Multi-Outcomes Procurement Policy [Austin, Curtin]</p> <p>Lessons learned and development of a methodology providing for enhanced social policy development implemented on procurement projects in WA.</p> <p>WADTF – 2006-039-A Managing Knowledge in an Outsourcing Environment [Galvin, Curtin]</p> <p>Implementation of strategies for better knowledge capture by government agencies in an environment of staff shortages and outsourcing of services.</p> <p>QDPW/QDMR/QBSA/BCC – 2004-032-A Construction Industry Business Environment [Brown, QUT]</p> <p>Four government agencies provided with best practice, lessons learned and strategies for coherent policy development, together with productivity gains for government in sustainability, OHS, BIM and Sewer Mining.</p>	<p>WA Government has used these research outcomes in shaping procurement policies and policy effectiveness.</p> <p>QDTMR has adopted the Construction Safety Competency Framework for its 2500 employees.</p> <p>QDPW will use the National Guidelines for Digital Modelling through 2009 as a tool to encourage stronger industry engagement in the use of digital modelling on government projects.</p> <p>JHG will be implementing the Safety Effectiveness Indicators in their national and international safety program.</p> <p>The Productivity Commission has incorporated CIBE outcomes in OHS policy assessment.</p> <p>CIBE project also resulted in a submission to the Inquiry into a Sustainability Charter, House of Representatives Standing Committee on Environment and Heritage.</p>

PERFORMANCE INDICATOR	OBJECTIVE / TARGET	2007-08 PROGRESS / ACHIEVEMENT	2008-09 PROGRESS / ACHIEVEMENT
		<p>JHG – 2005-027-A Safer Construction [Fleming, JHG]</p> <p>The best-practice guide endorsed by the national industry promoting whole of stakeholder engagement in safety has been implemented in the Sydney Water project, Melbourne Airport redevelopment, BCC projects.</p> <p>QDPW/Building Commission/ABCB – 2004-028-C Wayfinding in the Built Environment [Hogan, BC]</p> <p>QDPW, Building Commission and ABCB are better equipped to develop socially acceptable policy in relation to the design and operation of commercial buildings and public space.</p>	
4. Increase national and international collaborations.		<p>Commencement of the additional two-year research program with five new partners. An additional two new industry partners involved at the project level.</p> <p>Third International Conference</p> <p>Continued involvement in CIB</p> <p>Continued BuildingSMART involvement</p> <p>BRANZ – NZ contact</p> <p>Engagement with Tasmanian Innovation Award and Tasmanian Building Construction Industry Training</p>	<p>Nationally, the number and influence of the CRC's collaborations continue to be at a most significant level. For example, industry and government collaborations have been supported by Managing Directors of national firms and Directors General of government departments with engagement in research projects at key operating unit manager levels. Securing the commitment for <u>research into action</u> through national exemplar projects in Queensland, Western Australia and Victoria in major public transport, health and education projects respectively, has been a successful industry-wide engagement strategy. Critically, SME collaborations have been enhanced through safety and eBusiness/digital modelling research, also partnering with lead industry associations such as the ACIF and the BEIIC.</p> <p>At the international level, the CRC's collaborations confirm the value our centre has delivered in positioning Australian research leadership through our CRC. For example, the Governing Board Chair has</p>

PERFORMANCE INDICATOR	OBJECTIVE / TARGET	2007-08 PROGRESS / ACHIEVEMENT	2008-09 PROGRESS / ACHIEVEMENT
			<p>risen to one of the leading four office bearers on the pre-eminent building and construction research organisation - the CIB; the CEO has been invited as presenter or member of the review team for innovation strategy initiatives in The Netherlands and New Zealand, and served as keynote presenter at the Canadian Government-sponsored Construction Clients Innovation Conference in partnership with the Canadian Owners Association in Alberta; and the COO (Research & Commercialisation) continues to serve on the international board of building SMART, led a Bangkok Master Class in BIM on behalf of Marcus Evans and part of the review team for the University of Salford, UK international research quality review.</p> <p>CIFE Summer Program - Six representatives of the CRC participants and the COO (R&C) undertake the CIFE Summer Program on Virtual Design and Construction. The participants were the recipients of a total of \$20,000 sponsorship from the CRC. In addition to the Summer Program, the COO (R&C) facilitated industry visits to PB, Arup and Swinerton Inc (Construction Contractor) to hear first-hand the developments in digital modelling and its application in the design and construction process.</p> <p>Finally, international visitations continue to place the CRC for <i>Construction Innovation</i> at the centre of Australian leadership of construction research, with official visits from senior researchers or government construction development policy analysts from New Zealand, United Kingdom, China and The Netherlands.</p>

PERFORMANCE INDICATOR	OBJECTIVE / TARGET	2007-08 PROGRESS / ACHIEVEMENT	2008-09 PROGRESS / ACHIEVEMENT
5. Increase in industry innovations and shifts in the knowledge base.		<p>Model of Industry Taskforce has been implemented for the three new research streams for the new two-year research program.</p> <p>Increased use of ICT applications that use Building Information Models (BIM) within Sydney Opera House, Queensland Departments of Public Works and Main Roads, John Holland, Bovis Lend Lease, Leighton Contractors, Mirvac, and other industry partners. Industry employees have become more familiar with the advantages and applications from engagement in CRC projects that demonstrate the next level of potential application which significantly reduces re-work and re-entry of data across the design, tender, construct and facility management cycle.</p>	<p>The CRC for Construction Innovation has been instrumental in increasing industry innovation and enhancing the knowledge base of the Australian built environmental industry. This has been achieved through its applied research programs and the targeted industry adoption activities in publications, workshops, learning exemplars or demonstrators, and working with key industry champions and scholars.</p> <p>The industry-led taskforce model of senior project engagement has continued with good success. The Dispute Avoidance and Resolution Taskforce has ensured senior client, designer and contractor buy-in to a practical approach to alleviate the impact of contractual disputes input industry estimated to cost \$6B each year. The ICT Taskforce provided a practitioners view on the development and implementation of guidelines for a national consistent approach to digital modelling to improve the productiveness of the industry. Finally, the Safety Effectiveness Indicators taskforce has ensured that a 'self audit tool' for organisations that have/are in the process of implementing the requirements of the Construction Safety Competency Framework.</p> <p>The CRC has been at the forefront of research and adoption for BIM and eBusiness in the industry, safety, off site manufacture and sustainability in commercial buildings.</p>
6. Increased recognition of the CRC's contribution to improved standards of design and construction.		<p>Extensive support has been provided by private sector partners in contributing to the new research program which commenced this year. In particular the National Guidelines for BIM which attempts to improve standards at the design stage.</p>	<p>Improving the standards of design and construction, and improving the productivity is central to the CRC's activities – and it has been recognised by industry (Section 9 details awards achieved). Increased numbers of participants have joined the new bid for the Virtual Built Environment CRC</p>

PERFORMANCE INDICATOR	OBJECTIVE / TARGET	2007-08 PROGRESS / ACHIEVEMENT	2008-09 PROGRESS / ACHIEVEMENT
			<p>– especially across the design and construction sectors. Improving the interface operations between functions through, for example, better integrating safety in the design process to facilitate improved construction site safety through the Safer Construction project and digital modelling integration across the construction supply chain, through the SMEs and major firms in the design/construction functions. The Dispute Avoidance and Resolution project to be completed in November 2009, has been embraced by the key players in the national industry associations and will establish a framework for better relations between public and private sector clients, designers and constructors across the building and infrastructure sectors – so critical for Australia's growth and prosperity.</p>
7. Contribution by CRC participants in developing public policy initiatives.		<p>Key submissions have been provided to:</p> <ul style="list-style-type: none"> National Innovation System Review highlighting the value of CRC outputs to industry, April 2008. 	<p>The CRC continues to be influential in developing public policy initiatives – particularly in sustainability, safety and productivity. For example, our CRC made an influential submission to the Senate Education, Employment and Workplace Relations Committee – Inquiry into the Effects of Climate Change on Training and Employment Needs, 5 September 2008, Canberra. This arose out of our CIBE project.</p> <p>Our BIM strategy for transforming our industry has been jointly badged by the Australian Institute of Architects and buildingSMART, and outcomes from our safety work have been referred to by the OFSC. Additionally, our CRCs prime industry leaders in safety, John Holland, are represented at the national level on OFSC's CEO Forum to lead the industry to better safety standards.</p>

PERFORMANCE INDICATOR	OBJECTIVE / TARGET	2007-08 PROGRESS / ACHIEVEMENT	2008-09 PROGRESS / ACHIEVEMENT
			<p>Board Chair, John McCarthy AO has an unequalled record of industry leadership. He serves as Director on the Australian Building Codes Board and advises the Minister for Innovation, Industry, Science and Research through the BEIC.</p> <p>CEO, Dr Keith Hampson has continued to contribute to public policy development in Australia and internationally in New Zealand, The Netherlands, and Canada. The CRCs COO (Research & Commercialisation) Peter Scuderi has made significant contributions through his key engagement with industry development organisations including AGIC, ASBEC and buildingSMART.</p> <p>Our lead researcher in BIM at QUT, Professor Robin Drogemuller, contributes to national policy development in BIM on the Built Environment Digital Technology Working Group convened by the Department of Innovation, Industry, Science and Research.</p> <p>Our CRC has delivered two public policy focussed projects to BEIC as it prioritises the national agenda for national industry reform: models of procuring construction projects (through Curtin University of Technology) and innovation and knowledge exchange (through QUT).</p> <p>As the ABCB advances with incorporating more sustainability measures in the Building Code of Australia (BCA), it is drawing on the formative work of our CRC in an earlier project , <i>Sustainability and the BCA</i>.</p> <p>Finally, in the context of public policy for industry development, the CRC's foresight initiative <i>Construction 2020: A Vision for Australia's Property and Construction</i></p>

PERFORMANCE INDICATOR	OBJECTIVE / TARGET	2007-08 PROGRESS / ACHIEVEMENT	2008-09 PROGRESS / ACHIEVEMENT
			<i>Industry</i> continues to be highly referenced nationally and internationally.
8. Strength of collaboration achieved in research development between researchers and industry.		The successful start of five new projects at the commencement of the 2007-08 year engaging an additional seven new private sector partners – five at the core participant level and two at the project level demonstrates the strength of collaboration with industry. These projects are all proceeding well with the majority completing their research component in the first part of the 2009 calendar year, allowing time for dissemination of outputs prior to the closure of this CRC in June 2009.	Project development, management and project close-out including industry dissemination continues to reinforce the strength of collaboration between researchers and industry. The challenging but enormously rewarding initiative of forming taskforces to provide a strategic overview to our CRC's projects provides ample demonstration of the commitment to industry – research collaboration. The nationally adopted CRC outcomes in <i>Your Building</i> , <i>Safer Construction</i> , <i>BIM</i> and soon, <i>Dispute Avoidance and Resolution</i> , attest to the value of this approach.
9. External recognition of CRC for <i>Construction Innovation</i> as a leader in collaborative and innovative research in Australia.		<p>External recognition demonstrated by:</p> <ul style="list-style-type: none"> Requests such as from Master Builders request to print an article which they describe as 'a great article and great resource for the construction industry, as is the overall <i>Your Building</i> website.' In their bi-monthly magazine that goes to around 11,000 members of the construction industry. 	<p>In an example of external recognition of leadership, the CRC's board Chair John McCarthy's recent Australian Honours Award as Officer of the Order of Australia referred to his outstanding contribution for service to the property and construction industries, particularly through leadership roles in peak bodies, and through promotion of cooperation, research and innovation.</p> <p>The peak industry ACIF in conjunction with the APCC has endorsed the leadership of our CRC through the Key Performance Indicator project – to recommend a methodology to report to the industry on key areas of performance – in Safety, Productivity, Economic security, Workforce capability and Environmental sustainability.</p> <p>Finally, leading property industry association, the Property Council of Australia (PCA)'s selection of our CRC's <i>Your Building</i> project web site validates the industry leadership in industry research in Australia.</p>

PERFORMANCE INDICATOR	OBJECTIVE / TARGET	2007-08 PROGRESS / ACHIEVEMENT	2008-09 PROGRESS / ACHIEVEMENT
			The Honourable Peter Garrett, launched our environmental impact 'calculator' for commercial properties, <i>LCADesign</i> , at the World Sustainable Building 08 Conference.
Strategy for Utilisation and Commercialisation of Research Outputs			
1. Diffusion activities undertaken by CRC audience indicated by number of project initiated seminars and workshops.		<p>Summary of activities</p> <ul style="list-style-type: none"> • One research symposium attended by 75 people • 14 workshops – Sustainability Series attended by 277 people • 3 workshops – Relationship Management attended by 78 people • One Safety Leaders workshop attended by 16 people 	<p>The CRC has continued workshops for industry:</p> <p>Sustainability – 2 workshop attended by 64 people</p> <p>Relationship Management – 4 two-day workshops attended by 51 people</p> <p>Safety – 8 workshops attended by 226 people</p> <p>BIM – 4 workshops attended by 211 people</p> <p>These workshops have been delivered nationally via external facilitators and form the basis of a <i>research into practice</i> philosophy that underpins our CRC. The safety programs delivered through this CRC form key components of a safety program being delivered to over 11,000 people across the Queensland Department of Transport and Main Roads stakeholder network.</p>
2. Invitations as keynote speaker to industry conference, seminars, etc.	Number of presentations	4 keynote presentations nationally and 4 keynote presentations internationally	5 keynote presentations nationally and 2 keynote presentations internationally
3. Increase in participation in industry, trade and academic conferences.	Number in which CRC participated	10 internationally and 8 state or national events	12 internationally and 5 state or national events
4. Increase in publications for industry users.		25 publications for industry users	28 publications for industry users
5. Increase in number of media clippings/appearances.		60 articles published in industry and mainstream media	31 articles published in industry and mainstream media
6. Growth in income and industry uptake from commercialisation		One product, <i>LCADesign</i> is the subject of a development and commercialisation licence.	One product, <i>LCADesign</i> is the subject of a development and commercialisation licence. Delays in development has

PERFORMANCE INDICATOR	OBJECTIVE / TARGET	2007-08 PROGRESS / ACHIEVEMENT	2008-09 PROGRESS / ACHIEVEMENT
of IP.			delayed income.
Education and Training			
1. Uptake of CRC for <i>Construction Innovation</i> inputs to curriculum.		4 courses were identified as containing significant amount of curriculum content based on project outputs as stated in Section 6. Additional courses use our publications as reference materials.	8 courses were identified which contained significant amounts of curriculum content based on our project outputs. Additional courses continue to use our publications as reference materials.
2. Co-supervision of students by industry partners.	All students have an industry supervisor.	All students had an industry supervisor.	Scholarship program concluded 30 June 2008. Funding was provided to enrolling universities to fund the remaining scholarship period for the small remaining number. Industry supervision continued for remaining scholars.
3. Uptake of CRC for <i>Construction Innovation</i> Research Scholarships by quality candidates.	Candidates meet the requirements of the APAI guidelines. Meet the approval of academic and research users' participants.	No new scholarships awarded.	Scholarship program concluded 30 June 2008.
4. Growth in numbers of industry users involved in research training.		No new scholarships awarded. Therefore, no new industry supervisors engaged. However, existing industry supervisors continued their support.	Anecdotal evidence suggests that our industry participants are now more broadly engaged in research training outside the CRC.
5. Number of alliances delivering CRC for <i>Construction Innovation</i> research outputs to industry.		The Industry Taskforce model has provided successful and two new taskforces have been developed for the new extension program of research through 2007-09.	Taskforces for digital modelling, safety and dispute avoidance have provided an industry perspective on the research outputs of the Extension Program. In each case the taskforce chairs have been from industry – Tony Barry representing ACEA, Andrew Gutteridge representing AIA and Dean Cippolla representing himself! Each task force is made up of representatives of over 12 industry organisations. CRC has partnered with industry training authorities and industry associations to deliver short courses and workshops in safety, relationship management, sustainability with events held in Brisbane,

PERFORMANCE INDICATOR	OBJECTIVE / TARGET	2007-08 PROGRESS / ACHIEVEMENT	2008-09 PROGRESS / ACHIEVEMENT
			<p>Sydney, Canberra, Perth and Adelaide.</p> <p>ASBEC – child of our CRC – continuing to act as peak national body in sustainability</p> <p>PCA – delivering our sustainability in commercial blgs to industry now through their new integrated website</p> <p>CIB promoting our path breaking C2020 industry foresight initiative to the world – as part of its global summary of Technology Outlooks to assist policy makers and construction practitioners across the world.</p> <p>ACIF has partnered with the CRC to develop a KPI dash board providing industry indicators for safety, sustainability, productivity etc.</p>
6. Growth in value of research training sponsorship awarded by government and industry for research and/or study related to CRC projects.		Top-up funding from government and industry participants to three scholars continued.	Scholarship program concluded 30 June 2008.
External Communication			
1. Press releases raising profile of CRC for <i>Construction Innovation</i> and its partners in the promotion of collaboration and innovation.		9 media releases were issued.	3 media releases were issued.
2. Growth in impact of publications recognised as key by industry and academic partners.		<p>1 former Minister launched Safer Construction publication - Hon Joe Hockey</p> <p>1 industry publication used as basis for education by USQ.</p>	<p>Newton, P., Hampson, K. and Drogemuller, R., (eds.) (2009) 'Technology, Design and Process Innovation in the Built Environment'. Taylor & Francis, Oxon, Abingdon, UK.</p> <p>Publication embodies the results of our CRC's research of the life of the centre. [2,818 citations at 5 Oct 09, www.scholar.google.com.au]</p> <p>The AIA/CRC BIM strategy – with their Integrated Practice Taskforce – a key national recommendation for improving</p>

PERFORMANCE INDICATOR	OBJECTIVE / TARGET	2007-08 PROGRESS / ACHIEVEMENT	2008-09 PROGRESS / ACHIEVEMENT
			<p>the productivity of the industry is making a difference.</p> <p>Sydney Opera House BIM publication used globally as a reference for applications of BIM for enhancing facility management of large complex buildings.</p> <p>Use of the CRC's refereed conference papers – series of 3 <i>Clients Driving Innovation</i> – widely used in academic libraries and referenced by researchers and students.</p> <p>Our safety publications – <i>Safer Construction, A Construction Safety Competency Framework, and A Practical Guide to Safety Leadership</i> have been in high demand with well over 2,500 being distributed and many more electronically downloaded.</p> <p>Offsite Manufacturing has provided the industry with a snapshot of where the technology is in Australia and where improvements should be targeted.</p>
3. Number of papers presented to national and international conferences and promotional activities.		<p>20 refereed conference papers to international conferences and 4 international industry presentations.</p> <p>21 papers to national conferences and 5 industry and academic presentations.</p>	<p>13 refereed conference papers to international conferences and 8 international industry presentations</p> <p>5 papers to national conference and 32 national promotional activities.</p>
4. Number of presentations to partners, industry and community groups.		<p>14 projects industry seminars and launches, 1 stakeholder workshop, 1 research symposium.</p>	<p>17 project industry seminars and launches.</p> <p>Approximately 30, overview presentations to various industry groups including BuildingSmart, BEIIC, ACIF, CEDA, AIA, ASBEC and individual participant organisations.</p>
Administration			
1. Satisfaction of participant and Commonwealth with financial and		<p>4 Executive Report Cards circulated to participants.</p> <p>The Board has approved all financial and research management systems and close monitoring of these</p>	<p>The Board has again approved all financial and research management systems and close monitoring of these systems occurs through the Board committees – Audit and</p>

PERFORMANCE INDICATOR	OBJECTIVE / TARGET	2007-08 PROGRESS / ACHIEVEMENT	2008-09 PROGRESS / ACHIEVEMENT
research management systems.		systems occurs through the Board committees – Audit and Compliance Committee and Research Committee. There have been no issues of concern to the Board regarding the operation of these systems. The Commonwealth has accepted all quarterly financial reports and no funding payments have been withheld.	Compliance Committee and Research Committee. There have been no issues of concern to the Board regarding the operation of these systems. The Commonwealth has accepted all quarterly financial reports and no funding payments have been withheld.
2. Effective Centre operations across all Commonwealth programs.		All reporting and audit milestones have been met. The Centre's Governing Board continues to express confidence in the established systems which are regularly monitored through the risk management process overseen by the Audit and Compliance Committee.	All reporting and audit milestones have again been met. The Centre's Governing Board continues to express confidence in the established systems which are regularly monitored through the risk management process overseen by the Audit and Compliance Committee.
3. Collaborative transactions with industry or government partners, including research projects.		6 industry conferences were sponsored and conference presentations provided.	5 industry conferences were sponsored and presentations provided for other industry groups including internationally the CIB Board and various CIB Working Parties including – TG58, TG66, W78 and W99. Other collaborative transactions have occurred with: BEIIC ASBEC AGIC ACIF
4. Growth in number of additional collaborations annually, particularly with industry.		The two-year extension program commenced successfully bringing on 6 new industry partners whilst retaining all existing partners. It has also attracted the involvement of 3 new industry partners at the project level. The extension program has proved highly successful in meeting its goals of extending our CRC for 12 months to position for the next CRC funding round and engaging existing and new partners on new emerging areas of research. It has allowed the 8 newly engaged industry organisations to experience the benefits of the CRC Program as they work with us	A new core participant, Parsons Brinckerhoff, has been engaged throughout this year. Three new scoping projects commenced to identify new research based on our existing strengths to position the future centre: . Gold Coast Light Rail Project . Victorian Schools Plan Exemplar . Princess Margaret Hospital Exemplar After undertaking an in-house two day workshop on Relationship Management, Downer EDI has requested access to the training material for a national roll out.

PERFORMANCE INDICATOR	OBJECTIVE / TARGET	2007-08 PROGRESS / ACHIEVEMENT	2008-09 PROGRESS / ACHIEVEMENT
		in developing the new CRC proposal.	<p>Engineering Education Australia partnered with the CRC to deliver RM workshops in Perth, Brisbane, and Sydney.</p> <p>Australian Parliamentary Services partnered to deliver an in-house program of workshops on sustainability.</p> <p>Safety courses continue in conjunction with Safety Dimensions.</p> <p>UNSW, Swinburne and Deakin Universities have partnered with the CRC to undertake research projects in safety, sustainability and digital modelling.</p> <p>CCF, ACA, ACEA, WA Main Roads have committed cash and in-kind resources to develop and deliver publications to the industry including a national road show.</p> <p>BIM guidelines – buildingSMART and AIA have partnered with CRC to endorse and assist in the dissemination of the BIM guidelines to industry.</p> <p>Australian Government Department of Infrastructure, Transport, Regional Development and Local Government has agreed to launch the Dispute Avoidance and Resolution publications and is represented on the interim board of the successor to this CRC – the Sustainable Built Environment National Research Centre.</p> <p>BEDP has invited COO, Research and Commercialisation to join a BIM roadshow in Feb 2010 presenting the future of BIM from a research perspective.</p>
5. Growth in repeat collaborations with partners on projects and related activities.		In 2007-08, there have been 18 active projects, 13 continuing and the 5 new projects from the extension research program. Across the 18 projects there has been an average of 6 partners engaged on each project. In addition, there are 3 new	<p>In 2008-09, there have been 18 active projects, 13 continuing and 5 new projects including 3 scoping projects to position the CRC for the future research centre which will evolve in 2010.</p> <p>Ongoing close engagement</p>

PERFORMANCE INDICATOR	OBJECTIVE / TARGET	2007-08 PROGRESS / ACHIEVEMENT	2008-09 PROGRESS / ACHIEVEMENT
		industry partners engaged at the project level across two of the new extension program projects.	with industry associations – particularly with the ACIF and individual members of ACIF (EA, ACEA, AIA, PCA, AIB, FMA) Greater influence and engagement in the CIB in the international context.

8.0 Glossary of Terms

Association of Consulting Engineers Australia	ACEA
Association of Researchers in Construction Management	ARCOM
Australian Building Codes Board	ABCB
Australian Construction Industry Forum	ACIF
Australian Constructors Association	ACA
Australian Institute of Architects	AIA
Australian Institute of Building	AIB
Australian Institute of Management	AIM
Australian Institute of Project Management	AIPM
Australian Procurement and Construction Council	APCC
Australian Sustainable Built Environment Council	ASBEC
Bovis Lend Lease	BLL
Building Code of Australia	BCA
Building Commission (Victoria)	BC
Building Information Modelling	BIM
Building Research Innovation Technology and Environment	BRITE
Built Environment Industry Innovation Council	BEIIC
Civil Contractors Federation	CCF
Commonwealth Scientific and Industrial Research Organisation	CSIRO
Computer-Assisted Design	CAD
Cooperative Research Centre	CRC
Cooperative Research Centre Association	CRCA
Facilities Management Association Australia	FMAA
Facility management	FM
Industry foundation classes	IFC
Information and communication technology	ICT
Intellectual property	IP
International Alliance for Interoperability	IAI
International Construction Research Alliance	ICALL
International Council for Research and Innovation in Building and Construction	CIB
Key performance indicators	KPIs
Life cycle analysis	LCA
Occupational Health and Safety	OHS
Outcomes performance indicators	OPI
Property Council of Australia	PCA
Public Private Partnership	PPP
Queensland Department of Main Roads	QDMR
Queensland Department of Public Works	QDPW
Queensland University of Technology	QUT
Research and development	R&D
Royal Melbourne Institute of Technology	RMIT
Small-to-medium size enterprise	SME
Soft systems methodology	SSM
Sustainable Built Environment National Research Centre	SBEnc
Sydney Opera House	SOH
Technical and Further Education	TAFE
The University of Newcastle	UN
University of New South Wales	UNSW
Urban Development Institute of Australia	UDIA
Victorian Department of Education and Early Childhood Development	VDEECD
Western Australian Department of Housing and Works	WADHW
Western Australian Department of Treasury and Finance	WADTF

Appendix 1 Publications

Publications – July 2008 – June 2009

Books

Brown, K., Hampson, K., Brandon, P. and Pillay, J. (eds.) (2008) '*Clients Driving Construction Innovation: Benefitting from Innovation*'. CRC for Construction Innovation, Brisbane.

Newton, P., Hampson, K. and Drogemuller, R. (eds.) (2009) 'Technology, Design and Process Innovation in the Built Environment'. Taylor & Francis, Oxon, Abingdon, UK.

Robinson-Fayek, A. and Hampson, K. (eds) (2009) 'Leveraging Innovation for Sustainable Construction, Proceedings of the CIB Task Group 58: Clients and Construction Innovation Workshop', University of Alberta, Edmonton, Canada.

Book Chapters

Austen, S. and Seymour R. 'The Competitive Impacts of Leveraged Training Outcomes'. In Brown, K., Hampson, K., Brandon, P. and Pillay, J. (eds.) *Clients Driving Construction Innovation: Benefitting from Innovation*. CRC for Construction Innovation, Brisbane, pp. 61-66.

Ballesty, S. (2008) 'FM Exemplar Project: Sydney Opera House' In Brown, K., Hampson, K., Brandon, P. and Pillay, J. (eds.) *Clients Driving Construction Innovation: Benefitting from Innovation*. CRC for Construction Innovation, Brisbane, pp. 159-162.

Bateman, J. (2008) 'Industry Capacity Analysis: A new methodology for public road infrastructure development in Queensland'. In Brown, K., Hampson, K., Brandon, P. and Pillay, J. (eds.) *Clients Driving Construction Innovation: Benefitting from Innovation*. CRC for Construction Innovation, Brisbane, pp. 241-248.

Biggs, H. Dingsday, D. and Roos, C. (2008) 'Development of a Practical Guide to Safety Leadership: Industry-based applications'. In Brown, K., Hampson, K., Brandon, P. and Pillay, J., (eds.) *Clients Driving Construction Innovation: Benefitting from Innovation*. CRC for Construction Innovation, Brisbane, pp. 154-158.

Brown, K., Furneaux, C. and Allan, D. (2008) 'Harmonisation of OHS Regulation in Australia: An evaluation of three initiatives'. In Brown, K., Hampson, K., Brandon, P. and Pillay, J. (eds.) *Clients Driving Construction Innovation: Benefitting from Innovation*. CRC for Construction Innovation, Brisbane, pp. 120-127.

Brown, K., Pillay, J. and Hampson, K. (2008) 'Benefitting from Innovation'. In Brown, K., Hampson, K., Brandon, P. and Pillay, J. (eds.) *Clients Driving Construction Innovation: Benefitting from Innovation*. CRC for Construction Innovation, Brisbane, pp. 2-4.

Dingsday, D. and Biggs, H. (2008) 'The Use of Lead Indicators in Safety Culture Research: Measuring construction industry safety performance'. In Brown, K., Hampson, K., Brandon, P. and Pillay, J., (eds.) *Clients Driving Construction Innovation: Benefitting from Innovation*. CRC for Construction Innovation, Brisbane, pp. 146-153.

Drogemuller, R. (2008) 'Virtual prototyping from need to pre-construction'. In: Brandon, P. and Kocaturk, T. (eds.) *Virtual Futures for Design, Construction and Procurement*, Blackwell Science Asia Pty Ltd, Carlton, Vic, pp. 113-130.

- Drogemuller, R. (2009) 'Collaboration using BIM Results of Cooperative Research Centre for Construction Innovation projects'. In: Qiping Shen, G., Brandon, P. and Baldwin, A. (eds) *Collaborative Construction Information Management*, Routledge, UK, pp. 55-67.
- Drogemuller, R., Akhurst, P. Hough, R. and Bull, S. (2008) 'An Exploration of BIM Opportunities at the Sydney Opera House'. In Brown, K., Hampson, K., Brandon, P. and Pillay, J., (eds.) *Clients Driving Construction Innovation: Benefitting from Innovation*. CRC for Construction Innovation, Brisbane, pp. 163-167.
- Furneaux, C., Vassilev, N., Burgess, J., Brown, K. and Ward, M. (2008) 'Streamlining Local Government: Evaluating an eGovernment initiative in south-east Queensland'. In Brown, K., Hampson, K., Brandon, P. and Pillay, J. (eds.) *Clients Driving Construction Innovation: Benefitting from Innovation*. CRC for Construction Innovation, Brisbane, pp. 28-38.
- Galvin, P., Tywoniak, S. and Sutherland, J. (2008) 'Knowledge and the Boundaries of the Firm: Implications for the construction industry'. In Brown, K., Hampson, K., Brandon, P. and Pillay, J., (eds.) *Clients Driving Construction Innovation: Benefitting from Innovation*. CRC for Construction Innovation, Brisbane, pp. 183-189.
- Hampson, K., Brown, K., Pillay, J. and Brandon, P. (2008) 'Key Lessons and Conclusions'. In Brown, K., Hampson, K., Brandon, P. and Pillay, J. (eds.) *Clients Driving Construction Innovation: Benefitting from Innovation*. CRC for Construction Innovation, Brisbane, pp. 249-251.
- Hardie, M. and Manley, K. (2008) 'Exemplars of Successful Innovation Delivery by Small and Medium Construction Enterprises'. In Brown, K., Hampson, K., Brandon, P. and Pillay, J. (eds.) *Clients Driving Construction Innovation: Benefitting from Innovation*. CRC for Construction Innovation, Brisbane, pp. 190-196.
- Mayze, B. and Bradley, L. (2008) 'Safety Culture: A multilevel assessment tool for the construction industry'. In Brown, K., Hampson, K., Brandon, P. and Pillay, J. (eds.) *Clients Driving Construction Innovation: Benefitting from Innovation*. CRC for Construction Innovation, Brisbane, pp. 136-145.
- Newton, P., Hampson, K. and Drogemuller R (2009) 'Transforming the Built Environment through Construction Innovation'. In Newton, P., Hampson, K. and Drogemuller, R. (eds) *Technology, Design and Process Innovation in the Built Environment*, Taylor & Francis, Abingdon, UK.
- Pillay, J. (2008) 'Towards harmonisation: Accreditation schemes and construction OHS'. In Brown, K., Hampson, K., Brandon, P. and Pillay, J. (eds.) *Clients Driving Construction Innovation: Benefitting from Innovation*. CRC for Construction Innovation, Brisbane, pp. 116-119.
- Rowlinson, S. and Cheung, F. (2008) 'Alliances in Australia: A long-term joint venture?' In Brown, K., Hampson, K., Brandon, P. and Pillay, J. (eds.) *Clients Driving Construction Innovation: Benefitting from Innovation*. CRC for Construction Innovation, Brisbane, pp. 84-88.
- Sharabah, A., Setunge, S., Godau, R. and Karagiannis, C. (2008) 'Effective Condition Monitoring and Assessment for More Sophisticated Asset Management Systems'. In Brown, K., Hampson, K., Brandon, P. and Pillay, J., (eds.) *Clients Driving Construction Innovation: Benefitting from Innovation*. CRC for Construction Innovation, Brisbane, pp. 174-182.
- Sokolick, L. (2008) 'Developers Delivering Safer Projects by Measuring What They Value'. In Brown, K., Hampson, K., Brandon, P. and Pillay, J. (eds.) *Clients Driving Construction Innovation: Benefitting from Innovation*. CRC for Construction Innovation, Brisbane, pp. 113-115.
- Soon Kam, L. and Yang, J. (2008) 'Developing Frameworks and Processes to Enhance Sustainability Deliverables in Infrastructure Projects'. In Brown, K., Hampson, K., Brandon, P. and Pillay, J. (eds.) *Clients Driving Construction Innovation: Benefitting from Innovation*. CRC for Construction Innovation, Brisbane, pp. 225-229.

Sperling, L., Charles, M., Ryan, R. and Brown, K. (2008) 'Communication as the Catalyst for Enhanced Safety Outcomes: A multi-stakeholder perspective'. In Brown, K., Hampson, K., Brandon, P. and Pillay, J. (eds.) *Clients Driving Construction Innovation: Benefitting from Innovation*. CRC for Construction Innovation, Brisbane, pp. 128-135.

Thorpe, D., Ryan, N. and Charles, M. (2008) 'Environmental Sustainability as an Innovation Driver Among Small- and Medium-sized Construction Companies'. In Brown, K., Hampson, K., Brandon, P. and Pillay, J. (eds.) *Clients Driving Construction Innovation: Benefitting from Innovation*. CRC for Construction Innovation, Brisbane, pp. 205-213.

Tucker, S., Brown, S., Egan, S., Boulaire, F., Morawska, L. and He, C. (2008) 'Estimating Indoor Air Quality Using Integrated 3D CAD Building Models'. In Brown, K., Hampson, K., Brandon, P. and Pillay, J. (eds.) *Clients Driving Construction Innovation: Benefitting from Innovation*. CRC for Construction Innovation, Brisbane, pp. 94-100.

Venkatesan, S., Setunge, S., Molyneaux, T. and Fenwick, J. (2008) 'Diagnostic Process Based on Fuzzy Logic for the Management of Bridges Exposed to Aggressive Environments'. In Brown, K., Hampson, K., Brandon, P. and Pillay, J. (eds.) *Clients Driving Construction Innovation: Benefitting from Innovation*. CRC for Construction Innovation, Brisbane, pp. 168-173.

Yum, K., Froese, T., Aranda-Mena, G., Sher, W. and Goodman, N. (2008) 'Model-Based Estimating for Concrete Bridges: A feasibility study'. In Brown, K., Hampson, K., Brandon, P. and Pillay, J. (eds.) *Clients Driving Construction Innovation: Benefitting from Innovation*. CRC for Construction Innovation, Brisbane, pp. 101-110.

Refereed Publications

Refereed Journal Articles

Austen, S. and Seymour, R. (2009) 'Can Governments use their Construction Contracts to Improve Training Outcomes?' *Journal of Purchasing and Supply Management*, 15 (2009), pp. 43-50.

Biggs, H. C., Dingsdag, D. P., Kirk, P. J., and Cipolla, D. (In Press) 'Safety Culture Research, Lead Indicators, and the Development of Safety Effectiveness Indicators in the Construction Sector'. *The International Journal of Technology, Knowledge and Society*.

Davis, P. (2008) 'A relationship approach to construction supply chains'. *Industrial Management and Data Systems* 108-3/4: pp. 310-327.

Furneaux, C.W., Brown, K.A. and Allan, D. (2008) 'Public Values Embedded in Australian Public Works Procurement', *Public Money and Management*, 28(3). pp. 167-172.

Lingard, H.C., Townsend, K.J., Bradley, L.M. and Brown, K.A. (2008) 'Alternative work schedule interventions in the Australian construction industry: a comparative case study analysis', *Construction Management and Economics*, 26(10). pp. 1101-1112. (Unpublished)

Love, P.E.D., Davis, P. R., Ellis, J.M. and Cheung, S.O. 'A Systemic View of Dispute Causation', Submitted to *Building Research and Information*.

Love, P.E.D., Davis, P. R., Ellis, J.M. and Cheung, S.O. 'An Exploratory Study of Project Dispute Pathogens', Submitted to *Building Research and Information*.

Love, P.E.D., David, P.R., Edwards, D.J., and Baccarini, D. (2008) 'Uncertainty avoidance: public sector clients and procurement selection', *International Journal of Public Sector Management*, Vol 12, Issue 7, pp. 753-776.

Manley, K., McFallan, S. and Kajewski, S. (2009) 'The relationship between construction firm strategies and innovation outcomes', *Journal of Construction Engineering and Management*, 135(8), 764-771.

Manley, K. (2008) "Implementation of innovation by manufacturers subcontracting to construction projects", *Journal of Engineering, Construction and Architectural Management*, Vol 15, No 3, pp. 230-245.

Manley, K. (2008) 'Against the odds: Small firms successfully introducing new technology on construction projects', *Research Policy*, 37(10), 1751-1764.

Rose, T. and Manley, K. (accepted 19/6/09) 'Financial incentives and advanced construction procurement systems' *Project Management Journal*.

Refereed Conference Papers

Ballesty S.P. and Brownjohn K., 'Current Challenges and Future Trends in Asset Management' (keynote) and 'Commercial Property: addressing the Sustainability Challenge', CPA Australia's Asset Accounting & Management series, Marriott Hotel, Brisbane, Australia, 30 April – 1 May 2009

Ballesty S.P. and Quinn M., 'Current Challenges and Future Trends in Asset Management' (keynote) and 'Commercial Property: addressing the Sustainability Challenge', CPA Australia's Asset Accounting & Management series, Oaks on Collins, Melbourne, Australia, 4-5 May 2009

Ballesty S.P., 'Managing the Built Environment: the Sydney Opera House experience'; 'FM Exemplar Project: Sydney Opera House' - Adopting BIM for Facilities Management'; 'Managing the Built Environment: a view from downunder'; 'Total Asset Management (TAM): the Sydney Opera House experience'; 'Sustainability in FM: a view from downunder' and 'RICS's Technical Due Diligence Guidelines US launch', Rock the Foundation 2009 tour, nine keynote presentations various venues, Chicago IL, Boston MA, New York NY and Atlanta GA, USA, 15-24 April 2009.

Ballesty S.P., 'FM Action Agenda conclusions' (opening keynote) and 'REliefing Strategies for Aging Buildings', Marcus Evan's Next-Gen FM'08 conference, Marriott, Sydney, Australia, 8-9 December 2008.

Ballesty S.P., 'Facilities Management in the 21st Century' (opening keynote), IIR's Facilities Management 2008 conference, Crowne Plaza, Sydney, Australia, 17-18 February 2009.

Ballesty S.P., 'FM Downunder #3: FM Action Agenda conclusions', International Facility Management Association (IFMA)'s World Workplace 2008 Conference, Dallas Convention Center, Dallas TX, USA, 15-17 October 2008.

Biggs, H.C., Dingsdag, D.P., Kirk, P.J. and Cipolla, D. 'Safety culture research, lead indicators, and the development of safety effectiveness indicators in the construction sector', 5th International Conference on Knowledge Technology and Society, 30 January - 1 February 2009, Huntsville AL, USA. (Unpublished)

Furneaux, C., Brown, K. and McCabe, A. 'Managing Multi-objective Building Contracts: Public Art in Public Building Procurement'. 22nd ANZAM Conference 2008: Managing in the Pacific Century, 2 – 5 December 2008, Auckland, New Zealand.

Gu, N., Singh, V., London, K., Brankovic, L., Taylor, C. 'BIM: Expectations and a Reality Check', 12th International Conference on Computing in Civil and Building Engineering, Beijing, China, 16-18 October 2008.

Hampson, K. 'A Sustainable Industry R&D Program', Leveraging Innovation for Sustainable Construction Conference, University of Alberta, Edmonton, Canada, 18-19 May 2009.

Kraatz, J., Kajewski, S. and Manley, K. 'Value mapping for urban infrastructure projects: Mapping project outcomes to corporate objectives', CIB Transformation Through Construction Conference, Dubai, November 2008.

Kraatz, J., Kajewski, S. and Manley, K. 'Mapping values: Aligning project outcomes with Brisbane City Council's Living in Brisbane 2026 themes', Centre for Sub Tropical Design Conference, Queensland University of Technology, Brisbane, Australia, September 2008.

London, K., Singh, V., Taylor, C., Gu, N. and Brankovic, L. 'Building Information Modelling Project Decision Support Framework', Association of Researchers in Construction Management (ARCOM) 24th Annual Conference, Cardiff, United Kingdom, 1-3 September 2008.

Lopez, R, Davis, P, Jasper, T, Love, P, and London, K. 'It's Not Just About Bricks and Mortar: Procedural Failures in Construction'. Association of Researchers in Construction Management (ARCOM) 24th Annual Conference, Cardiff, United Kingdom, 1-3 September 2008.

Love, P.E.D., Davis, P., London, K. and Jasper, T., 'Causal Modelling of Construction Disputes', Association of Researchers in Construction Management (ARCOM) 24th Annual Conference, Cardiff, United Kingdom, 1-3 September 2008.

Manley, K., Marceau, J., Parker, R. and Matthews, J. 'Getting a foot in the door: Exploring how small innovative firms contribute to project outcomes', *Australia and New Zealand Academy of Management Conference*, University of Auckland, New Zealand, 2-5 December 2008.

Manley, K., McFallan, S., Swainston, M. and Kajewski, S. 'Assessing the value of different business strategies to innovation by firms in the construction industry', *The 4th IEEE International Conference of Management of Innovation and Technology*, Bangkok, Thailand, 21-24 September 2008.

Manley, K. and McFallan, S. 'Business Strategies Supporting Effective Implementation of Innovation by Project-Based Firms', *Academy of Management 2008 Annual Meeting*, Anaheim, U.S., 8-13 August 2008.

Appendix 2 Scholars Update

Current CRC Scholarship Holders – Yet to Graduate

Scholarship Type PhD/ Masters	University	Student	Research Topic Title	Academic Supervisor (Associate Supervisor)	Industry Supervisor	Project Aligned to	Date Scholarship Awarded	Expected Completion Date	Comment
PhD	QUT	Brett Mayze	Multilevel Approach to Safety Culture in Construction Industry Benefit to industry: Identification of impact safety leadership training can have for a large construction contractor.	Lisa Bradley	Dean Cipolla JHG	Program A	24-Jan-05	23-Oct-08	As of November 2008, Brett reached his PhD term and all data has been collected (pilot, study1 and study 2). Brett applied and was granted an additional extension to write up his thesis which was due to expire end of March 2009. However, since January 2009, Brett has returned to full time work and has been granted a leave of absence which, with the remainder of his previous extension, should see him finish his PhD by December 2009. Brett is still in contact with Dean Cipolla (JHG) and has finalised his part time work with JHG in March 2009. Brett is currently finalising a role with Maritime Safety Queensland and is part of a large commercial tender team with Worley Parsons to investigate Qld Rail's safety culture and risk management practices.
PhD	QUT	Judy Kraatz	Value-Mapping for Major Economic Infrastructure Projects for the Australian Public Sector Benefit to Industry: Improved ability to better identify and align project outcomes and impacts with stated corporate objectives as well as assist in managing risks and minimise possible ecological and social harm.	Stephen Kajewski (Karen Manley)	Scott Stewart BCC	Program C	22-May-06	22-May-09	Judy is on track for the 3 year completion of her PhD (one of the few scholars not to have requested an extension) and has submitted it for external examination. Her PhD focus and commitment to timelines as well as the quality of her results have been impressive. Judy undertakes consultancy work via her business Terrella Consulting (currently both research based and commercial). Judy submitted and had accepted a conference paper to CIB DUBAI 15-17 Nov 08 entitled <i>Value Mapping For Major Economic Infrastructure Projects</i> by Judy Kraatz, Prof Stephen Kajewski & Dr Karen Manley.
PhD	QUT	Soon Kam Lim	Decision Making Processes for Sustainable Infrastructure Projects Benefit to Industry: Improved understanding among stakeholders and better sustainability reporting mechanisms.	Jay Yang	Derek Skinner QDMR	Program B	01-Oct-06	01-Oct-09	In February 2009, QUT awarded Soon Kam Lim the 2008 Higher Degree Research Student Award (Faculty of Built Environment & Engineering) for research into sustainable construction. Soon Kam's research is progressing well and on track for completion, with submission for external examinations intended to occur by Sept 2009. His industry supervisor comments <i>"The 26 identified key issues align with my experience. Actions nominated to identify and address each issue are realistic and consistent with good practice"</i> . Eight refereed conference papers have been published or are to be published to date, with Soon Kam as lead author on six of these.

Current CRC Scholarship Holders – Yet to Graduate (Cont'd)

Scholarship Type PhD/ Masters	University	Student	Research Topic Title	Academic Supervisor (Associate Supervisor)	Industry Supervisor	Project Aligned to	Date Scholarship Awarded	Expected Completion Date	Comment
PhD	RMIT	Agustin Chevez Bernaldo de Quiros	Evolution of Workplace Architecture as a Consequence of Technology Development Benefit to Industry: Identification of holistic approaches to the design of and to strategically manage new and redeveloped office environments	Guillermo Aranda-Mena	James Calder Woods Bagot	Program C	18-Sep-06	18-Sep-09	Agustin is currently at the last stage of his PhD investigation and writing-up. He intends to submit a final Thesis draft to his supervisors by June 2009. The draft will initially be for internal revision by his supervisors before posting the final manuscript for external examination. A number of examiners from the UK and the US have been suggested by the Head of the School and the candidate's supervisors. It is anticipated that preliminary results of the research will be published in The Built and Human Environment Review (www.tbher.org). This forum was chosen because it is an internationally renowned open access scholarly peer-review electronic journal dedicated to postgraduate research in the built environment. Agustin is providing research for the CRCs 2007-002-EP National Guidelines and Case Studies. He is currently completing the eGrad School's Knowledge Transfer & Research Commercialisation Grad Certificate.
PhD	RMIT	Abdulkader Sharabah	A Reliability Based Predictive Model for Building Asset Management Benefit to Industry: Development of tools to support decisions on maintenance priority in relation to all building elements.	Sujeeva Setunge	Axl Driml QDPW	Program C	18-Sep-06	18-Sep-09	Abdul is in the final stage of analysing data for his PhD, followed by writing his thesis. He expects to finish his PhD on time. Abdul has recently married and taken a leave of absence until 15 Mar 09. Abdul works part time in VicRoads as Asset/Program Delivery Engineer. He is developing Road Maintenance plans/ strategies for Melbourne Metro North West region. Although dealing with roads Abdul is applying the same principle as his thesis for buildings. Abdul enjoys the job because he can use the experience he has from his research in different fields. As well as that, RMIT has contacted a number of Local Governments regarding Abdul's research. These agencies have expressed interest and support for his area of research.
PhD	Curtin	Robert Lopez	Design Management: Error Reduction and Containment Strategies in Projects Benefit to Industry: Highlight how fewer design errors can result in less waste, less rework and improved project performance in terms of schedule and budget.	Peter Love (Peter Davis)	Peter Tilley WADHW	Program C	07-May-07	01-Apr-10	Robert's research is progressing as planned. The 1st stage case study interviews are approaching completion & application for renewal of Level A ethics approval is being prepared. Work on remaining sections of the thesis has commenced. Reasons for design errors have been identified. Three refereed conference papers have been co-authored by Robert and presented at the ARCOM 2008 conference in Cardiff Sept 08. Robert has stated that while an academic/research career appears likely, he has been too preoccupied with the completion of his thesis in approx 12 months time to make definite determinations on his future.

Completed CRC Scholarship Period – Study Ongoing

Scholarship Type PhD/ Masters	University	Student	Research Topic Title	Academic Supervisor (Associate Supervisor)	Industry Supervisor	Project Aligned to	Date Scholarship Awarded	Expected Completion Date	Comment
PhD	QUT	Craig Fumeaux	Policy Networks: Demonstrating their Presence, Structure & Network	Kerry Brown (Amanda Gudmundsson)		2004-032-A	01-Jun-05	30-May-08	Craig continues his PhD studies, with one more year to go and has a full time scholarship from CIEAM. He is based at the School of Management, QUT and works as a part time Research Fellow for CRC CI
Masters by Research	QUT	Adrian Cupitt	Microclimatic Impacts on the Built Environment - Extension of Day Lighting Theory to Produce Algo- rithms for Light Technical Parameters for any Location	Stephen Coyne	Ron Apelt QDPW	2004-002-B	01-Jul-06	30-Dec-07	Although Adrian's scholarship period has concluded, he continues part time with his Masters and is looking to graduate mid 2009. Adrian has presented his findings from his research in New Zealand in October 2008 and since then has decided to extend the project to make the outcomes more user-friendly. He will be presenting his findings from this extra work in Bangkok in April 09. He currently works in the QUT Photometric Laboratory, Faculty of Science & Technology as a technician, testing lights to Australian Standards, calibrating light meters, and testing the reflection and transmission of materials. He also lectures and provides practical demonstrations for the QUT Lighting Courses and Optometry subjects.

Completed CRC Scholarship Period – Postponed

Scholarship No	Scholarship Type PhD/ Masters	University	Student	Research Topic Title	Academic Supervisor (Associate Supervisor)	Industry Supervisor	Project Aligned to	Date Scholarship Awarded	Expected Completion Date	Comment
S2003_007	PhD	UWS	Colin Greville	Psychology of Sustainable Development	Alan Jeary (Graham Miller)	John Oliver, Rider Hunt	Program B	28-Jul-03	26-Dec-07	In 2007, Col withdrew from study because of personal reasons and his current workload. He would however, like to return to his PhD in the future. Col is a self employed builder and building inspector in the Wide Bay/ Central Qld area and is currently is a qualified building certifier. In Sept 2008, Col provided a submission to the Senate Inquiry into Australia's Mandatory Last Resort Home Warranty Insurance Scheme operating ineffectively in NSW and was the major reason for Col's move from NSW to Qld in 2003. Col's scholarship period has concluded and no outstanding monies remain.
S2006-001	PhD	QUT	Colleen Yuile	Attention to CSR by Australian Corporations: Trends Over Time and the Relationship with Financial Performance	Boris Kabanoff & Amanda Gudmundsson	N/A	Program A	03-Feb-06	02-Feb-09	Colleen articulated from a PhD to a Masters by Research in 2007, however has recently withdrawn from her study owing to ongoing unsolved difficulties relating to programs required for the data investigation. Colleen now works as HR Manager for Terex Cranes at Eagle Farm Brisbane. As this was a top up scholarship for one year, no outstanding monies remain and the scholarship is concluded.

Appendix 3 Staff Tables

Staff Table 1 - CRC In Kind Staff

Arup

Name	Main activity	Total % of time	Program A	Program B	Program C	Extension Program	Scoping Projects	Research total (%)	Education (%)	External Comm. (%)	Commercialisation (%)	CRC Admin. (%)
John Hainsworth	R	0.7%	-	-	-	0.7%	-	0.7%	-	-	-	-
Richard Hough	R	3.3%	-	-	-	1.9%	-	3.3%	-	-	-	-
TOTAL CONTRIBUTED (% of PERSON YEARS)		3.9%	0.0%	0.0%	0.0%	2.6%	0.0%	3.9%	0.0%	0.0%	0.0%	0.0%

Bovis Lend Lease

Name	Main activity	Total % of time	Program A	Program B	Program C	Extension Program	Scoping Projects	Research total (%)	Education (%)	External Comm. (%)	Commercialisation (%)	CRC Admin. (%)
Ross Daddo	R	0.8%	-	-	-	0.8%	-	0.8%	-	-	-	-
Simon Hardy	R	7.5%	-	-	-	7.5%	-	7.5%	-	-	-	-
TOTAL CONTRIBUTED (% of PERSON YEARS)		8.3%	0.0%	0.0%	0.0%	8.3%	0.0%	8.3%	0.0%	0.0%	0.0%	0.0%

John Holland Group

Name	Main activity	Total % of time	Program A	Program B	Program C	Extension Program	Scoping Projects	Research total (%)	Education (%)	External Comm. (%)	Commercialisation (%)	CRC Admin. (%)
Dean Cipolla	R	17.6%	-	-	-	-	-	5.7%	-	-	-	12.0%
David Golightly	R	2.7%	-	-	-	-	-	0.0%	-	-	-	2.7%
Jim Pevitt	R	1.8%	-	-	-	-	-	0.0%	-	-	-	1.8%
Stephen Sasse	R	5.4%	-	-	-	-	-	0.0%	-	-	-	5.4%
TOTAL CONTRIBUTED (% of PERSON YEARS)		27.6%	0.0%	0.0%	0.0%	0.0%	0.0%	5.7%	0.0%	0.0%	0.0%	21.9%

Leighton Contractors

Name	Main activity	Total % of time	Program A	Program B	Program C	Extension Program	Scoping Projects	Research total (%)	Education (%)	External Comm. (%)	Commercialisation (%)	CRC Admin. (%)
Rick Collins	R	17.8%	-	-	-	17.8%	-	17.8%	-	-	-	-
Lambert van der Heide	R	0.5%	-	-	-	-	-	0.5%	-	-	-	-
TOTAL CONTRIBUTED (% of PERSON YEARS)		18.3%	0.0%	0.0%	0.0%	17.8%	0.0%	18.3%	0.0%	0.0%	0.0%	0.0%

Mirvac

Name	Main activity	Total % of time	Program A	Program B	Program C	Extension Program	Scoping Projects	Research total (%)	Education (%)	External Comm. (%)	Commercialisation (%)	CRC Admin. (%)
Shane McAtee	R	1.2%	-	-	-	1.2%	-	1.2%	-	-	-	-
Gary McCann	R	0.4%	-	-	-	0.4%	-	0.4%	-	-	-	-
TOTAL CONTRIBUTED (% of PERSON YEARS)		1.6%	0.0%	0.0%	0.0%	1.6%	0.0%	1.6%	0.0%	0.0%	0.0%	0.0%

Nexus Point

Name	Main activity	Total % of time	Program A	Program B	Program C	Extension Program	Scoping Projects	Research total (%)	Education (%)	External Comm. (%)	Commercialisation (%)	CRC Admin. (%)
Rainer Hillermann	R	0.2%	-	-	-	0.2%	-	0.2%	-	-	-	-
Claudelle Taylor	R	10.0%	-	-	-	10.0%	-	10.0%	-	-	-	-
TOTAL CONTRIBUTED (% of PERSON YEARS)		10.2%	0.0%	0.0%	0.0%	10.2%	0.0%	10.2%	0.0%	0.0%	0.0%	0.0%

Parsons Brinckerhoff

Name	Main activity	Total % of time	Program A	Program B	Program C	Extension Program	Scoping Projects	Research total (%)	Education (%)	External Comm. (%)	Commercialisation (%)	CRC Admin. (%)
Mark Le Pla	R	7.5%	-	-	-	-	-	7.5%	-	-	-	-
TOTAL CONTRIBUTED (% of PERSON YEARS)		7.5%	0.0%	0.0%	0.0%	0.0%	0.0%	7.5%	0.0%	0.0%	0.0%	0.0%

Rider Levett Bucknall

Name	Main activity	Total % of time	Program A	Program B	Program C	Extension Program	Scoping Projects	Research total (%)	Education (%)	External Comm. (%)	Commercialisation (%)	CRC Admin. (%)
Stephen Ballesty	R	1.7%	-	-	-	-	-	1.7%	-	-	-	-
Angie Chui	R	0.4%	-	-	-	0.4%	-	0.4%	-	-	-	-
Greg Nowak	R	6.3%	-	-	-	-	-	0.5%	-	-	5.8%	-
John Oliver	R	20.0%	1.3%	-	-	4.9%	-	17.3%	-	-	2.7%	-
Cameron Smith	R	0.5%	-	-	-	-	-	0.0%	-	-	0.5%	-
David Stewart	R	0.1%	-	-	-	-	-	0.1%	-	-	-	-
Reginald Streifler	R	8.1%	-	-	-	3.6%	-	3.6%	-	-	4.5%	-
TOTAL CONTRIBUTED (% of PERSON YEARS)		37.1%	1.3%	0.0%	0.0%	8.9%	0.0%	23.7%	0.0%	0.0%	13.5%	0.0%

Sydney Opera House

Name	Main activity	Total % of time	Program A	Program B	Program C	Extension Program	Scoping Projects	Research total (%)	Education (%)	External Comm. (%)	Commercialisation (%)	CRC Admin. (%)
Michael Clark	R	32.9%	-	-	-	32.9%	-	32.9%	-	-	-	-
Chris Linning	R	7.5%	-	-	-	7.5%	-	7.5%	-	-	-	-
Naomi Martin	R	1.1%	-	-	-	1.1%	-	1.1%	-	-	-	-
Greg McTaggart	R	3.5%	-	-	-	3.5%	-	3.5%	-	-	-	-
TOTAL CONTRIBUTED (% of PERSON YEARS)		45.0%	0.0%	0.0%	0.0%	45.0%	0.0%	45.0%	0.0%	0.0%	0.0%	0.0%

Thiess

Name	Main activity	Total % of time	Program A	Program B	Program C	Extension Program	Scoping Projects	Research total (%)	Education (%)	External Comm. (%)	Commercialisation (%)	CRC Admin. (%)
Dean Bingham	R	4.6%	-	-	-	4.6%	-	4.6%	-	-	-	-
Kike Boyle	R	0.2%	-	-	-	0.2%	-	0.2%	-	-	-	-
Dirk Clapham	R	0.5%	-	-	-	0.5%	-	0.5%	-	-	-	-
Erik Isokangas	R	7.9%	-	-	-	7.9%	-	7.9%	-	-	-	-

Ted Williams	R	1.0%	-	-	-	1.0%	-	1.0%	-	-	-	-
TOTAL CONTRIBUTED (% of PERSON YEARS)		14.2%	0.0%	0.0%	0.0%	14.2%	0.0%	14.2%	0.0%	0.0%	0.0%	0.0%

Woods Bagot

Name	Main activity	Total % of time	Program A	Program B	Program C	Extension Program	Scoping Projects	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
Jams Calder	R	0.3%	-	-	-	-	-	0.0%	-	-	-	0.3%
David Marchant	R	0.9%	-	-	-	0.6%	-	0.6%	-	-	-	0.4%
TOTAL CONTRIBUTED (% of PERSON YEARS)		1.2%	0.0%	0.0%	0.0%	0.6%	0.0%	0.6%	0.0%	0.0%	0.0%	0.7%

Australian Building Codes Board

Name	Main activity	Total % of time	Program A	Program B	Program C	Extension Program	Scoping Projects	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
Brian Ashe	R	0.8%	-	-	-	-	-	0.8%	-	-	-	-
Ivan Donaldson	R	0.1%	-	-	-	-	-	0.1%	-	-	-	-
TOTAL CONTRIBUTED (% of PERSON YEARS)		0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%	0.0%	0.0%	0.0%	0.0%

Building Commission

Name	Main activity	Total % of time	Program A	Program B	Program C	Extension Program	Scoping Projects	Research total (%)	Education (%)	External Comm. (%)	Commercial-isation (%)	CRC Admin. (%)
Dennis Hogan	R	0.2%	-	-	-	-	-	0.2%	-	-	-	-
Jeff Norton	R	0.6%	-	-	-	-	-	0.6%	-	-	-	-
TOTAL CONTRIBUTED (% of PERSON YEARS)		0.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%	0.0%	0.0%	0.0%	0.0%

Queensland Department of Main Roads

Name	Main activity	Total % of time	Program A	Program B	Program C	Extension Program	Scoping Projects	Research total (%)	Education (%)	External Comm. (%)	Commercialisation (%)	CRC Admin. (%)
Ross Guppy	R	4.8%	-	-	-	-	-	1.0%	-	-	-	3.8%
David Kelly	R	0.9%	-	-	-	0.9%	-	0.9%	-	-	-	-
Ian Reeves	R	0.9%	-	-	-	0.4%	-	0.4%	-	-	-	0.5%
John Spathonis	R	0.3%	-	-	-	-	-	0.0%	-	-	-	0.3%
Alan Tesch	R	0.1%	-	0.1%	-	-	-	0.1%	-	-	-	-
Dennis Wogan	R	6.2%	-	-	-	4.7%	-	4.7%	-	-	-	1.5%
TOTAL CONTRIBUTED (% of PERSON YEARS)		13.0%	0.0%	0.1%	0.0%	6.0%	0.0%	7.0%	0.0%	0.0%	0.0%	6.0%

Queensland Department of Public Works

Name	Main activity	Total % of time	Program A	Program B	Program C	Extension Program	Scoping Projects	Research total (%)	Education (%)	External Comm. (%)	Commercialisation (%)	CRC Admin. (%)
Don Allan	R	0.3%	-	-	-	-	-	0.0%	-	-	-	0.3%
Ron Apelt	R	3.1%	-	-	1.3%	-	-	1.3%	1.9%	-	-	-
Ashely Byrnes	R	2.2%	-	-	-	2.2%	-	2.2%	-	-	-	-
Jeff Brown	R	1.3%	-	-	-	1.3%	-	1.3%	-	-	-	-
Dayv Carter	R	1.6%	-	-	-	1.1%	-	1.6%	-	-	-	-
John Cogan	R	1.7%	-	-	-	1.7%	-	1.7%	-	-	-	-
Thomas Fussell	R	26.5%	-	-	-	26.5%	-	26.5%	-	-	-	-
Bob Giles	R	0.7%	-	-	-	0.2%	-	0.7%	-	-	-	-
Adam Hinde	R	0.9%	-	-	-	0.9%	-	0.9%	-	-	-	-
Roger Hope	R	0.3%	-	-	-	0.3%	-	0.3%	-	-	-	-
Adrian Lo	R	0.3%	-	-	-	0.3%	-	0.3%	-	-	-	-
Lee Rapley	A	0.1%	-	-	-	-	-	0.1%	-	-	-	-
Max Smith	A	5.7%	-	-	-	-	-	0.9%	-	-	-	4.8%
Julia Willis	A	1.1%	-	-	-	-	-	0.0%	-	-	-	1.1%
TOTAL CONTRIBUTED (% of PERSON YEARS)		45.6%	0.0%	0.0%	1.3%	34.4%	0.0%	37.6%	1.9%	0.0%	0.0%	6.1%

Department of Treasury and Finance

Name	Main activity	Total % of time	Program A	Program B	Program C	Extension Program	Scoping Projects	Research total (%)	Education (%)	External Comm. (%)	Commercialisation (%)	CRC Admin. (%)
Janene Adey	R	0.2%	-	-	-	-	-	0.0%	-	-	-	0.2%
Darral Haynes	R	0.3%	-	-	-	-	-	0.0%	-	-	-	0.3%
Richard Mann	R	3.2%	-	-	-	-	0.3%	0.3%	-	1.3%	-	1.7%
Graeme Mclean	R	0.7%	-	-	-	-	0.3%	0.3%	-	0.5%	-	-
Sam Mileti	R	1.1%	-	-	-	-	-	0.0%	-	-	-	1.1%
TOTAL CONTRIBUTED (% of PERSON YEARS)		5.5%	0.0%	0.0%	0.0%	0.0%	0.5%	0.5%	0.0%	1.8%	0.0%	3.2%

CSIRO

Name	Main activity	Total % of time	Program A	Program B	Program C	Extension Program	Scoping Projects	Research total (%)	Education (%)	External Comm. (%)	Commercialisation (%)	CRC Admin. (%)
Angelo Delsante	R	3.3%	-	3.3%	-	-	-	3.3%	-	-	-	-
Kevin McDonald	R	2.1%	-	-	-	-	-	0.0%	-	-	2.1%	-
TOTAL CONTRIBUTED (% of PERSON YEARS)		5.4%	0.0%	3.3%	0.0%	0.0%	0.0%	3.3%	0.0%	0.0%	2.1%	0.0%

Curtin University of Technology

Name	Main activity	Total % of time	Program A	Program B	Program C	Extension Program	Scoping Projects	Research total (%)	Education (%)	External Comm. (%)	Commercialisation (%)	CRC Admin. (%)
David Baccarini	R	1.3%	-	-	1.3%	-	-	1.3%	-	-	-	-
Peter Davis	R	23.8%	-	-	2.5%	18.8%	2.5%	23.8%	-	-	-	-
Peter Galvin	R	11.3%	11.3%	-	-	-	-	11.3%	-	-	-	-
Peter Love	R	28.8%	-	-	2.5%	26.3%	-	28.8%	-	-	-	-
Sarah Niran	A	2.8%	-	-	-	-	-	2.8%	-	-	-	-
Lily Tandi	A	0.5%	-	-	-	-	-	0.5%	-	-	-	-

TOTAL CONTRIBUTED (% of PERSON YEARS)		68.3%	11.3%	0.0%	6.3%	45.0%	2.5%	68.3%	0.0%	0.0%	0.0%	0.0%
--	--	--------------	--------------	-------------	-------------	--------------	-------------	--------------	-------------	-------------	-------------	-------------

The University of Newcastle

Name	Main activity	Total % of time	Program A	Program B	Program C	Extension Program	Scoping Projects	Research total (%)	Education (%)	External Comm. (%)	Commercialisation (%)	CRC Admin. (%)
Ljiliana Brankovic	R	7.5%	-	-	-	7.5%	-	7.5%	-	-	-	-
Ning Gu	R	8.8%	-	-	-	8.8%	-	8.8%	-	-	-	-
Kerry London	R	7.5%	1.8%	-	-	5.5%	-	7.5%	-	-	-	-
TOTAL CONTRIBUTED (% of PERSON YEARS)		23.8%	1.8%	0.0%	0.0%	21.8%	0.0%	23.8%	0.0%	0.0%	0.0%	0.0%

Queensland University of Technology

Name	Main activity	Total % of time	Program A	Program B	Program C	Extension Program	Scoping Projects	Research total (%)	Education (%)	External Comm. (%)	Commercialisation (%)	CRC Admin. (%)
Alyssa Bates	A	2.5%	-	-	-	-	-	0.0%	-	-	-	2.5%
Bert Biggs	R	38.8%	-	-	-	23.8%	-	23.8%	-	-	15.0%	-
Donald Dingsdag	R	25.0%	-	-	-	15.0%	-	15.0%	-	-	10.0%	-
Robin Drogemuller	R	38.1%	-	-	2.5%	20.6%	8.8%	23.1%	-	-	15.0%	-
Craig Furneaux	R	4.3%	4.3%	-	-	-	-	4.3%	-	-	-	-
Keryn Gray	A	10.8%	-	-	-	-	-	10.8%	-	-	-	-
David Hood	R	2.5%	-	-	-	-	-	2.5%	-	-	-	-
Rosemary Kennedy	R	1.3%	-	1.3%	-	-	-	1.3%	-	-	-	-
Donald Lam	A	4.0%	-	-	-	-	-	2.0%	-	-	-	2.0%
Richi Nayak	R	1.3%	-	1.3%	-	-	-	1.3%	-	-	-	-
David Neilsen	R	5.0%	-	-	-	5.0%	-	5.0%	-	-	-	-
Stephane Tywoniak	R	5.0%	5.0%	-	-	-	-	5.0%	-	-	-	-
TOTAL CONTRIBUTED (% of PERSON YEARS)		138.3%	9.3%	2.5%	2.5%	64.3%	8.8%	93.8%	0.0%	0.0%	40.0%	2.0%

Royal Melbourne Institute of Technology

Name	Main activity	Total % of time	Program A	Program B	Program C	Extension Program	Scoping Projects	Research total (%)	Education (%)	External Comm. (%)	Commercialisation (%)	CRC Admin. (%)
Guillermo Aranda-Mena	R	6.3%	-	-	-	6.3%	-	6.3%	-	-	-	-
Nick Blismas	R	10.0%	-	-	-	10.0%	-	10.0%	-	-	-	-
Ron Wakefield	R	4.8%	-	-	-	4.8%	-	4.8%	-	-	-	-
TOTAL CONTRIBUTED (% of PERSON YEARS)		21.0%	0.0%	0.0%	0.0%	21.0%	0.0%	21.0%	0.0%	0.0%	0.0%	0.0%

Staff Table 2 - CRC Paid Program Staff

Name	Employing organisation	Main activity	Total % of time	% spent on Research Program					% spent on Education	% spent on External Comm.	% spent on Commercialisation	% spent on CRC Administration
				Subprogram				Total on Research				
				A	B	C	EP					
Michael Ambrose	CSIRO	R	0.2%	-	0.2%	-	-	0.2%	-	-	-	-
Fanny Boulaire	CSIRO	R	0.3%	-	0.3%	-	-	0.3%	-	-	-	-
Brenton Burger	Curtin	R	14.2%	-	-	14.2%	-	14.2%	-	-	-	-
Dong Chen	CSIRO	R	0.2%	-	0.2%	-	-	0.2%	-	-	-	-
Agustin Chevez Bernaldo de Quiros	RMIT	R	24.8%	-	-	1.2%	23.6%	24.8%	-	-	-	-
John Crawford	RMIT	R	18.0%	-	-	-	18.0%	18.0%	-	-	-	-
Yohann Daruwala	USYD	R	0.1%	-	-	0.1%	-	0.1%	-	-	-	-
Jennifer Davies	QUT	R	5.9%	5.9%	-	-	-	5.9%	-	-	-	-
Angelo Delsante	CSIRO	R	11.2%	-	11.2%	-	-	11.2%	-	-	-	-
Lan Ding	CSIRO	R	0.6%	-	-	-	-	0.0%	-	-	0.6%	-
Stephen Egan	CSIRO	R	0.2%	-	-	-	-	0.0%	-	-	0.2%	-
Craig Furneaux	QUT	R	75.0%	65.0%	-	-	10.0%	75.0%	-	-	-	-
Gayleen Furneaux	QUT	R	27.4%	27.4%	-	-	-	27.4%	-	-	-	-
Ting (Esther) Ge	QUT	R	25.0%	-	25.0%	-	-	25.0%	-	-	-	-
Carole Green	CRC HQ	A	100.0%	-	-	-	-	10.0%	10.0%	10.0%	15.0%	55.0%
Keith Hampson	CRC HQ	R	100.0%	-	-	-	-	25.0%	10.0%	25.0%	20.0%	20.0%
Robert Kivits	QUT	R	36.5%	36.5%	-	-	-	36.5%	-	-	-	-
James Harley	RMIT	R	6.6%	-	-	-	6.6%	6.6%	-	-	-	-
Md Zahidul Islam	UN	R	2.9%	-	-	-	2.9%	2.9%	-	-	-	-
Sandra Janssen	QUT	R	27.4%	27.4%	-	-	-	27.4%	-	-	-	-
Thomas Jasper	Curtin	R	34.1%	-	-	-	34.1%	34.1%	-	-	-	-
David Jellie	RMIT	R	25.3%	-	-	-	25.3%	25.3%	-	-	-	-
Mi Jeong Kim	USYD	R	0.3%	-	-	0.3%	-	0.3%	-	-	-	-
Loretta Kivlighon	CSIRO	R	0.9%	-	0.9%	-	-	0.9%	-	-	-	-
Susan Loh	QUT	R	6.3%	-	6.3%	-	-	6.3%	-	-	-	-
Robert Lopez	Curtin	R	31.2%	-	-	11.2%	20.0%	31.2%	-	-	-	-
Angela McCabe	QUT	R	34.7%	34.7%	-	-	-	34.7%	-	-	-	-
Kevin McDonald	CSIRO	R	14.6%	-	-	-	-	0.0%	-	-	14.6%	-
Stephen McFallan	CSIRO	R	1.1%	1.1%	-	-	-	1.1%	-	-	-	-

Staff Table 2 - CRC Paid Program Staff (Cont'd)

Name	Employing organisation	Main activity	Total % of time	% spent on Research Program					% spent on Education	% spent on External Comm.	% spent on Commercialisation	% spent on CRC Administration
				Subprogram				Total on Research				
				A	B	C	EP					
Cheryl McNamara	CSIRO	R	2.2%	-	-	-	-	0.0%	-	-	2.2%	-
Anne Miller	CSIRO	R	18.8%	-	18.8%	-	-	18.8%	-	-	-	-
Trivess Moore	RMIT	R	3.7%	-	3.7%	-	-	3.7%	-	-	-	-
Clinton McMurray	Curtin	R	25.0%	25.0%	-	-	-	25.0%	-	-	-	-
Gavin Munroe	Curtin	R	100.0%	-	-	-	-	0.0%	-	-	100.0%	-
Michael Niedzwiecki	Curtin	R	1.6%	-	-	1.6%	-	1.6%	-	-	-	-
David Nielsen	QUT	R	102.5%	-	-	12.5%	90.0%	102.5%	-	-	-	-
Andrej Petrovic	Curtin	R	1.6%	-	-	1.6%	-	1.6%	-	-	-	-
Ute Quink	QUT	R	25.0%	25.0%	-	-	-	25.0%	-	-	-	-
Bridget Rice	Curtin	R	2.7%	2.7%	-	-	-	2.7%	-	-	-	-
Joanna Ridge	Curtin	R	4.1%	-	-	1.2%	2.9%	4.1%	-	-	-	-
Collett Roos	QUT	R	50.0%	-	-	-	25.0%	25.0%	-	-	25.0%	-
Rachel Ryan	QUT	R	4.6%	4.6%	-	-	-	4.6%	-	-	-	-
Peter Scuderi	CRC HQ	R	100.0%	-	-	-	-	60.0%	10.0%	10.0%	10.0%	10.0%
Richard Seymour	Curtin	R	25.0%	25.0%	-	-	-	25.0%	-	-	-	-
Ashok Sharma	CSIRO	R	0.4%	-	0.4%	-	-	0.4%	-	-	-	-
Vishal Singh	UN	R	12.8%	-	-	-	12.8%	12.8%	-	-	-	-
James Steel	CSIRO	R	100.0%	-	-	-	-	0.0%	-	-	100.0%	-
Jenny Tsai	UN	R	10.6%	-	-	-	10.6%	10.6%	-	-	-	-
Bilal Succar	RMIT	R	49.7%	-	-	-	49.7%	49.7%	-	-	-	-
Peter Tresise	Curtin	R	22.5%	-	-	-	22.5%	22.5%	-	-	-	-
Kendra Wasiluk	RMIT	R	25.0%	-	25.0%	-	-	25.0%	-	-	-	-
Angela Williams	CSIRO	R	1.4%	-	-	-	-	0.0%	-	-	1.4%	-
Philip Kirk	QUT	R	100.0%	-	-	-	100.0%	100.0%	-	-	-	-
Darren Wishart	QUT	R	25.0%	-	-	-	25.0%	25.0%	-	-	-	-
TOTAL CRC			1438.8%	280.2%	91.8%	43.9%	478.9%	989.9%	30.0%	45.0%	289.0%	85.0%

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 Administration
		Subprogram					Total on Research				
A	B	C	EP	SP							
TOTAL CONTRIBUTED	5.04	0.24	0.06	0.10	3.07	0.12	4.02	0.02	0.02	0.56	0.42
TOTAL FUNDED BY CRC	14.39	2.80	0.92	0.44	4.79	0.00	9.90	0.30	0.45	2.89	0.85
GRAND TOTAL	19.43	3.04	0.98	0.54	7.86	0.12	13.92	0.32	0.47	3.45	1.27