

**8th Nordic Conference on Construction Economics and Organization:
Leadership for targeted change and proven advancements
Tampere, Finland, 28 May 2015**


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**Research, Development & Innovation:
Global State of the Art in Real Estate and
Construction Sector**





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Collaborating Authors






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Presentation Structure

1. SBEnrc and CIB Context
2. Collaboration in R&D and Innovation
3. WTFH?

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Good to be back in Finland!

- 2001 - Tapio Koivu, VTT; Stanford Fellow + CIB TG35 book: *Innovation in Construction*
- 2002 - Pekka Huovila, Mika Lautanala, Sami Kazi (International Construction Research Alliance with CRC-CI) AND ... Kalle Kähkönen
 - Finland vs Sweden ice hockey ...
- **2011 - Inaugural meeting of CIB TG85: R&D Investment and Impact at SB11, Helsinki**








Recent Linkages ...

2012 - Australian Research Council Linkage Project:
Leveraging R&D Investment for the Australian Built Environment



Göran Roos

2014 - Chapter authors in CIB Book:
R&D Investment and Impact in the Global Construction Industry



Suvi Nenonen



Miimu Airaksinen



Terttu Vainio

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Evaluation of Green Public Road Procurement in Australia: The Team (2011)

Researcher Liisa Lehtiranta
Aalto University, Finland



Professor Keith Hampson
Sustainable Built Environment National Research Centre, Australia




Professor Russell Kenley
Swinburne University of Technology, Australia




Research Associate Adriana Sanchez
Sustainable Built Environment National Research Centre, Australia




SASBE2012 4th CIB INTERNATIONAL CONFERENCE ON Smart and Sustainable Built Environments



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Setting the Scene ...

	Australia	Sweden	Finland	Netherlands	USA
Population (million)	24	10	5	17	317
Population Density (persons/sq km)	3	21	16	407	35
GDP/capita (US\$/hd PPP)	48	47	41	48	55
Unemployment	6	8	10	7	6
Human Development Report (2012 rank)	2	12	24	4	5

(Source: Wikipedia)

Australia's Construction Industry

- AU\$260B = US = €180B pa
- Employs 1 million people
- 300,000 firms => many small firms
- Slowing and growing at same time ...
 - Commercial and Industrial
 - Resources and Mining
 - Residential
 - Transport Infrastructure



Our Centre's Mission

To be an enduring world-class research and knowledge broker in sustainable infrastructure and building design, construction and management

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Growth of Collaborative Research through Australia's SBEnrc

QUT/CSIRO Construction Research Alliance



1996
↓
2001
↓
2009
2010
↓
2012
↓
2015
↓
Ongoing

Integrated Research Programs

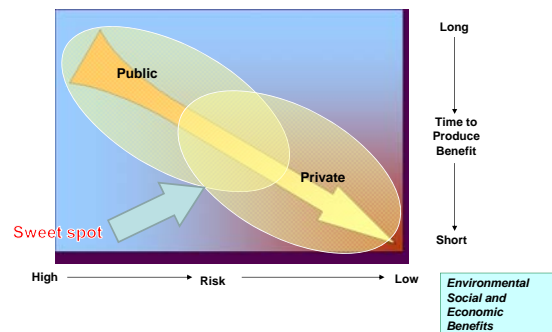


- Program 1 - Greening the Built Environment
- Program 2 - People, Processes and Procurement
- Program 3 - Productivity through Innovation

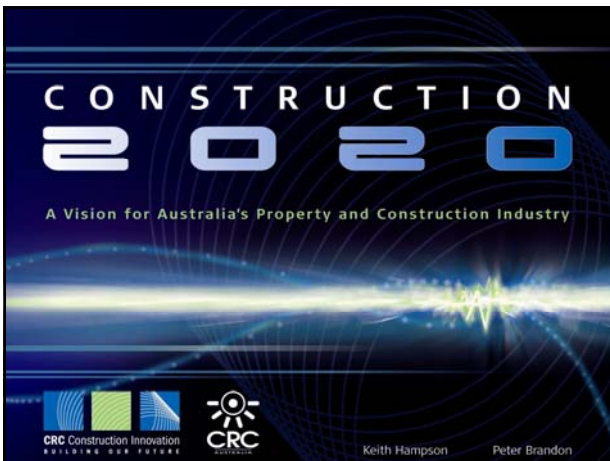
- » Collaborative research centre with key international partners
- » Industry, government and research partners
- » Applied research and industry outreach across integrated themes

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Research Space



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Construction 2020 Visions

1. Environmentally sustainable construction
2. Meeting client needs
3. Improved business environment
4. Welfare and improvement of the labour force
5. Information and communication technologies for construction
6. Virtual prototyping for design, manufacture and operation
7. Off-site manufacture
8. Improved process of manufacture of constructed products




But ... we can always do better ...

- Models for industry-government-research collaboration
- Options for research engagement ... what are other countries doing?
- How can we better sell message that R&D matters?
- Inform public policy to enhance investment outcomes

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System improvements required ...

- Foster, transfer innovated products & practices
- Industry, government and researchers working together to upgrade industry practice
- Sharing information, resources, trust
- Coherent collective force



SBEnrc Core Partners

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It's about partnerships ... adding value

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Leveraging Global Innovation Networks



**International Council
for Research and Innovation
in Building and Construction**

Global network for exchange and cooperation in innovation for construction industry

5,000 experts from about 500 member organisations across 100 countries



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**CIB TG85 Global Team:
R&D Investment and Impact**



39 members from 19 countries across 6 continents

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TG85 Study: Key Industry Themes

- Productivity and global competition
- Energy efficiency and sustainability
- Information and communication technology (ICT)
- SMEs and R&D Collaboration
- Population pressures, ageing and skills

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Key Challenges for Construction Industry

- Tight profit margins and risk aversion
- Contracting process (design, bid, construct) inhibiting knowledge sharing across supply chain
- Innovation ad hoc and project-based
- Knowledge and training lost with moving staff

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**AUSTRALIA: Integrating the Supply Chain
through Digital Modelling**

Authors: Judy Kraatz, Keith Hampson

Queensland Housing & Public Works acknowledged leadership in digital modelling for delivery of buildings

- reduce project team conflict
- improve collective understanding of design intent
- improve overall project quality
- faster client approval cycles



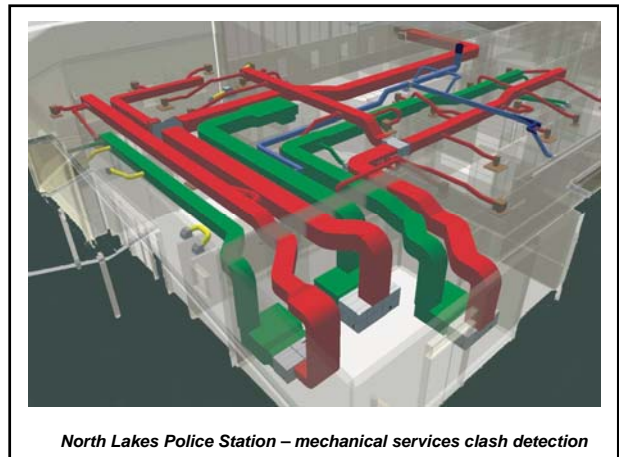
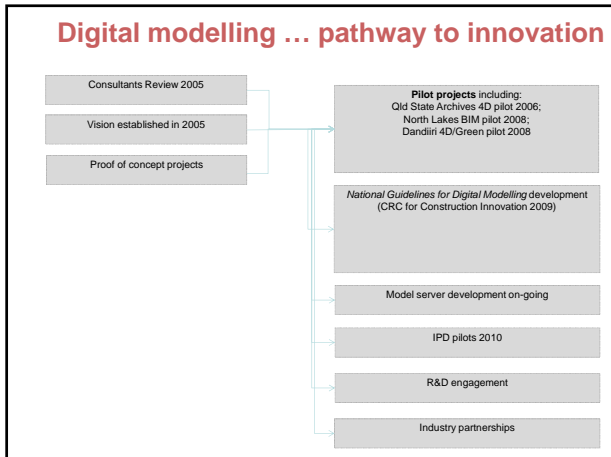
Thom Fussell

Process of adoption

- Strong vision
- Focus on performance
- Formal and informal R&D with incremental adoption of new technologies and work practices
- Internal proof of concept on projects
- Complimented by strong industry and research partnerships and engagement

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Outcomes

- More efficient delivery mechanisms through new technology enablers coupled with process changes
- Disseminating leading work-practices to other agencies, researchers, external contractors and consultants, suppliers and vendors

GERMANY: Houses as Power Plants
Author: Alexandra Staub

- Govt encouraging homes that compensate for energy use through renewable energy at local level
- Germany committed to becoming a world leader in energy efficiency
- New buildings strict energy efficiency standards and covering part of energy demand through renewables

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Case

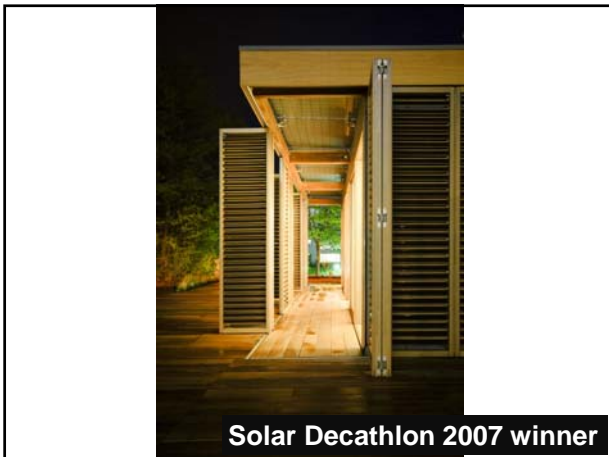
- **plus energy** housing project
 - buildings producing more energy than they consume
- Directly funding owners
- Funding prefabrication companies to develop and test *plus energy* homes
- Demonstration houses through universities and government
 - TU Darmstadt 2007, 2009 winners of Solar Decathlon

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Efficiency Plus House with Electromobility

Living in the Efficiency Plus House with Electromobility

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Outcomes

- National economic interests in advanced building and supporting car industry into post-oil era
- Focus on energy and technology consistent with German Government's focus on creating *national identity as a high-end, high-tech powerhouse*

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NORWAY: Cutting Edge Wood Construction

Authors: Marit Støre Valen, Knut Samset, Ole Jonny Klakegg, Torill Meistad, Anita Moum

- Wood dominant since ancient times
- Concerted national effort to re-introduce wood with new technology to address fire resistance and improve overall performance and applications

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Case

- Showcase wooden structures highlighting industry, government, research efforts to innovate and create new designs and constructed facilities
 - Vikingskipet, 1994; Oslo Airport, 1998; Svartlamoen, 2005; Kjølssæter Bridge, 2006; Vennesla Library, 2011
- Advances in technology - fire retardants, glulam
 - increase beam spans, strength and cross-sections; fire resistance and load capacity esp. multi-storey buildings

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Government Leadership

- Research and education instrumental in development
 - NTNU collaborating with industry and Foundation for Scientific and Industrial Research (SINTEF) through *Wood Programme (Treprogrammet)* to research
 - Norwegian Government support:
 - *Program for Wood* - production chain
 - *Norwegian Wooden Cities* - timber for public buildings
 - *Norwegian Wood Program* - international showcases
 - *Nordic Wooden Towns* - timber in urban development
 - *Wooden Towns* EU Culture 2000 initiative

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Outcomes

- Adapting traditional construction material to create modern, sustainable, robust and beautiful buildings
- Natural, renewable resource reduces CO₂ emissions, suited to meet built environment demands
- Initiatives paving the way for international use of wood in larger scale buildings



Oslo Airport

**Synthesis:
Future Directions for R&D Investment**

- **Government leadership** critical
- View construction as **driver for growth** and catalyst for other industries to develop
- Exemplary **pilot projects creating evidence** for policy makers and clients
- Evidence to deliver **additional value** through innovation which **enhances quality of life**

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Key Research Challenges

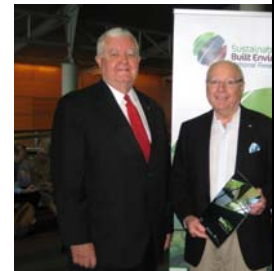
- **Build more meaningful collaborations**
 - Between and across supply chain; academia, industry and community; drivers for public policy and private practice
- **Build more durable R&D infrastructure**
 - Within and between organisations, across entire supply chain and between countries
- **Improve dissemination and impact of research**
 - Greater focus on improving industry-wide skills and training opportunities, especially for SMEs, measuring performance

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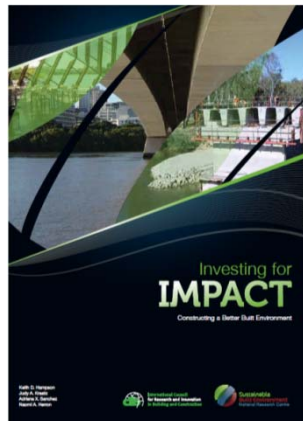
By neglecting to conduct our own R&D, we not only reduce the chances that we will discover new ideas and develop new inventions before our competitors, we also limit our abilities to accept and use those new inventions that are developed elsewhere

(Ian Chubb, Chief Scientist of Australia)

Ian Chubb AC
Chief Scientist of Australia
John McCarthy AO
SBEncr Chair
World Building Congress, 2013



Translating research into industry and government speak ...



R&D INVESTMENT AND IMPACT IN THE GLOBAL CONSTRUCTION INDUSTRY

EDITED BY
KEITH D. HAMPSON, JUDY A. KRAATZ
AND ADRIANA X. SANCHEZ



... while growing academic and research leadership

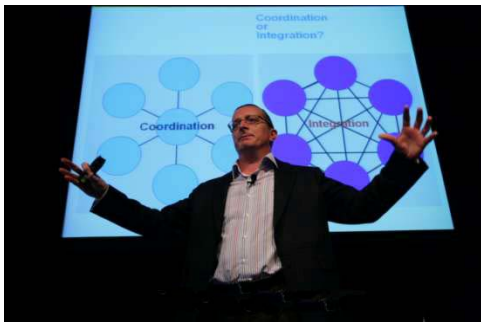


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Champions ...



Building (Future) Global Collaborations

CIB TG90: Information Integration in Construction (IICON)

- Efficient knowledge creation, preservation and integration across life-cycle of constructed assets
- Monitoring and feedback from end-users into design, construction and asset management of buildings and infrastructure
- Creating more effective and reflective industry and deliver benefits to public and private asset owners



Questions



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