Sustainable
Built Environment
National Research Centre

2013 Annual Report

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Sustainable Built Environment National Research Centre (SBEnrc)

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Executive Summary

A vibrant and innovative construction industry is critical to Australia's future. We depend on a healthy construction industry to build and maintain our homes, roads, hospitals, schools, retail and recreational facilities, in addition to our mines and industrial facilities; these underpin our quality of life.

However the industry has challenges: it must improve productivity and efficiencies, reduce contributions to landfill and wastewater; and improve workplace safety. Initiating the changes to solve these problems takes courage; delivering the innovations that will transform the industry requires conviction; and advancing the built environment can only be achieved through collaboration.

Our Centre aims to be an enduring world-class research and knowledge broker in sustainable infrastructure and building design, construction and management. In 2013 we began the second three-year phase of our Centre – building on the reputation of our predecessor the CRC for Construction Innovation and embedding lessons learned as an independent national research centre. We continued our commitment in collaborating with our core members, project associates and other industry stakeholders to grow the value of SBEnrc research for our partners and our industry.

Our challenge for the 2013-15 phase is to grow the value and impact of our applied research more deeply and broadly across Australia. In early 2013 we relocated our national headquarters to Curtin University, Western Australia to embrace the opportunities of continuity and growth. We have maintained our Brisbane offices to continue servicing and growing our Queensland, New South Wales and Victorian partners. The proven CEO-Chair partnership has been reinforced with Keith Hampson maintaining continuity in leadership as CEO and John V McCarthy AO re-committing as Chair of SBEnrc's Governing Board. Ross Guppy from Queensland Transport and Main Roads and Ryan Harry from John Holland very ably served in the pivotal role of Research and Utilisation Committee Chair.

2013 saw our Centre successfully expand our research network and the quality of research undertaken. This would not have been possible without our members' support, research leadership and the commitment of the industry, government and research collaborative teams involved in our three programs of activity:

- Program 1: Greening the Built Environment, led by Professor Peter Newman, Curtin University
- Program 2: People, Processes and Procurement, led by Professor Russell Kenley, Swinburne University of Technology
- Program 3: Productivity Through Innovation, led by Professor Xiangyu Wang, Curtin University.

We are delighted to have been able to confirm on-going funding with a new round of industry-focussed projects starting following the Phase 1 2010-12 projects completing in late 2012.

The valuable research outcomes have largely been due to the commitment and support of our core members and we thank you wholeheartedly: Curtin University; John Holland; NSW Roads and Maritime Services; Queensland Transport and Main Roads; Queensland University of Technology; Swinburne University of Technology; Western Australian Government agencies: the Department of Commerce (Building Commission), the Department of Treasury (Strategic Projects), the Department of Finance (Building Management and Works) and Main Roads WA.

In December 2013 we said goodbye to Queensland University of Technology as a partner. We acknowledge our appreciation of the foundation support that QUT offered in serving as the institutional base for the CRC for Construction Innovation (2001-09) and for the first phase of our Sustainable Built Environment National Research Centre (2010-12) as we successfully transitioned from a CRC to an industry-funded national research centre. I would also like to thank QUT's professional team of researchers and their high level of research commitment.

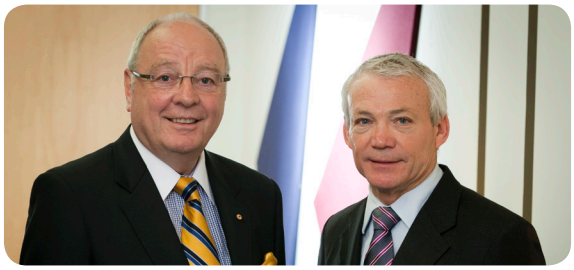
Internationally, the SBEnrc is extending its reach as it matures through its projects and partnerships. SBEnrc continues to play an active role in the CIB - the International Council for Research and Innovation in Building and Construction. As our Governing Board Chair John V McCarthy AO stepped down after three active years of service as CIB Global President, SBEnrc and QUT co-hosted the triennial World Building Congress 2013 in May in Brisbane. A majority of SBEnrc projects were profiled and the SBEnrc and its partners were well presented to the world. This Congress was acknowledged as a notable success with Australia's friendliness and professionalism a central contributor to this outcome.

In addition, the CEO has served as Coordinator for a number of CIB Task Groups this past seven years. The most recent engagement has been through TG85: R&D Investment and Impact. This TG has achieved considerable success in building valuable global collaborations and last year was acknowledged as making "the most remarkable contributions to the CIB from amongst all the Commission and Task Group Coordinators and Members".

SBEnrc values its relationships with international collaborators in Stanford University, University of Virginia, Hong Kong Polytechnic University, University of Salford, Centre Scientifique Et Technique Du Batiment (CSTB), Constructing Excellence UK, VTT Technical Research Centre of Finland, and Chalmers University of Technology. These key relationships provide important global perspectives on our research as we share information and collaborate to improve the quality and application of our research.These relationships and others assist in diversifying the Centre's research funding sources, aid industry and academic dissemination and strengthen our Centre's research impact.

Our challenge is to continue growing the value and impact of our applied research more deeply and broadly across Australia and to secure a more durable financial base. The Sustainable Built Environment National Research Centre is acknowledged as an excellent example of a CRC that has graduated into an independent organisation delivering unique industry, government and research collaboration.

We look forward to maintaining our joint commitment and working with core partners, project associates and other industry stakeholders growing the value of SBEnrc research for our partners and Australia's built environment industry well into the future.



John V. McCarthy AO, Chairman

Keith D. Hampson, Chief Executive Officer

Organisational Chart

Team Members

SBEnrc Governing Board

1. John V. McCarthy AO (Chair)
2. Ross Guppy, Queensland Transport and Main Roads (to March 2013)
   Neil Scales, Queensland Transport and Main Roads (March 2013 to October 2013)
   Matthias Schlotterbach, Queensland Transport and Main Roads (from November 2013)
3. Angelo Conte, John Holland
4. Richard Mann, Western Australia Department of Treasury
5. Charlie Thorn, Curtin University
6. George Collins, Swinburne University of Technology
7. Stephen Kajewski, Queensland University of Technology
8. Michael Veysey, NSW Roads and Maritime Services (to February 2013)
   Jim Peachman, NSW Roads and Maritime Services (February 2013 to October 2013)
   Chris Harrison, NSW Roads and Maritime Services (from November 2013)
9. Keith Hampson, CEO, SBEnrc

Research and Utilisation Committee

1. Ross Guppy, Queensland Transport and Main Roads - Chair (to March 2013)
   Narelle Dobson, Queensland Transport and Main Roads (from April 2013)
2. Angelo Conte, John Holland (to May 2013)
   Ryan Harry, John Holland - Chair (from May 2013)
3. John Byron, Curtin University (to August 2013)
   Tim Dolin, Curtin University (from September 2013)
4. Carolyn Marshall, Western Australia Department of Finance - Building Management and Works
5. Angela Heymans, Building Commission, WA Department of Commerce
6. Michael Veysey, NSW Roads and Maritime Services (to February 2013)
   Jim Peachman, NSW Roads and Maritime Services (February 2013 to October 2013)
   Chris Harrison, NSW Roads and Maritime Services (from November 2013)
7. Program 1 Leader: Peter Newman, Curtin University
8. Program 2 Leader: Russell Kenley, Swinburne University of Technology
9. Program 3 Leader: Xiangyu Wang, Curtin University
10. Keith Hampson, CEO, SBEnrc

Team Members

John V. McCarthy AO

Chair, Sustainable Built Enviornment National Research Centre

FRICS, FAPI, FREI

John is a recognised industry leader, with a breadth of experience across various commercial and industry disciplines.
He served as inaugural Chair on the Australian Sustainable Built Environment Council (ASBEC), as Chair of the Australian Construction Industry Forum (ACIF), President of Property Council of Australia (PCA) and member of the Australian Building Codes Board (ABCB). He is Australia's first industry representative on the Board of the International Council for Research and Innovation in Building and Construction (CIB) - an organisation he served as global President from 2010-13.

Keith Hampson

CEO, Sustainable Built Environment National Research Centre

BEng (Hons), MBA, PhD, RPEQ

FIEAust, FAICD, FAIM

Keith is an energetic senior leader with a blend of strong technical and management skills and formal qualifications gained through international experience in industry, government and university environments. He is committed to building an internationally competitive Australia by promoting access to better education, technology and innovative practices. At the industry level, Keith is a registered civil engineer and project manager with extensive experience in operating in multi-disciplinary environments in planning, design, construction and maintenance.

Richard Mann

Western Australia Department of Treasury and Finance

BE, CPEng, FIEAust

Richard is a civil engineer with more than 25 years experience in building and infrastructure projects throughout Western Australia. He heads Treasury's Strategic Projects and Asset Sales division and oversees the delivery of an $8 billion portfolio of 20 major projects, including the $2.0 billion Fiona Stanley Hospital, $1.2 billion Perth Children's Hospital and $918 million new Perth Stadium.

Angelo Conte

John Holland

BE (Civil) (Hons), FIEAust, RPEQ

Angelo is the Strategic Development Director at John Holland and has had over 30 years experience in the construction industry. He has been involved in numerous projects throughout Australia in the civil, structural and mechanical disciplines. Angelo provides strategic advice to assist the Managing Director and Executive Management Team to formulate the strategic direction of the Company.

George Collins

Swinburne University of Technology

BSc(Hons I), PhD, Certified Materials Professional, Materials Australia FInstP, MAIP, GAICD

George began his appointment as Deputy Vice-Chancellor (Research & Development) in August 2012. In this capacity, he is driving Swinburne to become Australia's leading university in research innovation by creating a distinctive Research and Development environment that focuses on the application of research. George has more than 30 years experience in research and research management.
He has significant experience across the Australian research sector with a strong focus on the promotion of excellence in research and innovation.

Charlie Thorn

Curtin University

BSc (Agric) (Hons)

Curtin University recently appointed Australian Sustainable Development Institute (ASDI) Director, Charlie Thorn to the position of Director Research and Development. Charlie has more than 30 years experience in research management, commercialisation and technology transfer. During his time as ASDI Director he led, developed and grew Curtin's research in the areas of energy, climate change, water, sustainable resources, urban and regional development, sustainable communities and food.

Team Members

Matthias Schlotterbach

Queensland Transport and Main Roads

Matt is a senior manager with over 15 years experience in rail/transport project management and program delivery, strategy and policy reform across both Government and rail organisations. He is a key authority and expert on rail, developing key service agreements between the state and Queensland Rail for rail infrastructure services and analysing new investment options for public transport. He also Chairs various research project steering committees in the Rail CRC research program.

Chris Harrison

NSW Roads and Maritime Services

Chris has over 30 years experience in road, traffic and transport areas. He held senior management positions in public and private sectors prior to taking up his present position of Group General Manager, Engineering Technology, NSWRMS. He was the Austroads Technology Program Manager (2009-13) oversighting national research and guideline development. Chris has managed major projects in Sydney as well as significant road maintenance and construction projects in both urban and rural areas.

Russell Kenley

Swinburne University of Technology

BBldg (QS) (Hons), PhD, MAIB, AAIQS

Russell is Professor of Management at Swinburne University of Technology and Visiting Professor of Construction at Unitec, NZ. His research interests involve the built environment including: project financial management; lean management of production in construction; and strategic management of property portfolios. He has co-developed the location-based management system and is working with industry to introduce new model-based production systems to improve productivity.

Stephen Kajewski

Queensland University of Technology

BEng(Hons) , GDProjMgt, MBuiltEnv(ProjMgt), PhD

Professor Stephen Kajewski is Head of School, Civil Engineering & Built Environment, Science & Engineering Faculty at QUT.

Peter Newman AO

Curtin University

BSc (Hons), Dip.ES&T, PhD, FTSE

Peter Newman is the Professor of Sustainability at Curtin University and is the Leader of the Greening the Built Environment Program. He was appointed as a Lead Author for Transport on the next Intergovernmental Panel on Climate Change Report. He is on the Board of Infrastructure Australia and has published more than ten books and 200 academic publications. In 2011 he was awarded the Sidney Luker medal for his contribution to the science and practice of town planning.

Xiangyu Wang

Curtin University

PhD, MS, BS

Xiangyu holds the position of Curtin-Woodside Chair Professor for Oil, Gas & LNG Construction and Project Management, and is the Co-Director of the Australasian Joint Research Centre for Building Information Modelling (BIM). Professor Wang is an internationally recognised researcher in the field of Construction IT, BIM, Lean, Visualisation Technologies and Project Management having obtained over $5 million in research funds and published over 300 peer-reviewed technical papers. He is the Chair of the Australian National Committee of the International Society in Computing in Civil and Building Engineering.

Team Members

Carolyn Marshall

Building Management and Works , Western Australia
Department of Finance
Architect, MA World Heritage
BArch

Carolyn is Assistant Director of the Building Research and Technical Services team in Building Management and Works, WA Department of Finance. Carolyn is a registered architect with post graduate qualifications in building sustainability and heritage, and a Green Building Council of Australia Green Star Accredited Professional.

Angela Heymans

Building Commission, WA Department of Commerce
BSc

Angela is Principal Sustainable Buildings Officer in the Building Commission, Department of Commerce. Angela is a graduate of Murdoch University in Sustainable Development and had a key role in the introduction of minimum standards for energy and water efficiency in new housing in Western Australia.

Core Partners

John Holland

Queensland Government

GOVERNMENT OF WESTERN AUSTRALIA

NSW GOVERNMENT Transport Roads & Maritime Services

Curtin University

QUT

SWINBURNE UNIVERSITY OF TECHNOLOGY

Project Partners/Affiliates

AUSTRALIAN CONSTRUCTORS ASSOCIATION

CCF CIVIL CONTRACTORS FEDERATION

IS

CIMC

VTT

roads australia

Built Environment Industry Innovation Council

ClimateWorks AUSTRALIA

SAFETY DIMENSIONS
Moving Industry Forward
RTO No. 122052

woodside

CFMEU CONSTRUCTION AND GENERAL

cib International Council for Research and Innovation in Building and Construction

buildingSMART International home of openBIM

ENGINEERS AUSTRALIA

New Zealand Contractors' Federation

Aalto University

green building council australia

Australian Government
Department of Education, Employment and Workplace Relations
Office of the Federal Safety Commissioner

Research Program 1

Greening the Built Environment

The Program objectives are to deliver improved environmental performance across the built environment industry through enhanced ecological efficiencies. These include carbon emission reductions and climate change adaptation of new and existing infrastructure and buildings.

The first three years of SBEnrc saw Program 1 deliver a range of valuable outputs that support improvements in sustainability performance across the built environment sector. In working with industry and government partners, researchers have built a framework upon which has continued this work in the second stage of the SBEnrc.

Led by Professor Peter Newman of Curtin University, the program has delivered research outputs that focused on specific industry and government needs.

Project outcomes have delivered new knowledge and tools targeting:

- Commercial buildings, including cost savings for industry and government through energy savings; a reduction in costs for green retrofits of infrastructure buildings; and increased worker productivity
- Biophilic urbanism, with increased productivity from sustainability designers and reduced water consumption and waste
- Mass haul, involving fuel and carbon savings on major earthworks in infrastructure and building projects
- The future of roads, with decreased greenhouse gas emissions in the built environment industry; the opportunity to reuse waste in road construction; and increased sustainability skills in the road industry.

The second phase of the SBEnrc has three new projects in Program 1 developed in close consultation with industry which are described in the information sheets following.

by Dawn Easterday Flickr

Project 1.22
Strategies and Solutions for the Future of Roads

RESEARCH PROGRAM 1: GREENING THE BUILT ENVIRONMENT

Road agencies are facing increasing pressure to respond to resource shortages, shifting preferences for transport options, maintenance costs and climate change impacts. A key part of the response will be the reduction of dependency on fossil-fuel-based energy and associated greenhouse gas emissions..

A number of advances in this area need to be investigated for suitability for Australian road agencies. Building on the previous research findings the first stage of the project will focus on key areas of innovative technologies and processes selected by SBEnrc Core Members, namely: The inclusion of onsite renewable energy generation technologies as part of road and transport infrastructure, the potential for automated motorways to reduce traffic fuel consumption (referred to as 'Smart Roads'), and the reduction of energy demand from route and signal lighting. Given the rapid growth of such options it is important to ensure a rigorous investigation is undertaken to inform the development of a business case that will influence policy development. An additional component of the the project will be to investigate sustainability assessment and reporting tools to identify opportunities to provide greater value to road and transport agencies (working closely with AGIC as an in-kind partner to the project and informing the Global Reporting Initiative on invitation).

In consultation with partners this may involve the trialling of aspects of selected tools to current projects, such as the Gateway Project in Western Australia, and appropriate projects in Queensland and NSW to identify key benefits, highlight areas of focus to improve performance, and identify opportunities to embed associated processes in strategic planning, feasibility assessments, procurement processes, and asset operations and management.

Objectives

Building on previous SBEnrc findings, the project is focused on key areas of innovative technologies and processes, as nominated by industry partners, namely:

- the inclusion of on-site renewable energy generation technologies as part of road and transport infrastructure
- the potential for automated motorways to reduce traffic fuel consumption (referred to as 'Smart Roads')
- the reduction of energy demand from route and signal lighting.

A rigorous investigation will be undertaken to inform a business case to influence policy development. The project will also investigate how sustainability assessment and reporting tools can inform low carbon tendering, with a focus on the Infrastructure Sustainability Council of Australia's 'IS' Rating Tool. In addition to its core members, SBEnrc's research team will work with other industry partners including the Infrastructure Sustainability Council of Australia and Roads Australia to identify opportunities to provide greater value to road and transport agencies early in the development process. In 2014 the project team will collaborate with the CRC for Low Carbon Living to deliver a joint project informing and trialling the inclusion of low carbon requirements in state government tenders.

Industry Outcomes

This project will work closely with government and industry to address two key areas facing Australian road and transport agencies: the increased uptake of sustainability innovations and technologies and the use of sustainability reporting tools to inform low carbon tendering options and gain an indication of the level of low carbon readiness of tenderers

by New Generation Transport Flickr

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Project 1.24
A Roadmap for Carbon Structural Adjustment in the Built Environment Sector

RESEARCH PROGRAM 1: GREENING THE BUILT ENVIRONMENT

The Australian built environment industry must significantly reduce greenhouse gas (GHG) emissions. Greater understanding of industry structural adjustment options is required to inform public policy to guide economic decisions. This is the case for carbon, whether market-based, industry led, or direct action approaches are taken.

Objectives

This project investigates the potential for large system change mechanisms to achieve a profitable and timely transition towards significantly lower carbon operation across the Australian economy. This includes:

- The identification of lessons for Australian governments from carbon reduction and green growth strategies.
- The investigation of strategies to achieve large system change and shifts in socio-technical regimes to achieve technology transitions towards low carbon operation.
- The identification of lessons from structural adjustment programs to inform a structural approach to sector wide transition to low carbon operation.

The project will inform the built environment industry response to the increased costs associated with carbon, and provide strategic guidance on key future areas of impact and opportunity. Concerns include the levels of carbon exposure, the need for financial assistance or tax deductions, the need for capacity-building and re-training, shifts in technology trends, and shifts in government and consumer preferences. In 2014 the project will collaborate with the CRC for Low Carbon Living on a project instructing and trialling the inclusion of low carbon requirements in state government tenders.

Industry Outcomes

The project will inform carbon structural adjustment's application to include mechanisms leading to a significant reduction in carbon whilst enabling social and economic acceptance of such change. From encouraging the uptake of low carbon technologies and practices, assisting educational institutions to update curriculum, and supporting community behaviours, there is much that governments and industry can do to underpin a practical carbon structural adjustment process.

The project will create a roadmap for 'Carbon Structural Adjustment' in the Built Environment.

by donabelandewen Flickr

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11 July 2014

Project 1.29
Strategies and Solutions for Housing Sustainability

RESEARCH PROGRAM 1: GREENING THE BUILT ENVIRONMENT

Housing is more than human shelter – it is a significant national and family asset, requires considerable upfront and ongoing capital, contributes to national carbon emissions, impacts on physical health and wellbeing, and reflects social and cultural identity.

The housing supply chain must respond to increasing stringency and scope of building regulations, as well as rising energy costs, and affordability challenges. To address this, researchers are working to improve the economic, social and environmental sustainability of the Australian housing market. The first part of this project, now completed, focused on the housing sector and related infrastructure as a whole. It asked if building information files and broader concepts of customer value can be applied to the housing market to enhance the value of sustainable housing for stakeholders. The second part of this project focuses on housing and building construction, examining what contribution manufactured buildings can make towards improving performance outcomes and adding value to the construction industry.

Objectives

The first part of the project identified the typology, format and location of data about individual dwellings from industry stakeholders representing the Australian housing supply chain. This information was used to develop a draft impact relationship map and formulate stakeholder engagement strategies. Results from stakeholder workshops were analysed to develop the potential applicability of a building information file and building performance certificate. The second project component will carry out a SWOT analysis of manufactured building construction in Australia, comprising a comparison of traditional construction methods and prefabricated construction methods. The next phase, due for completion in September 2014, will investigate the business case for manufactured building methods. The outputs of this project will feed into the ARC Linkage Project From Innovators to Mainstream Market.

Industry Outcomes

The project will disseminate knowledge on construction standards that will assist the construction industry in reducing its overall project costs, on-site construction duration, and waste and improve on factors such as project safety, quality and client satisfaction. The project will assist the construction industry in becoming more systematic, organised and predictable by changing the focus from a linear sequence driven onsite work-flow to a parallel or simultaneous work based on repetitive processes and procedures performed in a controlled factory and production conditions with greater emphasis on three cardinal elements of project success known as time, cost and quality.

The research team's findings will be used to better understand and convey value to stakeholders in the housing market. Further, they will improve industry productivity through the development, delivery and marketing of manufactured buildings that reflect environmental and social sustainability needs of modern society.

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by New Generation Transport Flickr

Research Program 2

People, Processes and Procurement

The primary aim of Program 2 is to deliver improved operational and business outcomes. Social outcomes for workers will be delivered through more sustainable work practices and minimising environmental health and safety risks; new process models will capture benefits from future technologies, off-site fabrication and mobile construction management, and business will benefit from more integrated project environments.

Led by Professor Russell Kenley of Swinburne University, the program has provided public and private organisations with tools designed to improve sustainable construction practices, including:

- a cultural-change management program and implementation plan for industry employers nationally to manage the safety impacts of alcohol and other drugs in construction
- the Off Site Manufacture Project Team Evaluation Tool which aids construction project teams in rating their off-site manufacture (OSM) capability
- a strategic research and development roadmap based on a rigorous evaluation of Australia's R&D investment history and future industry needs

The second phase of the SBEnrc has two new projects in Program 2 which are described in the information sheets following.

Project 2.21
New Project Management Models for Productivity Improvement in Infrastructure

RESEARCH PROGRAM 2: PEOPLE, PROCESSES AND PROCUREMENT

Construction productivity has been a focus for both industry and academia for at least 20 years; yet demonstrable productivity improvement has proven elusive. In contrast, other major industries have achieved a doubling of their productivity over the same period. In an environment where disruptive technologies are becoming the norm (as digital technologies, such as online, mobile and cloud technologies become pervasive) it is time to reassess the fundamentals of project management processes and their supporting data structures to reduce transaction costs. Rethinking processes to move beyond compliance to productive application of project domain knowledge has been identified by industry as a major barrier to increasing construction sector productivity.

The sheer size and complexity of infrastructure projects places significant challenges on traditional methods. Alternative approaches are required to deliver informed and supported, productive work environments. These need to be integrated in a transparent and clear way as amendments to existing project management systems.

Project 2.21 considers capital works: buildings and linear infrastructure and their associated project management systems. The project aims to deliver productivity gains to infrastructure projects through changing project management systems through smarter use of data. The necessity of providing usable nD models can lower the cost of portfolio management and information-overload on large-scale projects.

Objectives

The objectives of the project are to provide industry and government stakeholders with tools to increase productivity levels by lowering project and construction management costs using location-based thinking. The tools to reduce transaction costs will be used to provide:

- Guidance on the feasibility of increasing levels of productivity through application of location-based data structures.
- Identification of the value of proximity minimisation for project and portfolio asset management of roads, rail and infrastructure buildings.
- Contributions to re-forming processes using location-based thinking for identified common industry data handing overload.
- Reduced data-handling in project management systems by limiting duplication.

The project will provide a basis for reforming data and process models using location as the unit of analysis. The outcome will be portfolio management systems and transaction process-models applying location-based data structures to facilitate increased levels of productivity.

Industry Outcomes

This project will provide industry with two alternative construction management tools to increase productivity. A new project data handing model will assist site managers to use location in the planning, management and control of complex projects. The model will remove location-based redundancy in data handling. Productivity gains based on reduced transaction costs will follow from automation of the resulting processes for problem one above. A new model of location-based optimisation will add alternative productivity dimensions for dispersed portfolio planning and contracting. The proximity-based algorithm for effective distributed asset management of current and proposed infrastructure will support the reduction of supply chain costs for increased productivity addressing problem two.

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Project 2.24
Integrated Project Delivery - Productivity Gain through Industry Transformation

RESEARCH PROGRAM 2: PEOPLE, PROCESSES AND PROCUREMENT

Sustainable Built Environment National Research Centre

This research will contribute to realising productivity benefits of digital modelling and integrated project delivery for the Australian construction industry through the use of building information modelling (BIM) and virtual design and construction (VDC) in the delivery of transport infrastructure projects. This project addresses procurement, process improvement and technology required to improve BIM and VDC uptake. Data was collected through interviews in Australia and Sweden, one of the acknowledged global leaders in this field.

BIM/VDC has been identified as important emerging and transformative enabling technologies, with the potential to streamline processes throughout the constructed facility lifecycle. The Australian Productivity Commission (2014) highlights that more widespread adoption of BIM/VDC could enhance productivity across the industry and in turn have a significant positive impact on the cost of infrastructure.

Objective

This research aims to: (i) inform a national strategy for the adoption of BIM/VDC, (ii) develop guidelines for new contractual frameworks and (iii) provide a strategy to reduce skill gaps especially for SMEs, within the context of Integrated Project Delivery in Australia.

Specific Objectives

- Build an understanding of the current institutional environment and business systems and support (especially skills and business capability development) which impact on the uptake of BIM/VDC in infrastructureture
- Gather data to enable cross-country analysis (in particular between Australia and Sweden) of these environments
- Provide strategic and practical outcomes for implementation in the delivery of BIM/VDC on transport infrastructure projects, with spill-over benefits to the building industry.

Key Milestones

- Test and refine the research methodology in conjunction with industry partners to ensure practical outcomes (Apr 13 -Sep 13)
- Undertake interviews in Australia and Sweden (Nov 2013 - Apr 14)
- Analyse data gained from both countries highlighting success factors and barriers within the specific national context (Nov 13 - May 14)
- Consolidate findings for dissemination to project partners and the broader industry (May 14 - Jul 14)

Industry Outcomes

1. Recommendations for policy makers to achieve a nationally consistent strategy
2. Recommendations for modifications of current procurement and contractual frameworks to allow more collaborative and BIM-enabled project environments.
3. A dissemination strategy that includes providing informative material to different levels of the supply chain through work with organisations such as CCF and EA, as well as through our partner organisations and our media resources (e.g. YouTube channel and industry publications)

Dr Keith Hampson
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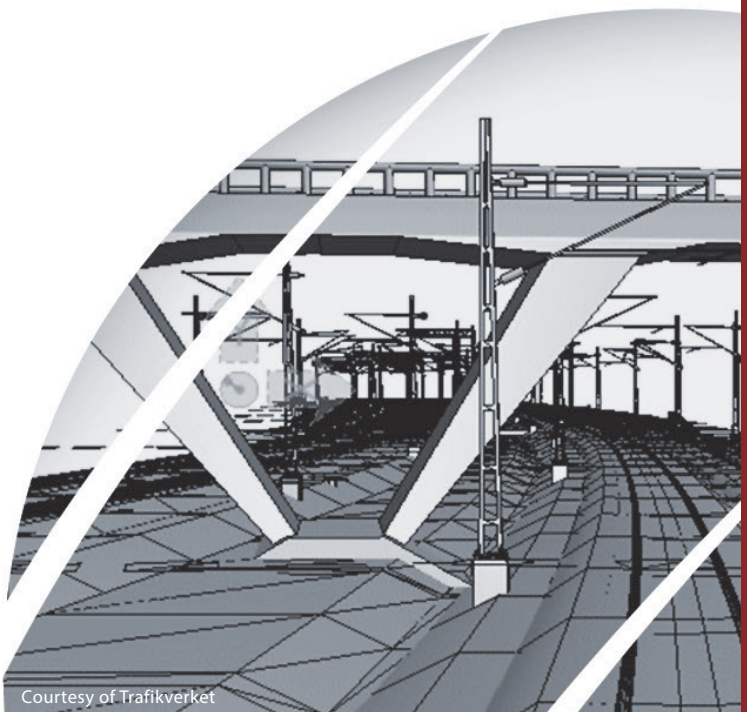

Courtesy of Trafikverket

Research Program 3

Productivity Through Innovation

Productivity Through Innovation will deliver economic benefits to the built environment industry through reductions in risks and costs and improved productivity associated with complex information management and procurement processes on infrastructure and building projects.

Phase one concentrated on the project 'Object Libraries Supporting the Facility Lifestyle'. This research aimed to increase construction industry efficiency by reducing the duplication of effort in incorporating digitalisation in the design, construction, facility management process. Specifically, it relates to the development of digital object libraries containing products for use with CAD tools in construction projects.

Led by Professor Xiangyu Wang at Curtin University, phase two of Program 3 is focussed on maximising the potential of Building Information Modelling (BIM) in the actual construction and operation stages of the built environment.

The second phase of the SBEnrc has two new projects in Program 3 which are described in the information sheets following.

by Alan Levine Flickr

Project 3.27
Using Building Information Modelling (BIM) for Smarter and Safer Scaffolding Construction

Sustainable Built Environment National Research Centre

RESEARCH PROGRAM 3: PRODUCTIVITY THROUGH INNOVATION

A considerable number of accidents that occur on construction sites in Australia can be attributed to scaffolding that is non-compliant and unsafe. In 2009, Workplace Health and Safety (WHS) Authorities in Australia have found that 40% of all scaffolding projects do not comply with national safety and design standards. It is clear that the planning and management of temporary scaffolding structures must be informed more directly by safety and construction considerations.

Objectives

This research will deliver tools and knowledge that help reduce the likelihood of accidents arising from non-compliant structures, by integrating construction and safety constraints into the design, analysis, assembly, inspection and disassembly of scaffolding.

As a core member of SBEnrc, the QUT team has developed a prototype modelling system demonstrating how current industry standards and practices can be translated into design rules that facilitate automated scaffolding layout. The system uses building massing information and user-specified parameters to generate scaffolding designs (figure 1), and has been successfully tested against a variety of building forms (figure 2). This project builds on the prototype by providing further support for:

- automated model and drawing outputs
- quantity take-offs and costings
- visualisations for construction scheduling
- direct links to structural analysis
- onsite safety checks and real-time construction tracking.

Industry Outcomes

This project is aligned with the national harmonisation of the new Workplace Health and Safety (WHS) act across all states and territories, requiring designers to consider and assess safety and constructability issues early on in a project. It will improve the industry's ability to meet requirements for the design of structures that are within appropriate risk limits to the health and safety of the persons using them.

It will also result in significant productivity benefits by streamlining the links between the design and construction of temporary scaffolding structures, for building projects initially and looking to explore the implications for infrastructure projects also.

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Project 3.28
National BIM Guidelines and Case Studies for Infrastructure

Sustainable Built Environment National Research Centre

RESEARCH PROGRAM 3: PRODUCTIVITY THROUGH INNOVATION

There is growing enthusiasm for fully integrated Building Information Models to contribute to increased productivity across the construction supply chain. The need for Building Infrastructure Modelling (BIM) guidelines and case studies to be developed in the infrastructure - especially transport infrastructure - sector has become apparent. These should be established in a mode complimentary to resource and mining developments in this area to capitalise on existing investments and provide consistency across common contexts.

Objective

A review of existing BIM guidelines and initiatives has been compiled and studied. It includes more than 40 sets of guidelines across 10 countries. The development of the guidelines and the implementation plan for Australian infrastructure will be based initially on existing BIM guidelines from the building industry, but validated through a series of rigorous research methodologies. These research instruments include questionnaires, interviews, focus groups, multiple case studies, Charrette workshops and benchmarking.

The research team will work closely with industry partners from Western Australia, Queensland, New South Wales and Victoria with participants representing a key cross section of the Australian infrastructure industry.

Industry Outcome

This project will leverage off earlier successes in commercial building and provide a practical set of BIM guidelines and case studies to support ongoing industry productivity improvements. These will benefit the Australian infrastructure construction industry by helping to more fully integrate Building Information Models to increase productivity across the project delivery supply chain.

This project also aims to establish a taskforce with key stakeholders to facilitate a two-year program for the delivery of the BIM Implementation Plan for Infrastructure.

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