



Active and Completed Projects

November 2022



Australian Government
Department of Industry,
Science and Resources

AusIndustry
Cooperative Research
Centres Program



Active Projects

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3. Projects to Platforms: Investigating New Forms of Collaboration (Scoping Study)

Project Lead: Dr Duncan Maxwell | Monash University

Problem / thesis

Construction practice is rooted in project-based thinking as organisations utilise temporary teams, to create one-off products, in response to unique and changeable site conditions. In response, product platforms have begun to emerge in construction, but the introduction of broader, platform-based business models promises fundamental and holistic change to traditional construction. Such business models leverage a combination of strategies in terms of product and process that require investigation, definition, critique, and adaptation for their potential use in construction. Project 3 examines construction's disparate ecosystem to consolidate the broader network of actors through an examination of industry-wide business-level platforms.

List of partners:

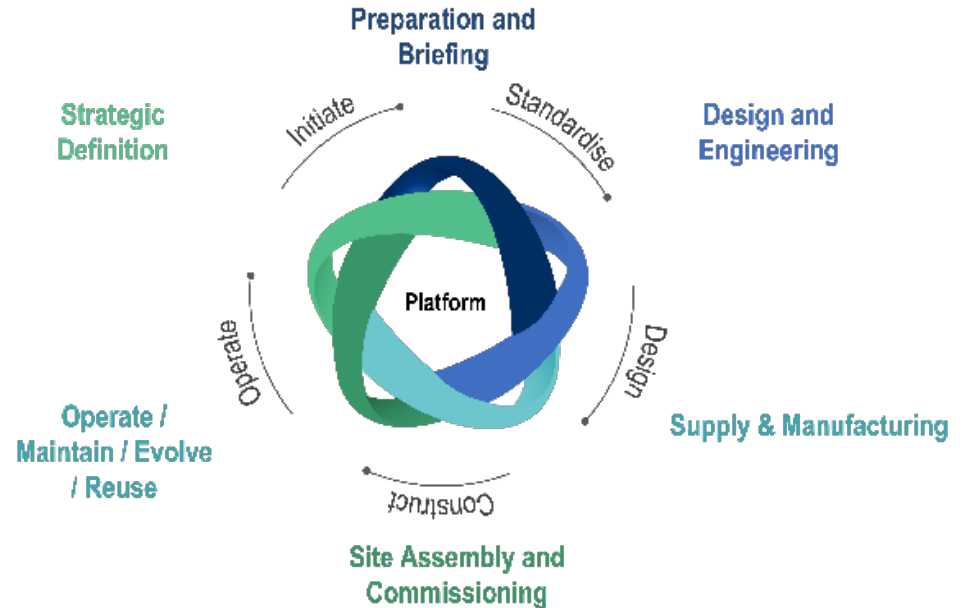
A.G. Coombs, BlueScope Steel, Hyne & Son, Lendlease Digital, Monash University, Sumitomo Forestry, The University of Melbourne

List of researchers:

Duncan Maxwell, Amrik Sohal, Robert Moehler, Alka Nand, Daniel Samson, Prakash Singh, Zahra Seyedghorban, Liang Chen.

Date commenced and duration:

September 2021; 12 months



11. Environmental Credentials for Building Technology Platforms

Project Lead: Dr Victor Bunster | Monash University

Problem / thesis

There is a growing need for environmental credentials to support B2B and B2C communication in the building industry. Solutions based on the Life Cycle Assessment (LCA) methodology are the most comprehensive, covering all the stages of the building's lifecycle – from extraction of raw materials to their end-of-life stages.

Despite the potential efficiencies of loosely-coupled supply chains, distributed decision making, and increased levels of digitalisation, there are no readily available methods to systematically assess the environmental impacts of building technology platforms.

This project is developing an ISO-compliant LCA framework to quantify and communicate these impacts using the uTecture and Airbuildr platforms as cases.

List of partners:

Utecture Australia, Coresteel Buildings, Monash University

List of researchers:

Dr Victor Bunster, Dr Duncan Maxwell, Santiago Muñoz-Vela, Fernando Pavez, Yusra Rashed, Seongwon Seo

Date commenced and duration:

March 2021; 12 months



Image credit: Airbuildr construction design platform (uTecture, 2022).

Supply Chain Impacts

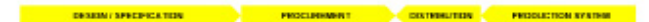
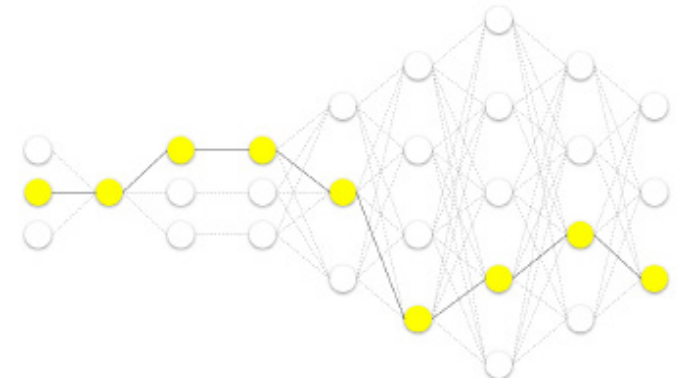


Image credit: Supply chain impacts of building technology platforms (Victor Bunster, 2022).

15. Using the Whole Tree for Future Timber-Based Construction Scoping Study

Project Lead: Dr Benoit Belleville | The University of Melbourne

Problem / thesis

This project aims to optimise parts of the Australian sawn timber processing sector, so it can adapt to changes in market demand and material characteristics in ways that align with the future timber-based construction. The project is a review and scoping exercise to find ways of using the whole tree more effectively, while adding value to the built environment. The aim is to propose avenues of research that will address timber supply and provide manufacturing and structural design solutions to build a more resilient industry.

List of partners:

Hyne & Son, Sumitomo Forestry Australia,
The University of Melbourne

List of researchers:

Dr Benoit Belleville, Dr Wen Li, Dr Alireza A. Chiniforush,
Prof Tuan Ngo, Prof Barbara Ozarska, Prof Rod Keenan,
Mr Richard Nero, Mr Johannes Fehrmann

Date commenced and duration:

May 2022; 12 months

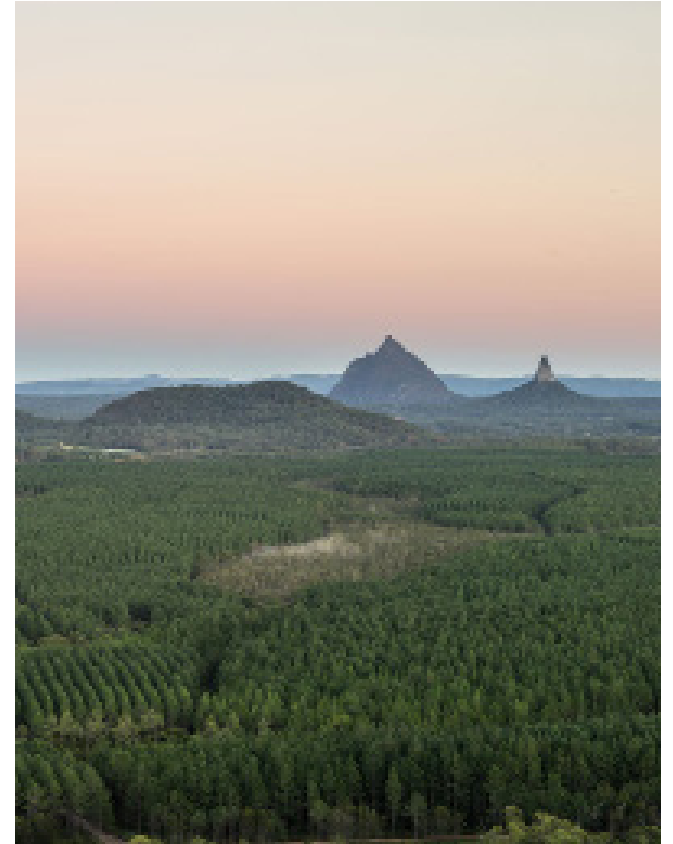


Image credit: Beerburum (Hyne Timber, 2022).

24. Next Generation of Robust and Fire-resilient Light Gauge Steel Systems for Mid-Rise Buildings

Project Leads: Prof Tuan Ngo & Dr Mahen Mahendran | UoM & QUT

Problem / thesis

Traditional construction practices in Australia have been criticised for their focus on the reduction of upfront construction costs at the expense of quality, performance and flexibility.

Current and emerging prefabrication processes could provide the efficiency and quality of construction to the traditional built-to-sell market, however by incorporating the possibilities to cater for the recently developing built-to-rent sector is considered to drive it even stronger.

This is because Build-to-rent shifts the housing profit model from capital gains to one based on ongoing rental income, with viability tied to minimising ongoing expenditure.

This scoping study seeks to examine the intersection of these assets and prefabrication processes, to identify opportunities for the housing and construction sector to reduce ongoing greenhouse gas emissions and increase the quality of stock.

List of partners:

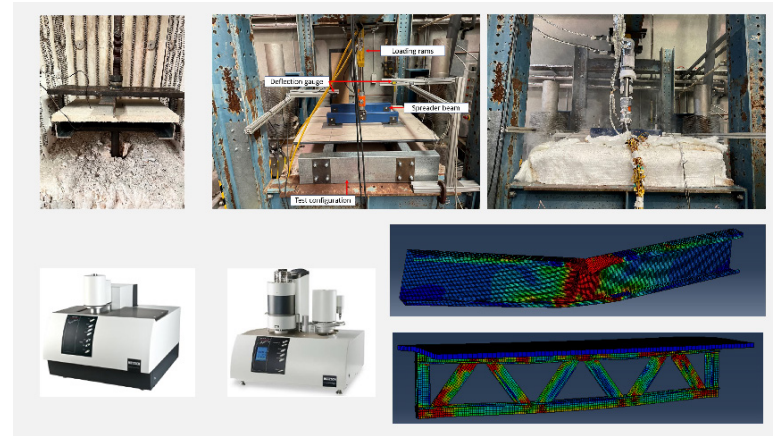
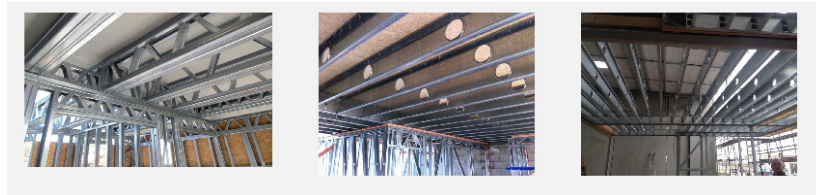
Bluescope Steel, Queensland University of Technology

List of researchers:

Prof. Mahen Mahendran, Dr Anthony Ariyanayagam, Mr Fatheen Hisham, Mr Gihan Ranasinghe

Date commenced and duration:

March 2022; 36 Months



24. Next Generation of Robust and Fire-Resilient Light Gauge Steel Systems for Mid-Rise Buildings (Umbrella Project)

Project Leads: Prof Tuan Ngo & Dr Tai Thai | The University of Melbourne

Problem / thesis

Light gauge steel (LGS) offers significant advantages over other construction materials such as easy to install and resistant to rotting, shrinking and termite attack. However, the structural robustness to resist progressive collapse under localised damage due to accidental loads is a critical concern in LGS systems. This is particularly the case given the connections in LGS buildings are usually made via screws and rivets with low tying resistance.

This project will develop cost-effective structural solutions for robustness of LGS structures to promote their applications in mid-rise construction markets such as offices, apartments, hotels, hospitals, student accommodation and aged care facilities.

List of partners:

BlueScope, University of Melbourne

List of researchers:

Prof Tuan Ngo, Prof Nelson Lam, A/Prof Tai Thai, Dr Tuan Nguyen, Mr Chris Mathwin, Mr Trac Nguyen

Date commenced and duration:

March 2022, 36 Months



27. Environmental Decision-support for Steel Structures

Project Lead: Dr Victor Bunster | Monash University



Problem / thesis

There is a growing demand for reliable methods to rapidly assess and compare the environmental impacts of alternative building solutions. Approaches based on the Life Cycle Assessment (LCA) methodology are most commonly recognised by industry and academia; however, producing accurate results under this framework requires highly specialised skills and research effort that prevents their ready incorporation into the design of most buildings.

The main objective of this project is to generate a knowledge base to inform the development of decision-support systems, supporting environmentally efficient building design.

List of partners:

Bluescope, Monash University, The University of Melbourne

List of researchers:

Victor Bunster, Victor Chang, Maxwell Chng, Peter Graham, Santiago Muñoz-Vela, Safoura Salehi, Jenny Zhou, Lu Aye, Khuong Bui, Philip Christopher, Tuan Ngo, Thais Goncalves-Sartori

Date commenced and duration:

June 2021, 6 months



Image credit: Penguin Parade Visitor Centre, Phillip Island, VIC. © Peter Bennetts 2019.
Frame made from TRUECORE® steel.



Image credit: Smalls Road Public School, Ryde, NSW. © School Infrastructure NSW and Austruss. Frame made from TRUECORE® steel.

32. Acoustic flanking performance of mid-rise light gauge steel (LGS) structures

Project Lead: Dr Amin Heidarour | Monash University

Problem / thesis

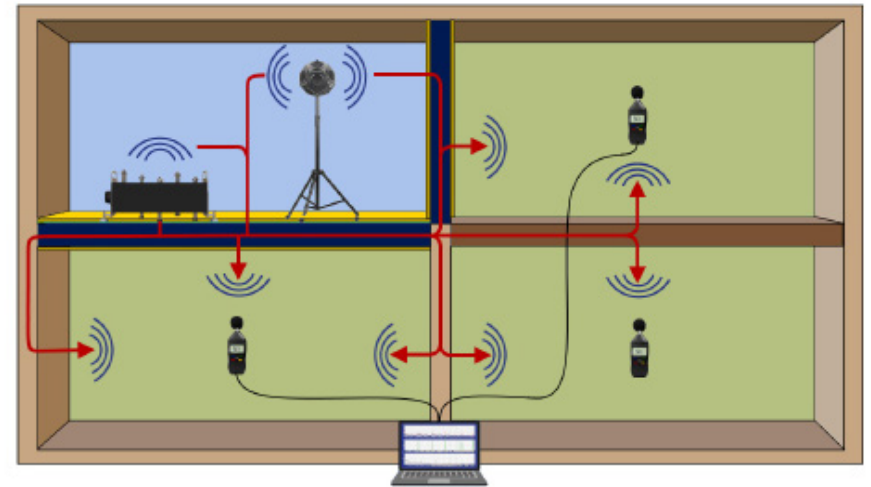
The project aims to develop a robust method for predicting the acoustic flanking performance of floor and wall systems in mid-rise LGS buildings. The resulting design recommendations will give the building community confidence about how to reliably design and construct LGS buildings.

List of partners:

Bluescope, Monash University, The University of Melbourne

Date commenced and duration:

September 2022; 36 months



33. Remote Compliance Inspections

Project Lead: Dr Yihai Fang | Monash University



Problem / thesis

Remote (virtual) building inspections are expected to reduce the time and travel needs required by traditional in-person inspections while maintaining (or enhancing) the integrity and rigor of the inspection process and outcome. However, the effectiveness and suitability of technologies for remote building inspections are not fully understood and rigorously evaluated. This project aims to 1) review best remote inspection practices, 2) evaluate digital technologies for remote building inspections, and 3) develop a guideline for the effective implementation of suitable technologies for remote building inspections. Outcomes from this project are expected to guide the implementation of technologies and workflows for remote building inspection.

List of partners:

Victorian Building Authority, VMIA, Salesforce.com, Sumitomo Forestry Australia, University of Melbourne, Monash University,

List of researchers:

Dr Yihai Fang, Eric Windholz, Kourosh Khoshelham, Tuan Ngo, Tanghan Jiang, Jimmy Weng, Sajjad Einizinab

Date commenced and duration:

June 2022; 12 months

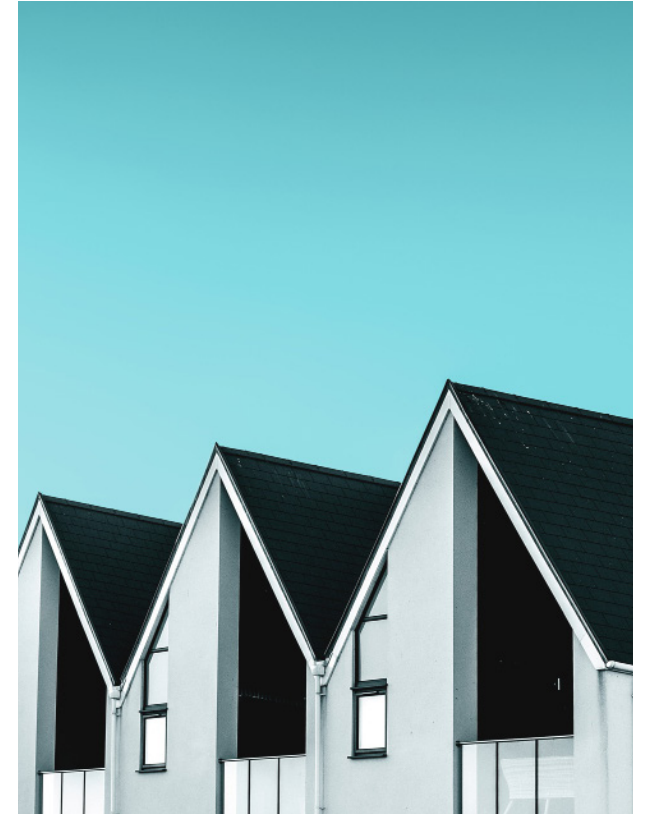


Image credit: Stock image (Alexander Andrews)

36. Academic validation of performance gap research in energy rating systems

Project Lead: Dr Victor Bunster | Monash University

Problem / thesis

The report Closing the performance gap in Australia's commercial office sector (produced by Building 4.0 CRC and the Green Building Council of Australia (GBCA)) showed modelled energy performance of Green Star certified buildings is being achieved in operation, as demonstrated by NABERS energy ratings. The GBCA aims to further validate and extend this research through an academically peer-reviewed publication.

This project involves undertaking research to understand the outcomes of the Closing the performance gap report in the context of international contemporary academic studies and literature.

List of partners:

Green Building Council of Australia, Monash University

Date commenced and duration:

September 2022; 6 months



37. Australian Timber Fibre Insulation Scoping Study

Project Lead: Dr Phil Christopher | The University of Melbourne



Problem / thesis

The Australian timber industry generates significant quantities of low grade by products in the form of chips and sawdust through the manufacturing of sawn and mass timber products. Most problematic among these are the H2 and H3 treated products that are not currently re-purposed into other products. Additional to this timber waste stream there are large amounts of other low to no value feedstock such as bark and single use timber pallets that have the potential to be manufactured into higher value fibre insulation products for the Australian market. This presents a potential opportunity to divert considerable quantities of waste from landfill and produce a high performance, locally made, low carbon, natural fibre insulation products for the building industry in Australia. This project is a scoping study that will assess the techno-economic feasibility and opportunities associated with the creation of a timber fibre insulation manufacturing facility in Australia.

List of partners:

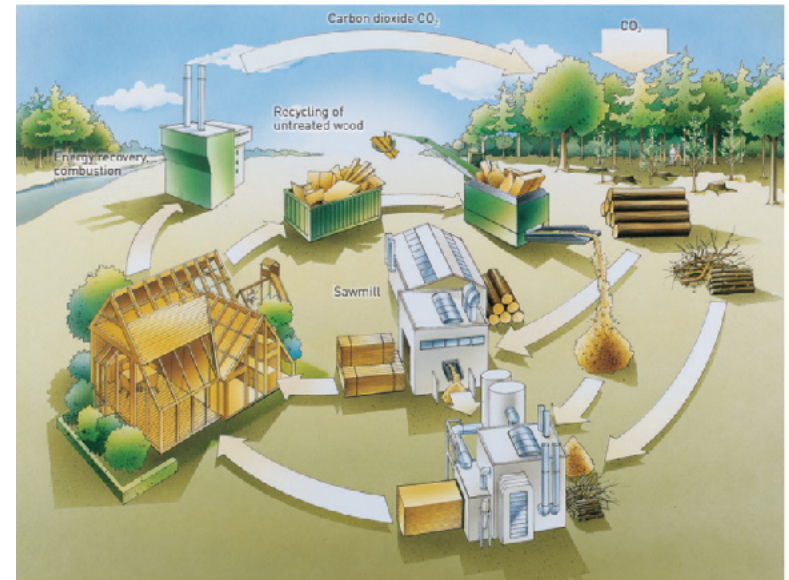
Ultimate Windows, Hyne Timber, University of Melbourne

List of researchers:

Dr Philip Christopher, Dr Benoit Belleville, Dr Neda Nematollahi,
Dr Lu Aye, Prof Tuan Ngo

Date commenced and duration:

February 2022; 9 months



38. Victorian Government Digital Build - Translating theory into practice

Project Leads: Dr Lee-Anne Khor & Prof Diego Ramirez-Lovering | Monash University

Problem / thesis

Project #38 is a cross-sector collaboration that aims to address the gap between theory and practice to facilitate greater uptake of digitally integrated building and offsite construction in Victoria. Three tranches of research will be used to build Victoria-specific evidence about digital building projects, practices and environments: 1) off-site and modular construction hubs; 2) benefits of digital build; and 3) project applicability decision-making framework. Building on our partners expertise and project data, this project will integrate spatial, economic and socio-technical research to align government and industry imperatives for establishing and sustaining a robust, digitally integrated building industry in Victoria.

List of partners:

AG Coombs, BlueScope, Fleetwood (BRB Modular), Coresteel Australia (Donovan), Lendlease Digital, Monash University, Salesforce.com, Sumitomo Forestry Australia, Master Builders Assoc, Victoria State Government: Dept of Jobs, Precincts and Regions, The University of Melbourne, Ynomia.

List of researchers:

Prof Diego Ramirez-Lovering, Dr Lee-Anne Khor, Dr Duncan Maxwell, Dr Sahar Soltani, Dr Duncan Maxwell, Dr Laura Harper, Dr Ivana Kuzmanovska, A/Prof Lionel Frost, A/Prof Seamus O'Hanlon, Dr Claudio Labanca, A/Prof Gillian Oliver, Dr Abdallah Ghazlan, Dr Misita Anwar, Dr Caddie Gao, Prof Tuan Ngo, Dr Behzad Rismanchi, A/Prof Kourosh Khoshelham, A/Prof Tai Thai, Dr Lisa Kruesi, Dr Jocelyn Cranefield, Dr Siddhesh Godbole, Prof Tuan Ngo, Prof Nelson Lam, Dr Rackel San Nicolas, Dr Xuemei Liu

Date commenced and duration:

June 2022; 12 months

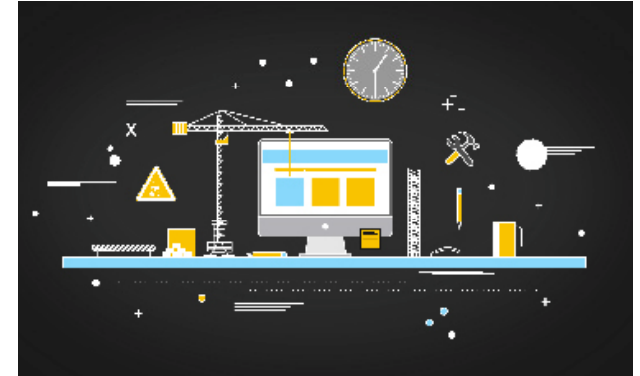


Image credit: Pavatex (Project Team, 2019)

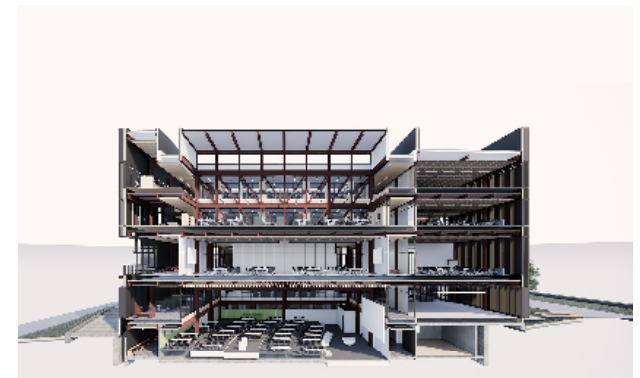


Image credit: Monash Woodside Building for Technology and Design. Sectional Perspective. (Grimshaw)

44. Generative Architectural Design Engine

Project Lead: Dr Camilo Cruz Gambardella | Monash University

Problem / thesis

Advancements in machine learning (ML) and artificial intelligence (AI) models that produce graphics have dominated the discussion around computational creativity for the past 5 years. Generative neural networks, like DALLE-2 and Midjourney, can render remarkably detailed, intricate and convincing images, to the point where they can be perceived as 'creative work'. This project aims to leverage these advancements to support creative processes in a more complex field: architectural design.

Using a combination of qualitative methods and advanced ML and AI models, our goal is to develop and implement prototypical digital tools, capable of 'proposing' multiple viable architectural design drafts, based on design value and performance. They will be used as a starting point for designers to build upon.

List of partners:

LendLease Digital, Monash University

List of researchers:

Dr Camilo Cruz Gambardella, Prof Jianfei Cai, Prof Shane Murray, Prof Dinh Phung, Prof Jon McCormack, Prof Mel Dodd, Dr Duncan Maxwell

Date commenced and duration:

April 2022; 36 Months



Image credit: An example of the use of AI for Generative Design (Camilo Cruz Gambardella, 2022).

45. Prefab Wall Integrated System – Phase 2 Demonstration House and Market Study

Project Lead: Dr Phil Christopher | The University of Melbourne

Problem / thesis

There currently exists significant logistical and material shortage challenges in the residential home construction market. This coupled with a highly competitive environment has translated into most builders focusing on price of delivery, assuming this is the most important aspect to consumers. Builders are also subject to increasing risk with greater supply chain, labour and material shortages hindering the on time and on budget delivery of homes. This project tackles this problem through a two-prong approach (1) leveraging of existing work build a demonstration home that utilises a prefabricated wall system that delivers greater energy performance and lower supply chain risk with an integrated system and (2) to better understand the values of home buyers and the role that cost, energy performance and quality play in their decision making. This project will see the materialisation of the high-performance wall system in the construction of demonstration home in Melbourne, showcasing constructability, performance and the aesthetics of the system.

List of partners:

Bentley Homes, University of Melbourne , Ultimate Windows

Date commenced and duration:

July 2022; 24 months

List of researchers:

Dr Philip Christopher, Prof Tuan Ngo, A/Prof Felix Hui, Dr Tu Le, Dr Khuong Bui, Dr Lu Aye



46. Data analytics for structural fibre resources optimisation

Project Lead: Dr Steven Psaltis | Queensland University of Technology



Problem / thesis

The ongoing digitalisation of manufacturing companies enables new potential for optimisation of their processes. With a growing number of sensors implemented in manufacturing systems such as modern large sawmills, a huge volume of data is generated. This data is an important resource to maintain competitiveness.

In this project we are using machine learning and data analytics approaches to explore the huge volume of data collected by Hynne Timber across various stages of production, to uncover new insights and avenues for future investigation.

List of partners:

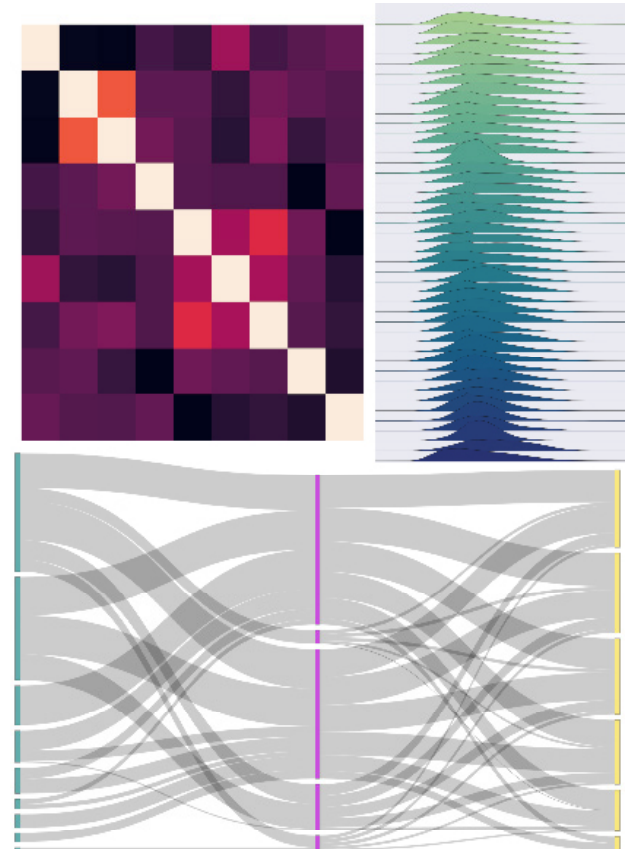
Hynne & Son, Queensland University of Technology

List of researchers:

Dr Steven Psaltis, Dr Xiaoyu Wang,
Prof Ian Turner, Rebecca Cherry

Date commenced and duration:

October 2021; 12 months



57. Wind Comfort Simulation and New Engineering Design Process

Project Lead: David Burton | Monash University

Problem / thesis

For a typical engineering project, Engineering design (upstream) and operation (downstream) commonly follow a linear process through multiple contracting parties. Such a process is inefficient and unsustainable for continuous improvement and IP retainment. To resolve such dilemmas in building wind comfort design, Lendlease Digital collaborates with Monash University to develop a new pathway by coupling cutting-edge multidisciplinary technologies, including wind tunnel experiments, numerical simulations, and field testing. The new pathway will improve efficiency by introducing a feedback loop to the system, to date an unprecedented approach to wind design for the built environment. Potentially, this pathway can also quickly transform comfort design within other engineering disciplines, for example, fire, water, and thermal.

List of partners:

Lendlease Digital Delivery, Monash University

List of researchers:

Mr David Burton, Prof Mark Thompson, Dr Daniel Tudball Smith, Dr Shibo Wang

Date commenced and duration:

July 2022, 24 months

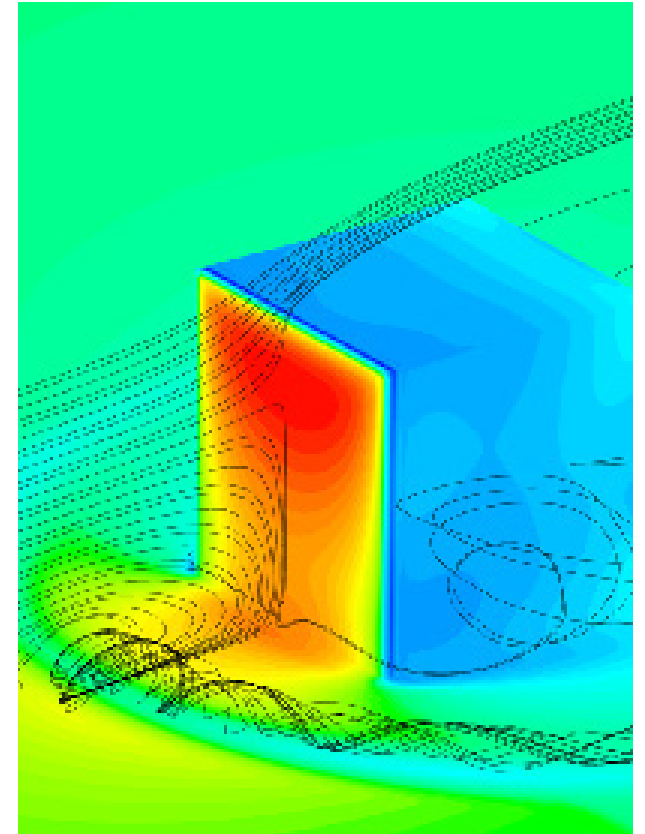


Image credit: CFD1 (Shibo Wang 2022)

59. Innovative Steel–Timber–Concrete Composite StrongFloor

Project Lead: Prof. Tuan Ngo | The University of Melbourne

Problem / thesis

This project aims to develop a novel structural flooring system covering mid- to long-spans that:

- * minimises material use
- * provides the possibility of fast and modular construction
- * reduces manufacturing and construction costs
- * improves space quality and aesthetic look
- * complies with the requirement of Australian standards and BCA.

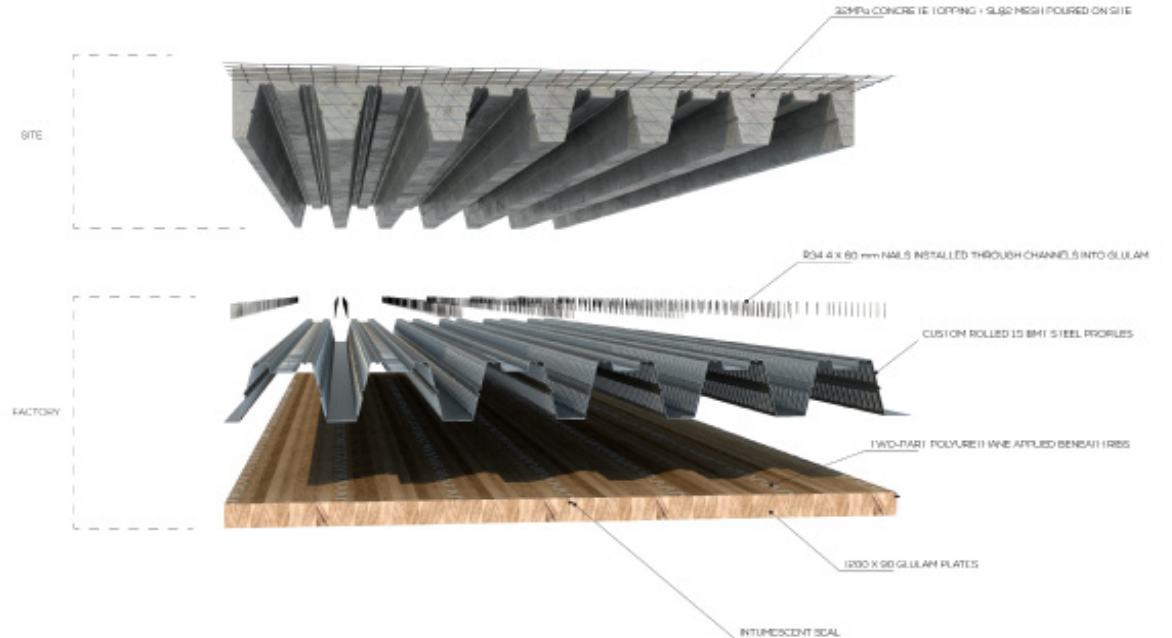
The initial phases are an extension of existing experimental knowledge and the development of reliable numerical and analytical models. Later stages of the project will include optimising the floor components.

List of partners:

VIRIDI Group, The University of Melbourne

Date commenced and duration:

September 2022, 18 months



Completed Projects

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1. ePlanning and eApprovals – Scoping Study

Project Lead: Dr Davood Shojaei | The University of Melbourne

Problem / thesis

Planning and building approval processes are still largely paper (PDF) based, which make them inefficient and time-consuming, imposing significant costs on both industry and government. Industry is effectively unable to test plan compliance against planning controls and building regulations, track progress of their applications, and efficiently track compliance through construction.

The longer-term objective of the CRC's work in this area is to embrace the opportunities that digital workflow and digital twin technology provide to design, develop and deliver an innovative digital platform to facilitate effective, efficient and timely planning, building permits, approvals, ongoing compliance with planning controls, building regulations and other regulatory requirements.

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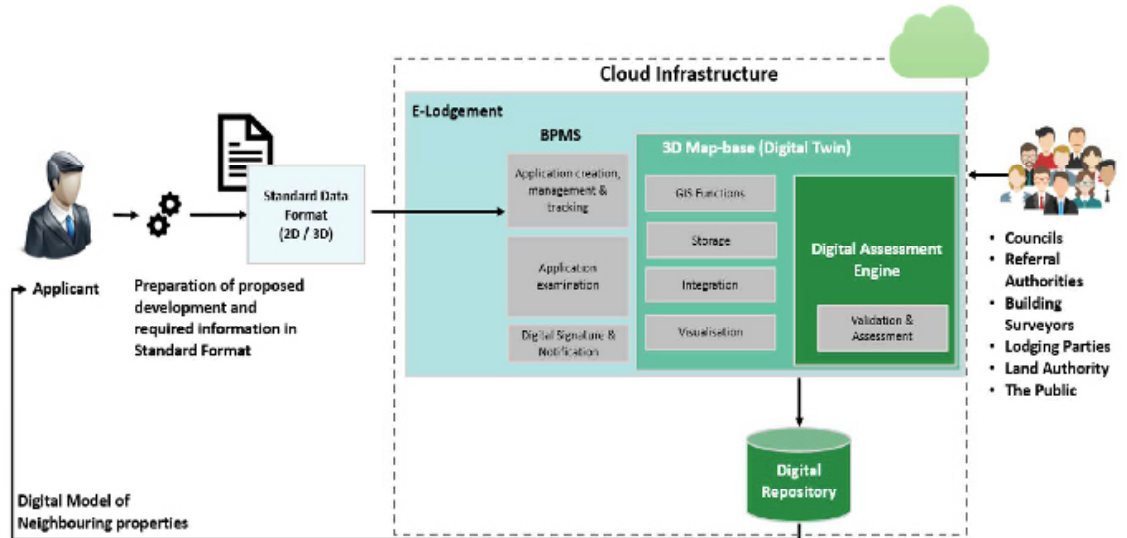
Lendlease Digital, uTecture, Sumitomo Forestry, A.G.Coombs Group, Salesforce.com, Inc., Master Builders Association of Victoria, Victorian Building Authority, Victorian Government, Department of Environment, Land, Water and Planning, Monash University, The University of Melbourne

Date commenced and duration:

22 March 2021; 6 months

List of researchers:

Dr Davood Shojaei, Dr Soheil Sabri, Dr Eric Windholz, Dr Alexa Gower, Prof Tuan Ngo, Prof Abbas Rajabifard, Prof Colin Duffield, A/Prof Yee-Fui Ng, Dr Neda Malekzadeh, Dr Nilupa Herath, Ms Jihye Shin, Ms Susan Wright, Mr James Moutsias, Ms Cassandra Tremblay, Ms Vania Djunaidi, Ms Nellie Sheedy-Reinhard



2. Automated tracking of construction materials for improved supply chain logistics and provenance – Phase 1 Scoping Study

Project Lead: Dr Wen Li | The University of Melbourne

Problem / thesis

The construction supply chain poses challenges and risks mainly due to its unstable, highly fragmented, and geographically dispersed nature. The ability to track and trace (i.e., traceability), is becoming increasingly important as it contributes to and associates with building compliances, safety, project efficiency, and sustainability. This study aims to understand the state-of-the-art of traceability in the construction industry and key stakeholders, and perspectives, as well as to recommend future research. Our researchers have used multiple research methods (e.g., interviews, literature review and case studies) to assess existing and emerging tracking technologies (e.g., sensors, information systems) for sectoral and issue appropriateness.

List of partners:

BlueScope Steel, Holmesglen Institute, Lendlease Digital, Monash University, Queensland University of Technology, Salesforce.com, Inc., Sumitomo Forestry, Master Builders Association of Victoria, The University of Melbourne, Victorian Building Authority, Ynomia

List of researchers:

Dr Wen Li, Dr Guilherme Luz Tortorella, Prof Robin Drogemuller, Dr Aravinda Sridhara Rao, A/Prof Joseph Liu, Dr Yihai Fang, A/Prof Tim Rose, Dr Sara Omrani, Prof Alistair Barros, Prof Tuan Ngo, Mr Declan Cox, Ms Negar Adeb, Mr Noor E Karishma Shaik, Mr Siyu Chen, Mr Xin Ma, Mr Tendai Makasi

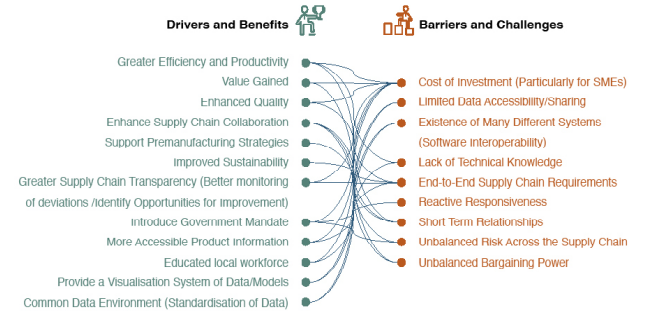


Image credit: Critical drivers, benefits, barriers and challenges for the construction traceability (Wen Li, 2022)

Date commenced and duration:

July 2021; 6 months

	QR Code	Barcode	Active RFID	Passive RFID	NFC	BLE	GPS
Cost-Effective	\$	\$	\$\$\$	\$	\$\$\$	\$\$\$	\$\$\$
Real-time tracking	⊘	⊘	⊘	⊘	⊘	✓	✓
Power Consumption	⊘	⊘	✓	⊘	✓	⊘	✓
Scanning Range	High	High	High	Low	Low	Low	Unlimited
Storage capacity	3 KB	> 100 bytes	2 KB	4-8 KB	48 Bytes – 8 KB	NA	Unlimited
Continuous scanning	✓	✓	✓	✓	✓	At regular intervals	Real-time data
Two-way Communication	⊘	⊘	⊘	⊘	✓	✓	✓
Labour Intensive	✓	✓	✓	×	✓	✓	✓
Popularity	Very high	Very high	High	High	Moderate	Moderate	Moderate

Image credit: Comparison of different product identification and tracking technologies (Aravinda Rao 2022)

4. Computational Design and Optimisation Tools for Prefabricated Building Systems

Project Lead: Dr Abdallah Ghazlan | The University of Melbourne

Problem / thesis

The objective of the project is to develop a computational framework for producing optimised design options for modular facade and floor systems, which are both structurally and thermally efficient, early in the conceptual design phase. Given the multi-objective criteria (both structural and energy), several designs will be presented to the client in a format that allows engineers to make an informed decision on the option that meets project constraints. The time/cost efficiency of these building systems will be ascertained by benchmarking them against existing case studies of building systems (facade and floor) designed using traditional manual techniques.

List of partners:

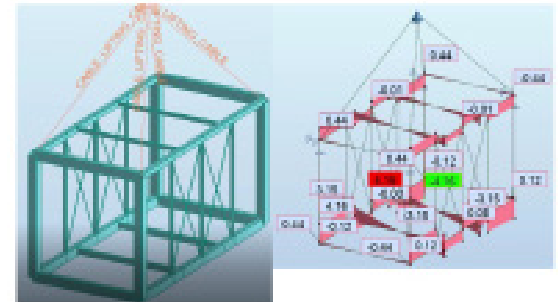
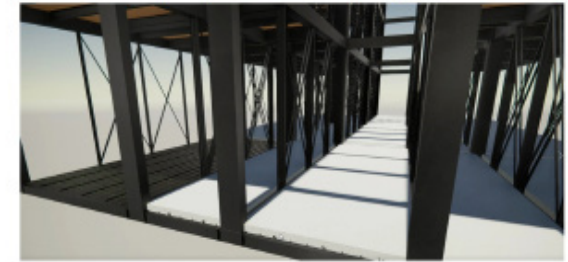
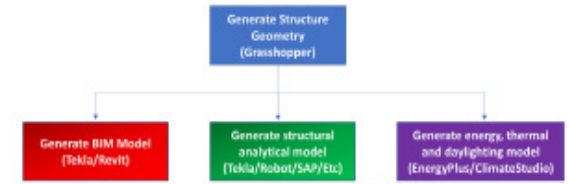
M-Modular, University of Melbourne

List of researchers:

Dr Tai Thai, Prof Tuan Ngo, Prof Robin Drogemuller, Dr Veronica Garcia Hansen, Dr Wendy Miller, Dr Abdallah Ghazlan, Dr Khuong Bui, Tu Le, Tay Son Le, Islam Mashaly

Date commenced and duration:

February 2021; 6 months



5. Automatic compliance and energy rating system

Project Lead: Dr Phil Christopher | The University of Melbourne



Problem / thesis

This project will transform the current manual process of energy compliance checks for new residential homes by integrating existing rapid digital building software with Australia's building regulation and performance assessment requirements.

The outcome is intended to be a fully integrated and seamless workflow with home design and subsequent implications, and energy performance assessment performed in real time.

This project developed a comprehensive workflow to take Utecture's existing home design and costing engine and propose subsequent compliance and NatHERS energy rating assessment procedures utilising CSIRO's Accurate engine. The developed road map has paved the way for designers, builders, and clients to understand the energy performance and compliance of a home whilst also having an estimate of the capital and ongoing costs in near real time during design

List of partners:

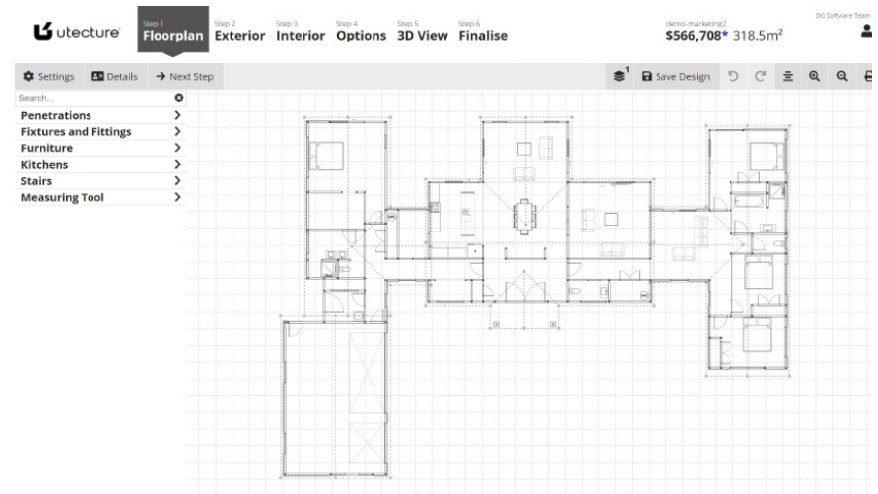
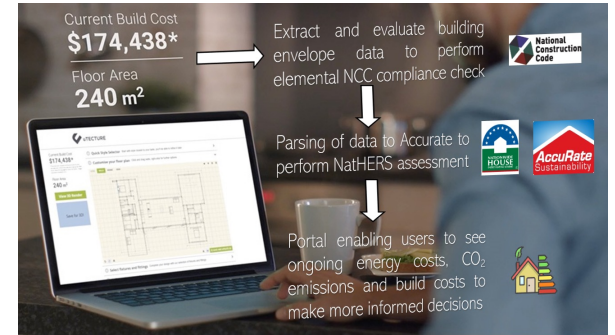
uTecture, Green Building Council of Australia, The University of Melbourne, Monash University, Queensland University of Technology

List of researchers:

Dr Tai Thai, Prof Tuan Ngo, Prof Robin Drogemuller, Dr Veronica Garcia Hansen, Dr Wendy Miller, Dr Abdallah Ghazlan, Dr Khuong Bui, Tu Le, Tay Son Le, Islam Mashaly

Date commenced and duration:

December 2020, 6 months



6. Field Data Collation to Support Real-Time Operational Management

Project Lead: Dr Yihai Fang | Monash University

Problem / thesis

Accurate and timely information about construction processes is essential to provide greater visibility and understanding of project progress and therefore deliver the projects on time and on budget.

This project seeks to make significant advances in the knowledge and practice of acquiring and managing real-time operation data. More specific objectives include:

- 1) understanding how passive data collection can improve the management and coordination of on-site activities
- 2) analysing state-of-the-art in sensing and analytics technologies
- 3) conducting field tests to assess and validate the key assumptions underlying an implementation roadmap.

List of partners:

Lendlease Digital, Ynomia, Standards Australia, Monash University

List of researchers:

Dr Yihai Fang, A/Prof Mehrdad Arashpour, Dr Robert Moehler, Dr Duncan Maxwell, Dr Ivana Kuzmanovska, Dr Ali Rashidi, A/Prof Kourosh Khoshelham, Dr Aravinda S. Rao, Prof Tuan Ngo, Prof Robin Drogemuller

Date commenced and duration:

October 2020, 6-month duration

Data types and technologies in passive data collation

Acquire			Process		Analyse	
Mapping	Positioning		Location data		Object condition (plant, worker, site, etc.)	Progress monitoring (structure, earthwork, etc.)
Laser scanning	RFID	UWB	Proximity	Triangulation	Environment + location + status + behaviour	As-built vs. As-planned (scan-vs-BIM)
RGB camera	BLE	ZigBee	Fingerprinting	Dead reckoning		
Depth camera	Wi-Fi	LoRa	Image data		Object utilisation (plant, equipment, etc.)	Incident detection (accident, near miss, etc.)
Frequency Modulation	Ultrasonic	Infrared	Photogrammetry	Object detection	Location + status + quantity + time	Location/status/behaviour vs. rules/thresholds
	IMU	GPS	Object tracking	Behaviour recognition		
Cellular Communication			Scene understanding		Visualise	
Platforms			Point cloud data		Automatic reporting	Automatic warning
Stationary	Handheld		Noise removal	Registration	Dashboard, BIM model, spreadsheet, etc.	Smartphone alert, equipment visual & auditory warning, etc.
Equipment-mounted	Wearable		Sub-sampling	Object detection		
Trolley	UGV/UAV		Meshing	As-built modelling		

Image credit: Technological landscape of passive data collation on construction sites (Yihai Fang, 2022).

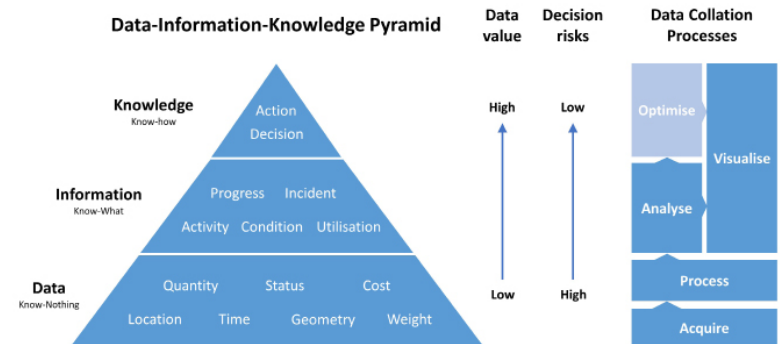


Image credit: DIK pyramid and data collation processes in site operational management (Yihai Fang, 2022).

8. Prefab, Integrated Wall Systems – Scoping Study

Problem / thesis

This project seeks to design a high-performance wall system exceeding the performance of a 7-star dwelling, with window systems that can be manufactured in two weeks and wall systems that can be assembled on-site

(lockup stage) in four weeks, and can be manufactured, delivered and installed in a cost-effective manner.

The initial phase consists of a technology review and scoping exercise that will lead a detailed design phase and a manufacturing systems design phase.

List of partners:

Bentley Homes
Ultimate Windows
The University of Melbourne
Monash University

Date commenced and duration:

November 2020, 12 month duration



9. Guidelines for Implementing DfMA and Lean Construction Principles in Building Projects

Project Lead: Dr Ivana Kuzmanovska | Monash University

Problem / thesis

This 6-month research project aimed to understand: the current state of Lean and Design for Manufacture and Assembly (DFMA) knowledge within construction; their degree of implementation in both the local construction industry and abroad; and the implementation challenges that need to be addressed if we are to see broader uptake. To address these points, the project team conducted a literature review, a case study of a local construction project, and a survey of leading local and international companies who have adopted DfMA and/or Lean practices. The findings were synthesised into a self-assessment tool and implementation roadmap concept aimed at individual companies hoping to adopt Lean and DfMA practices.

List of partners:

A.G. Coombs, Lendlease Digital, Monash University, The University of Melbourne

List of researchers:

Dr Ivana Kuzmanovska, Dr Rachel Couper, Dr Tharaka De Vass, Dr Felix Hui, Dr Duncan Maxwell, Dr Robert Moehler, Prof Tuan Ngo, Achini Peiris, Dr Gao Shang, Prof Amrik Sohal, Rebecca Williams, Yiqin (Iris) Yu, Darcy Zelenko

Date commenced and duration:

June 2021, 6 months

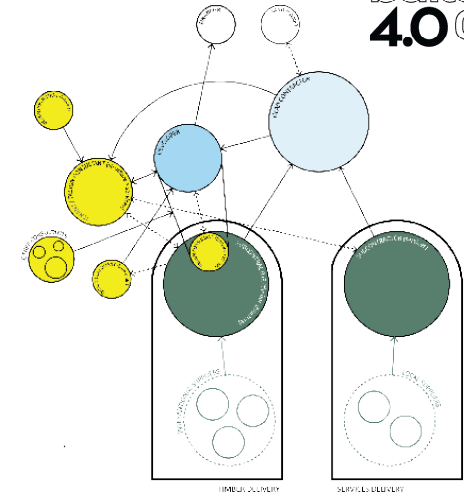


Image credit: Case Study Mapping of Project Stakeholders



Image credit: Case Study Construction Site

10. Product Platform for Volumetric Building (Scoping Study)

Project Lead: Dr Duncan Maxwell | Monash University

Problem / thesis

Product platforms have demonstrated success in manufacturing and construction to integrate design and production. This approach can drive efficiency improvements with design responsiveness. Product platforms deliver commonality in 'assets' that are defined as physical components, business processes, knowledge management, and stakeholder interactions. Defining common approaches to these assets allows variety to emerge through configuration while focusing resources on each asset to monitor performance and target continual improvement.

Fleetwood Building Solutions currently supply volumetric prefabricated buildings to the education, resources, housing, custodial, and commercial sectors. Designs are highly customised, responding to changing sites and client briefs. Working with the Future Building Initiative at Monash University, Fleetwood will develop a common organisational product platform for their built solutions to improve production efficiency while driving flexible designs that continue to deliver high quality design solution outcomes for customers.

List of partners:

Fleetwood Building Solutions, Monash University

List of researchers:

Dr Duncan Maxwell, Dr Ivana Kuzmanovska

Date commenced and duration:

October 2020, 12 months



Image credit: Steel framed volumetric module assembly



Image credit: Design flexibility enabled by the General Motors product platform (General Motors, 1956)

12. VR/AR Technologies in Vocational Education and Training

Project Lead: Dr Ali Rashidi | Monash University

Problem / thesis

Australia's Vocational Education Training sector has a critical role in preparing or updating current or future employees with job-related skills required in the workforce. The construction industry is highly regulated by VET programs that provide licensing requirements to many construction occupations. The number of VET-related occupations is expected to increase in the coming years, driven by a growing demand for skilled workers due to construction projects.

These requirements imply significant pressures to update the training delivery approaches in the construction VET system. Findings for this project were obtained from a literature review, market survey and a Delphi method as a research approach, which were selected to propose a decision making process to determine appropriate XR technology for specific skill training in the construction industry. This study proposes the most significant factors that VET educational providers should consider when selecting XR technologies to be implemented in VET training programs. Likewise, this study presents a workflow process for translating conventional vocational skill training into XR-based (VR/AR/MR) learning environments.

List of partners:

Holmesglen Institute, Monash University, Master Builders Association of Victoria (MBAV), Queensland University of Technology

List of researchers:

Dr Ali Rashidi, Dr Duncan Maxwell, A/Prof Mehrdad Arashpour, Dr Yihai Fang, Dr Barrett Ens, Dr Emadaldin Mohammadi Golafshani, Laura Gutierrez-Bucheli, Jian Tsen Goh, Ankit Shringi, Prof Robin Drogemuller, Dr Leo Rezayan, Dr Fiona Lamari, Alan Burder

Date commenced and duration:

April 2021; 6 months



Image credit: VR/AR demo workshop at Holmesglen Institute (Ali Rashidi, 2021).

17. The Implications and Opportunities from Industry 4.0 for the Building Industry: towards smart prefab

Project Lead: Dr Phil Christopher | The University of Melbourne

Problem / thesis

The Australian construction industry has faced severe challenges over the past few years. Spiralling costs of building materials and construction have made housing less affordable. Productivity, sustainability, health and well-being, and safety imperatives together with the market-wide expectation for high-quality design have further challenged traditional construction. This project aims to develop a roadmap for Smart Prefab and Industry 4.0 for the Australian building industry. We are developing this roadmap through a thorough review of world best practice and industry 4.0 principals coupled with a series of workshops with industry leaders in construction in Australia to better understand opportunities and barriers facing them.

List of partners:

AMGC and Prefab Innovation Hub (Funding body), Various Building 4.0 CRC Industry Partners, Monash University, The University of Melbourne, Queensland University of Technology

List of researchers:

Dr Philip Christopher, Dr Siddhesh Godbole, Dr Aravinda Rao, Dr Francisca Rodriguez Leonard, Dr Sahar Soltani, Dr Ali Rashidi, Prof Tuan Ngo, Dr Duncan Maxwell

Date commenced and duration:

April 2021; 12 months



Image Credit: Marketing Society (Project Team, 2022)

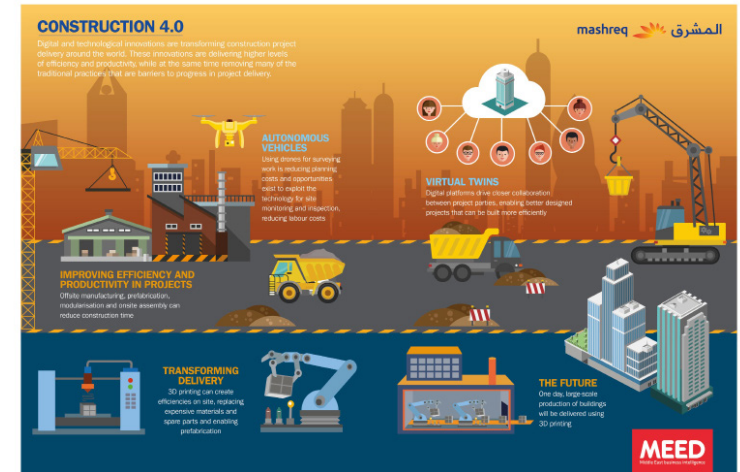


Image Credit: MEED (2021)

18. Long-Span Low-Carbon Floor Systems

Project Lead: Dr Ivana Kuzmanovska | Monash University

Problem / thesis

CRC#18 addresses the lack of data-informed product evaluation methods in construction, through the benchmarking of nine long-span, low carbon floor systems. The key outcomes of the research point towards a logic and workflow that could be applied to any productised building element, involving:

- product mapping according to material and element type
- visualisation of high level benchmarking findings for use during early building design
- synthesis of detailed benchmarking findings to enable transparent discussion of decision priorities

This framework can be used as the basis for: further product benchmarking; evaluation and selection of most suitable products given an explicit set of selection priorities; and future product design development.

List of partners:

Lendlease Digital, Sumitomo Forestry, Monash University, The University of Melbourne

List of researchers:

Ivana Kuzmanovska, Mizan Ahmed, Mehrdad Arashpour, Victor Bunster, Victor Chang, Lariza de Guzman, Tom Heath, Enzo Lara-Hamilton, Duncan Maxwell, Declan Murphy, Sejuti Saha, Angela Solarte, Jenny Zhou, Stephen Go, Felix Hui, Wen Li, Richard Nero, Tuan Ngo, Tuan Nguyen, Tai Thai, Muhammad Wasim

Date commenced and duration:

March 2021 , 6 months

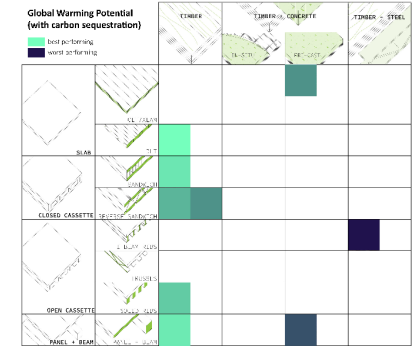


Image credit: Global Warming Potential (with carbon sequestration) (Ivana Kuzmanovska, 2022)

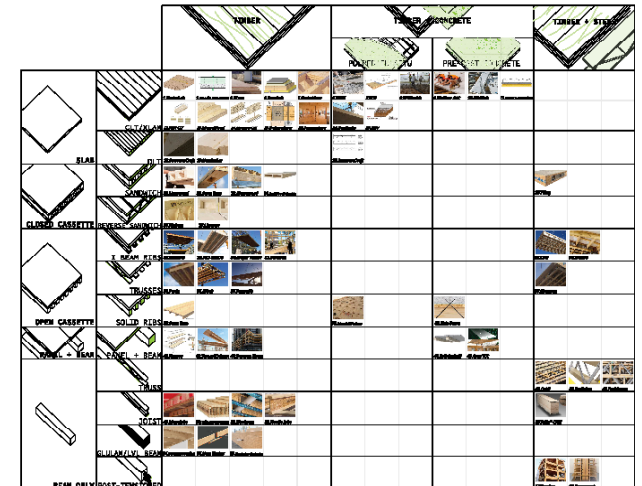


Image credit: Floor Systems Matrix (Ivana Kuzmanovska, 2022)

19. Hybrid Timber-Steel Structural Systems for Mid to High Rise Buildings – Phase 1 Scoping Study

Project Lead: Dr Amin Heidarour | Monash University

Problem / thesis

Mid-to-high-rise buildings in Australia are mainly constructed using reinforced concrete structures and have large carbon footprints.

Advanced manufacturing of engineered timber products, such as CLT and Glulam, as well as cold formed steel/high strength steel, with high strength-to-weight ratio, have paved the way for construction of those buildings, using hybrid timber-steel structural systems with a reduced carbon footprint.

Lightweight hybrid timber-steel systems may also enable a reduction in construction cost and time by allowing a DfMA approach to be taken to design and construction, and allowing the manufacturing of building components offsite. Despite the potential of hybrid structures, and unlike North America and Europe, the high-rise building market in Australia is still dominated by concrete structures, and the use of steel and timber has made few in-roads into this market.

This project will review developments in hybrid timber-steel buildings and identify the barriers to the take-up of this technology in Australia, with a focus on medium and high-rise buildings.

List of partners:

BlueScope
Hyne & Son
Monash University
University of Melbourne
Queensland University of Technology

Date commenced and duration:

July 2021; 6 months



20. Systems and methods for robustness of mid-rise light gauge steel (LGS) buildings – Phase 1 Scoping Study

Project Lead: Dr Tai Thai | The University of Melbourne

Problem / thesis

Unlike hot-rolled steel buildings, where the robustness requirement can be easily met with the use of bolted or welded joining methods with high tensile resistance for connecting structural members, the connections in LGS buildings are made in the form of screws and rivets with low tensile resistance, and thus they are usually vulnerable to progressive failure.

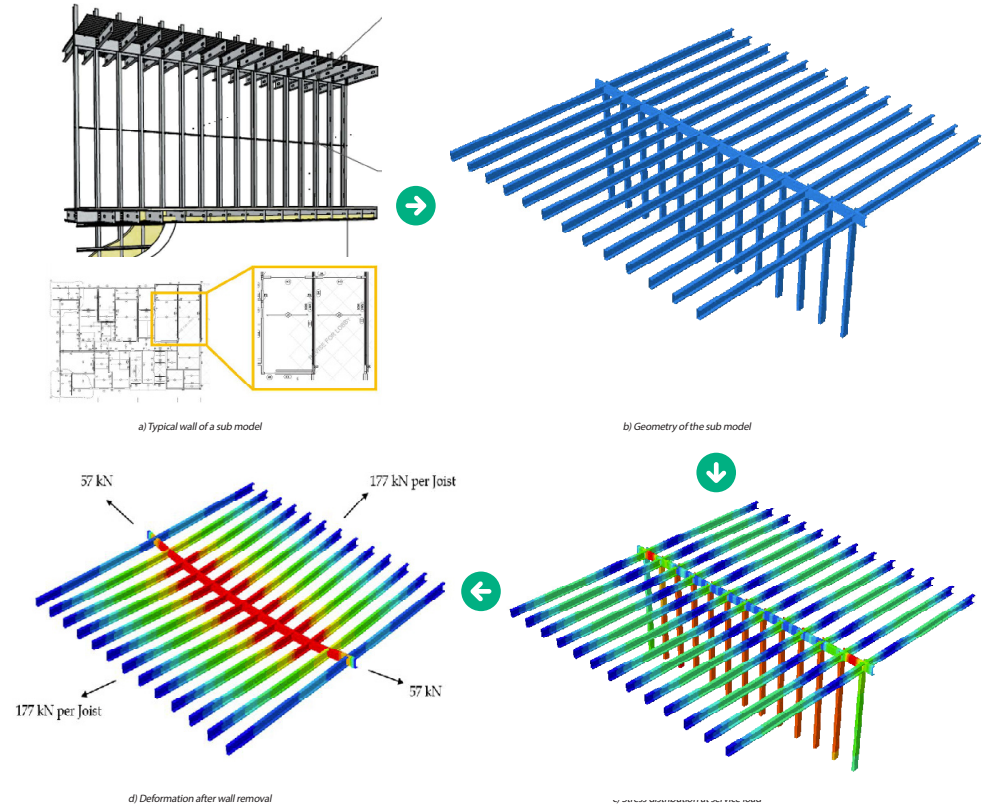
This project will develop cost-effective systems and design methods to achieve suitable robustness in LGS buildings. The success of this study will promote the practical application of LGS to mid-rise construction markets.

List of partners:

BlueScope, The University of Melbourne, Monash University

Date commenced and duration:

July 2021; 6 months



22. Generative design and BIM-based Design Automation methods for Steel Framed Buildings – Phase 1 Scoping Study

Project Lead: Dr Abdallah Ghazlan | The University of Melbourne

Problem / thesis

Light gauge steel (LGS) offers significant advantages over other materials including lightweight, quicker construction times, non-combustibility and resistance to rotting, shrinking, warping and termite attack. Today, it is not clearly understood which tools and inputs should be considered at the early planning phase for a LGS solution to be a viable structural construction alternative to timber, steel and other structural systems, particularly in mid-rise building applications. The project will develop computational design and optimisation tools for generating LGS building systems with excellent structural/fire performance that are benchmarked against an existing project that has employed traditional methods to quantify time and cost savings.

List of partners:

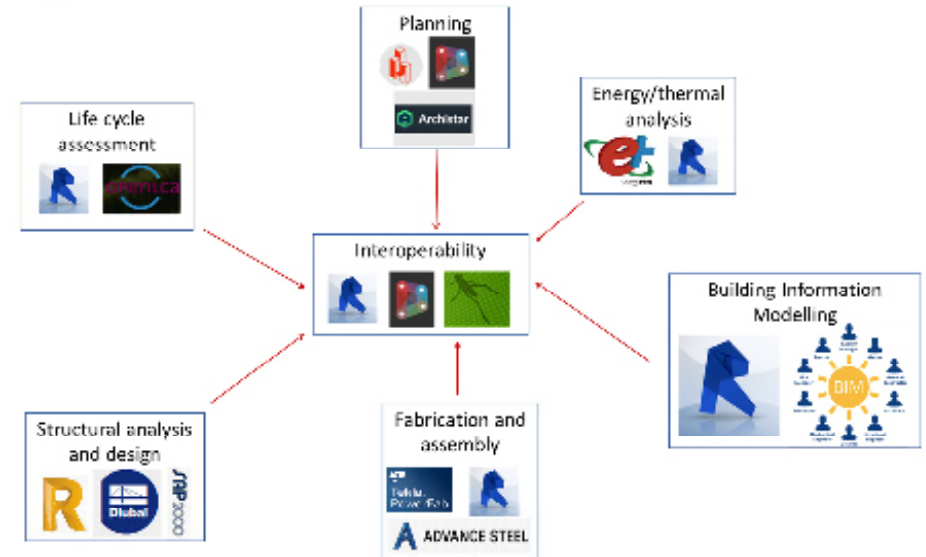
BlueScope Steel, The University of Melbourne, Queensland University of Technology

List of researchers:

Dr Abdallah Ghazlan, Dr Tu Le, Dr Yousef Alqaryouti, Dr Muhammad Wasim, Dr Sara Omrani, Dr Tai Thai, A/ Prof Hafizah Ramli Sulong, Prof Tuan Ngo, Prof Nelson Lam, Prof Robin Drogemuller

Date commenced and duration:

July 2021; 6 months



23. When prefab hits the ground: Barriers and opportunities in the Australian housing market

Program Lead: Dr Tanja Tyvima | Queensland University of Technology

Problem / thesis

Traditional construction practices in Australia have been criticised for their focus on the reduction of upfront construction costs at the expense of quality, performance and flexibility.

Current and emerging prefabrication processes could provide the efficiency and quality of construction to the traditional built-to-sell market, however by incorporating the possibilities to cater for the recently developing built-to-rent sector is considered to drive it even stronger.

This is because Build-to-rent shifts the housing profit model from capital gains to one based on ongoing rental income, with viability tied to minimising ongoing expenditure.

This scoping study seeks to examine the intersection of these assets and prefabrication processes, to identify opportunities for the housing and construction sector to reduce ongoing greenhouse gas emissions and increase the quality of stock.

List of partners:

Fleetwood Building Solutions, Sumitomo Forestry, Monash University, Queensland University of Technology

Date commenced and duration:

April 2021; 6 months

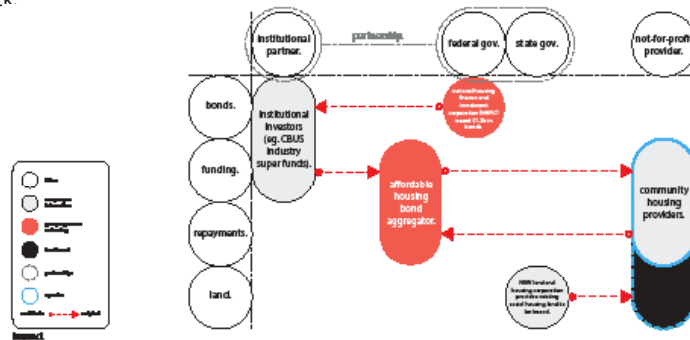


Image credit: Case study 1: BTR Cbus t Australian Housing Models

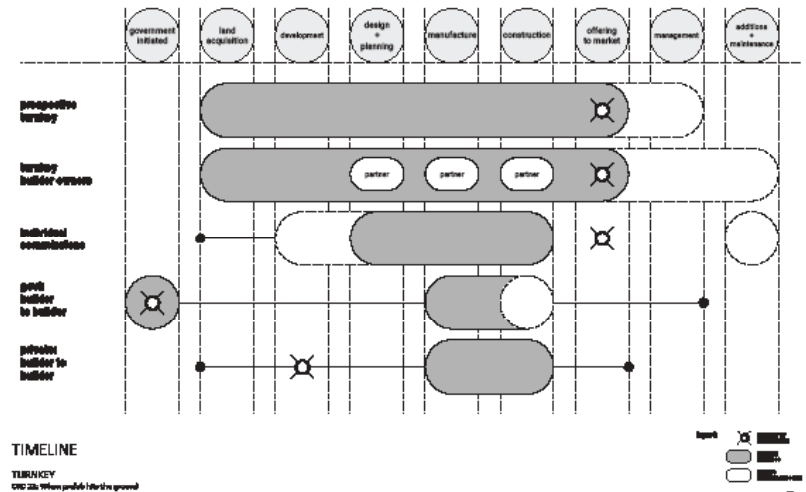


Image credit: Timeline Turnkey

25. Operational Excellence framework of steel fabrication and processing in the OSM and prefabrication sector (Phase 1)

Project Lead: Dr Felix Hui | The University of Melbourne

Problem / thesis

In the manufacturing of modules off-site, steel fabrication often comes with many challenges, including supply chain reliability and clarity, the need for efficient production at both the steel producer and the modular builder end, and the flexibility for customisation.

This project seeks to find new methods of efficient production and new ways of collaborating in the steel fabrication supply chain from different perspectives such as monitoring, sustainability performance, efficient product platforms, innovative manufacturing techniques, transport and logistics and efficient communications.

Phase 1 of this project is a scoping exercise to review the current state of the market and a comprehensive technology review.

List of partners:

BlueScope Steel, Fleetwood Building Solutions,
Monash University, The University of Melbourne, Ynomia

List of researchers:

A/Prof. Felix Kin Peng Hui, Prof. Daniel Samson, Prof. Prakash Singh,
A/Prof. Sherah Kurnia, Dr Guilherme Tortorella, Prof Tuan Ngo,
Dr Siddhesh Godbole, Mr Omar Castrejon , Dr Robert Moehler, Dr
Jenny Zhou, Dr Mizan Ahmed

Date commenced and duration:

November 2021; 9 months



26. New materials for windows of the future

Project Lead: Prof. Prof Jacek Jasieniak | Monash University

Problem / thesis

Double-glazed windows are a norm in many countries across Europe, Asia and North America due to their effective reduction of heat loss (-30%) compared to single-glazed windows.

However, in Australia, only 10% (approx.) of current window installations are double-glazed. This is in part owing to the temperate climate across many parts of Australia, but equally the high cost of double glazing. Material science has made rapid progress over the last two decades resulting in the development of many new advanced materials and coatings.

This project is focussed on providing a critical assessment of the opportunities to apply new materials and coatings to reduce the cost, and improve the performance and ease of installation of double-glazed windows.

List of partners:

Ultimate Windows
Monash University

Date commenced and duration:

May 2021; 2 months



28. Componentised Internal Wall Systems for Multi-residential Applications

Project Leads: Dr Laura Harper & Dr Lee-Anne Khor | Monash University

Problem / thesis

Internal wall systems continue to rely on labour intensive and wasteful on-site processing despite advances in prefabrication and other aspects of multi-residential construction. Described performance requirements rely heavily on craftsmanship and supervision, when these fail, significant and costly legacy issues arise. Through a design-led, systems-thinking approach, this project explored componentised and connected internal wall alternatives, ranging from the improvement of BAU construction to the separation of performance core and surface, to plug-n-play installation. The investigation revealed a series of design principles for costing legacy and life-time value, allowing services and performance-based criteria to be integrated in a controlled, off-site environment.

List of partners:

Lendlease Digital, Monash University, The University of Melbourne

List of researchers:

Dr Laura Harper, Dr Lee-Anne Khor, Dr Duncan Maxwell, Dr Ivana Kuzmanovska, Dr Victor Bunster, Jean-Paul Rollo, Daniela Tinios, Prof. Tuan Ngo, Dr Yousef Alqaryouti, Dr Xuemei Liu

Date commenced and duration:

July 2021; 6 months

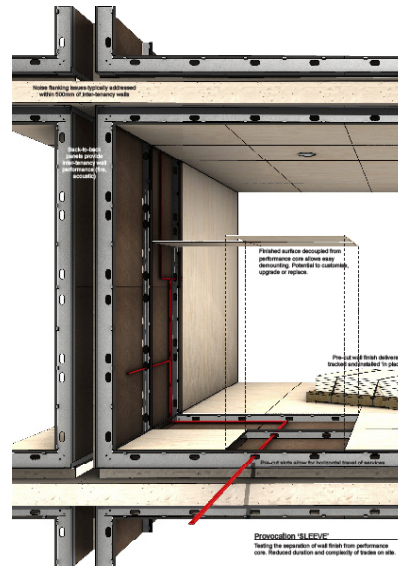


Image credit: Provocation SLEEVE: Testing the separation of wall finish from performance core. Reduced duration and complexity of trades on site. (Ayden Fiore 2022)

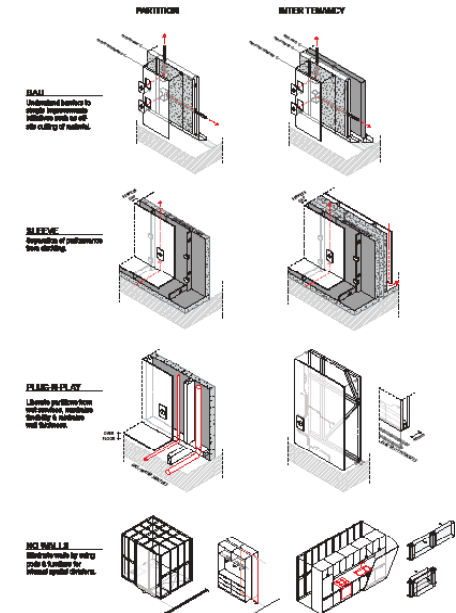


Image credit: Design principles for componentised and connected internal wall alternatives (Dani Tinios 2022)

30. Critical Path IMPACT through Productisation

Project Lead: Dr Robert Moehler | Monash University



Problem / thesis

The critical path coordinates and supports construction planning and execution, and defines the prioritisation and interdependence of tasks.

The resulting build program establishes a timeline, informed by the production modes, plans and management practices.

New building production systems and planning arrangements have only partially resulted in achieving the construction phase productivity gains and performance improvements promised by their introduction.

This project will examine the roadblocks to the effective impact on transforming construction programs, to establish the context and conditions of future project timelines.

List of partners:

Lendlease Digital, Monash University, The University of Melbourne

List of researchers:

Dr Robert Moehler, Dr Felix Hui, Prof Tuan Ngo, A/Prof Lihai Zhang, Dr Siddhesh Godbole, Dr Nicolas Diban, Dr Duncan Maxwell, Dr Ivana Kuzmanovska, Dr Yihai Fang, Becky Williams, Osama Hussain, Songbo Hu, Yimin Li, Kaveh Mirzaei

Date commenced and duration:

July 2021; 12 months

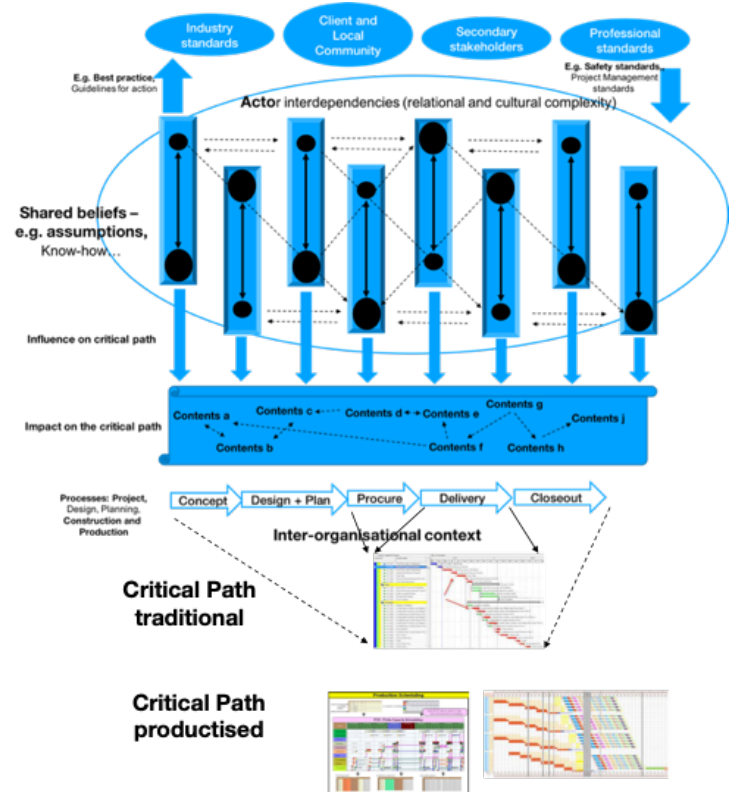


Image credit: Project visual abstract (Robert Moehler, 2022).

31. Demystifying Volumetric Construction: A Study of the Bathroom Pod

Project Lead: Dr Ivana Kuzmanovska | Monash University

Problem / thesis

The potential benefits of volumetric construction include faster builds, improved quality, and reduction in waste. However, increased transportation costs, structural redundancy, and increased overheads can dilute these benefits, limiting their uptake. Within the Australian construction industry, the bathroom pod is one of the few volumetric assemblies that has become commonplace, and considered an acceptable method of delivering bathrooms in multi-storey buildings. However, the degree to which manufacturing methodologies have been adopted in the design and delivery of bathroom pods varies. This project unpicks the complexities of a volumetric construction through the lens of the bathroom pod, examining business models, design approaches, and production strategies.

List of partners:

Lendlease Digital, Monash University, Queensland University of Technology, The University of Melbourne

List of researchers:

Dr Ivana Kuzmanovska, Dr Lu Aye, Marcel Gono, Dr Felix Hui, Mohaimeen Islam, Dr Lee-Anne Khor, Enzo Lara-Hamilton, Yimin Li, Dr Xuemei Liu, Dr Duncan Maxwell, Dr Robert Moehler, Prof Tuan Ngo, Mark Romei, Karen Tanfield, Dr Tanja Tyvimaa, Prof Clevo Wilson, Darcy Zelenko

Date commenced and duration:

July 2021; 12 months

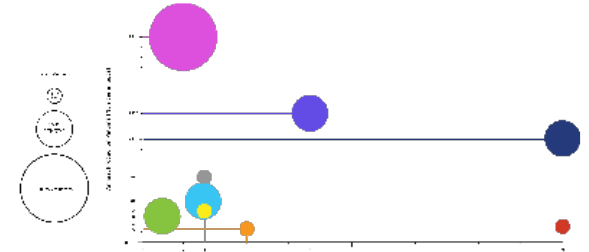


Image credit: Survey results: Age, size, and production volume of bathroom pod companies (Ivana Kuzmanovska, 2022)

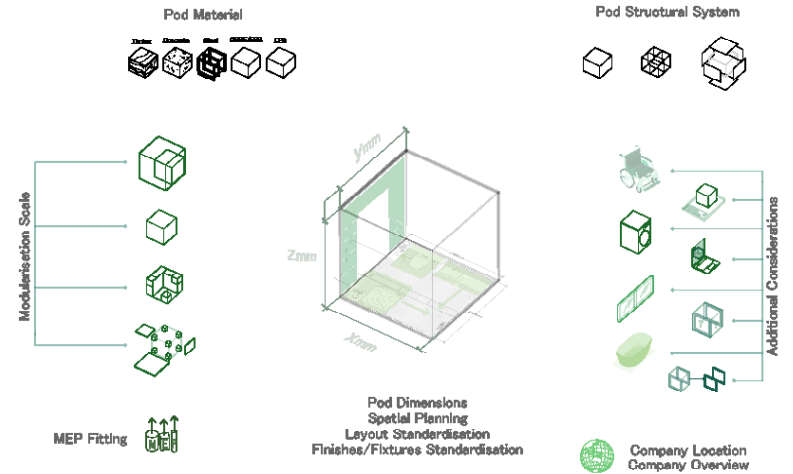


Image credit: Bathroom pod design considerations (Ivana Kuzmanovska, 2022)

34. Acoustic flanking performance of mid-rise Light Gauge Steel (LGS) structures – Phase 1 Scoping Study

Project Lead: Dr Amin Heidarour | Monash University

Problem / thesis

Light Gauge Steel (LGS) structures have great advantages in terms of lower weight, easier to transport, minimum construction wastes and shorter construction time.

Although the resistance of various light gauge systems, including floor and wall systems, under different loading cases has been widely recognised and tested, there is very limited information on the acoustic flanking performance of LGS structures.

This scoping study lays the groundwork for developing a robust methodology for assessing the acoustic flanking performance of LGS buildings.

List of partners:

BlueScope
Monash University
University of Melbourne

Date commenced and duration:

July 2021; 12 months



35. Prefab Housing Solutions for Bushfire and Disaster Relief

Project Lead: Prof Mel Dodd | Monash University

Problem / thesis

This study will investigate the potential for prefabrication and advanced manufacture to be an alternative to traditional construction in providing both short-term and long-term housing solutions for those affected by bushfires and other disasters. Through the research, we hope to understand the complexities and barriers to designing, manufacturing and installing prefabricated modular homes and units to bushfire impacted regions around the country.

List of partners:

AMGC, Melbourne University, Monash University

Date commenced and duration:

July 2021; 12 months

List of researchers:

Prof Mel Dodd, Prof Nigel Bertram, Dr Duncan Maxwell, Dr Rachel Couper, Dr Lee-Anne Khor, Dr Angela Solarte, Oscar Sainsbury, Prof Tuan Ngo, Dr Philip Christopher, Tu Le 35_1_ Precedent project examples (Oscar Sainsbury, 2022)

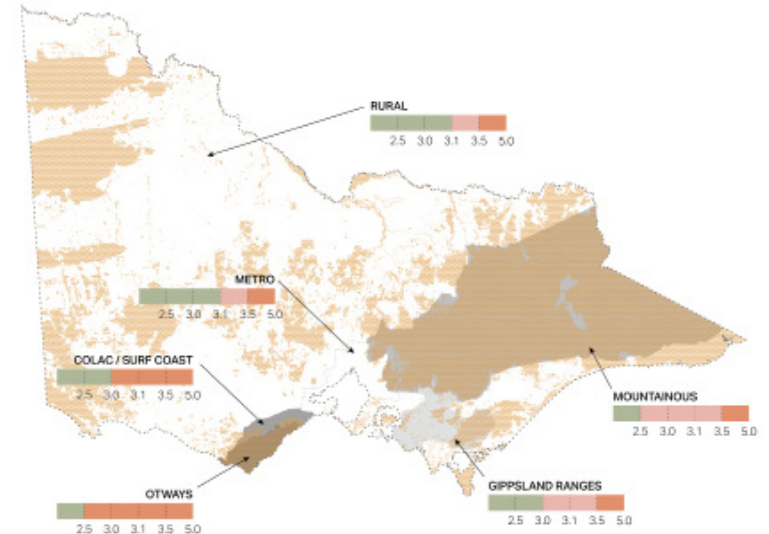


Image credit: Bushfire areas _ Transport access analysis (Tu Le, 2022)

42. Workflow Automation Tools for Residential Home Designs - Phase 1 Scoping Study

Project Lead: Dr Tu Le | The University of Melbourne

Problem / thesis

Volume builders are facing several challenges associated with the manual design of domestic homes where computational design automation can yield advantages, including many variations between house designs, regular design changes according to client requirements, time, resources and turnaround for each tender (cost estimation, drawings, material estimation and so on). An integrated and automated process would bring all stakeholders together at the conceptual design phase to achieve a more integrated solution. The project is focusing on reviewing currently available software and design workflows to propose a cutting-edge workflow for the automation of the residential home design process.

List of partners:

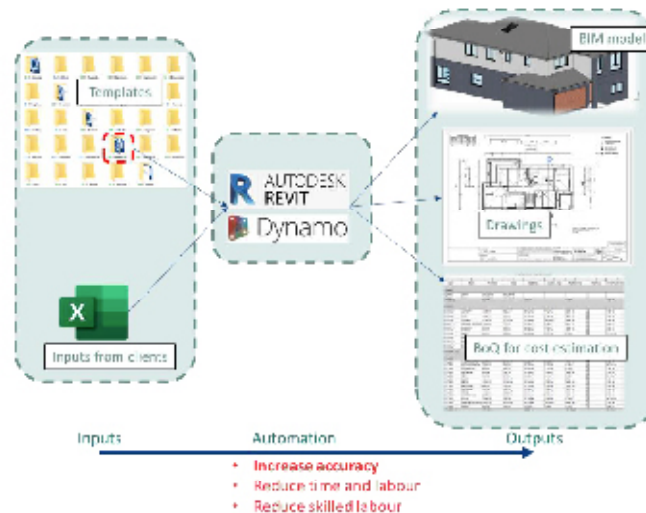
Bentley Homes, M-Modular, University of Melbourne

List of researchers:

Dr Tu Le, Ben Huynh, Dr Khuong Bui (Harry), Dr Tuan Nguyen, Prof Tuan Ngo, Dr Sara Rashidian, Fereshteh Banakar, Prof Robin Drogemuller

Date commenced and duration:

August 2021; 12 months



This project aims to develop a new workflow to automate the home design process. The outcomes of this project will provide industry with a time and cost-efficient solution to quickly customise the design to meet the changes and variations requested by clients, reduce time spent on the iterative design process, and achieve faster and more efficient tendering outcomes. Phase 1 of the project is focusing on:

- Reviewing current available software on Australian market for quantity take-off and cost-estimation.
- Reviewing leading research on design workflows for automation design and quantity take-off using BIM.
- To propose a workflow for the automation of residential home design process for small to mid-size volume builders.

A demonstration of the workflow has been developed in this phase to investigate the workability and limitation of the workflow, opening a pathway to further development of the workflow.

Keywords: Automation Workflow; BIM; BIM-integrated detailing; Generative Design; Home Design;

Active Projects Summary

● People, Practices and Culture

● Digitalisation

● Sustainability

● Industrialisation

Project No.	Title	Participants
Active		
3	Projects to Platforms: Investigating New Forms of Collaboration – Scoping Study	A.G. Coombs, BlueScope, Hyne & Son, Lendlease Digital, Monash University, Sumitomo Forestry, The University of Melbourne
11	Environmental Credentials for Building Technology Platforms	uTecture, Coresteel, Monash University
15	Using the Whole Tree for Future Timber-Based Construction – Scoping Study	Hyne & Son, Sumitomo Forestry, University of Melbourne
24	Next Generation of Robust and Fire-resilient Light Gauge Steel Systems for Mid-Rise Buildings (Umbrella Project)	BlueScope Steel Limited, Queensland University of Technology, The University of Melbourne
27	Environmental Decision-Support for Structures	BlueScope, Monash University, The University of Melbourne
32	Acoustic flanking performance of mid-rise light gauge steel (LGS) structures	BlueScope, Monash University & University of Melbourne
33	Evaluation of Emerging Technologies for Remote (virtual) Inspections of Building Work	Victorian Building Authority, Victorian Managed Insurance Authority (VIMA), Salesforce, Sumitomo Forestry Australia, Monash University
36	Academic validation of performance gap research in energy rating systems	Green Building Council of Australia, Monash University
37	Australian Timber Fibre Insulation Scoping Study	AMGC and Prefab Innovation Hub, Various Building 4.0 CRC Industry Partners, Monash University, The University of Melbourne, Queensland University of Technology
38	Victorian Government Digital Build - Translating Theory into Practice	Hyne & Son Pty. Limited, The University of Melbourne, Ultimate Windows
44	Generative Architectural Design Engine	The University of Melbourne, Ynomia.
45	Prefab Wall Integrated System – Phase 2 Demonstration House and Market Study	Bentley Homes, Ultimate Windows, The University of Melbourne
46	Data analytics for structural fibre resources optimisation	Bentley Homes, M-Modular, The University of Melbourne, Queensland University of Technology
57	Wind Comfort Simulation and New Engineering Design Process	Lendlease Digital, Monash University
59	Innovative Steel - Timber - Concrete Composite StongFloor	VIRIDI Group, The University of Melbourne

Completed Projects Summary

- People, Practices and Culture
- Sustainability
- Digitalisation
- Industrialisation

Project No.	Title	Participants
Completed		
1	ePlanning and eApprovals – Scoping Study	Lendlease Digital, uTecture, Sumitomo Forestry, A.G.Coombs Group, salesforce.com, Inc., Master Builders Association of Victoria, Victorian Building Authority, Victorian Government, Department of Environment, Land, Water and Planning, Monash University, The University of Melbourne
2	Automated tracking of construction materials for improved supply chain logistics and provenance – Phase 1 Scoping Study	BlueScope, Holmesglen Institute, Lendlease Digital, Monash University, Queensland University of Technology, Salesforce.com, Inc., Sumitomo Forestry, Master Builders Association of Victoria, The University of Melbourne, Victorian Building Authority, Ynomia
4	Computational Design and Optimisation Tools for Prefabricated Building Systems – Phase 1 Scoping Study	M-Modular, The University of Melbourne, Queensland University of Technology
5	Automatic compliance and energy rating system	uTecture, Green Building Council of Australia, The University of Melbourne, Monash University, Queensland University of Technology
6	Field data collation to support real-time operational management	Lendlease, Ynomia, Standards Australia, Monash University, Queensland University of Technology, The University of Melbourne
8	Prefab, Integrated Wall Systems - Scoping Study	Bentley Homes, Ultimate Windows, The University of Melbourne, Monash University
9	Implementing DfMA and Lean in Construction: Best Practice Guidelines through a Study of Building Services and Structure	A.G. Coombs, Lendlease Digital, Monash University, The University of Melbourne
10	Product Platform for Volumetric Building (Scoping Study)	Fleetwood Building Solutions, Monash University
12	VR/AR Technologies in Vocational Education and Training (Scoping Study)	Holmesglen Institute, Master Builders Association of Victoria, Monash University, Queensland University of Technology
17	The Implications and Opportunities from Industry 4.0 for the Building Industry: towards smart prefab	AMGC and Prefab Innovation Hub (Funding body), Various Building 4.0 CRC Industry Partners, Monash University, The University of Melbourne, Queensland University of Technology
18	Long-Span Low-Carbon Floor Systems	Lendlease Digital, Sumitomo Forestry, Monash University, The University of Melbourne
19	Hybrid Timber-Steel Structural Systems for Mid to High Rise Buildings – Phase 1 Scoping Study	BlueScope, Hyne & Son, Monash University, The University of Melbourne, Queensland University of Technology
20	Systems and methods for robustness of mid-rise light gauge steel (LGS) buildings – Phase 1 Scoping Study	BlueScope, The University of Melbourne, Monash University
22	Generative design and BIM-based Design Automation methods for Steel Framed Buildings – Phase 1 Scoping Study	BlueScope, The University of Melbourne, Queensland University of Technology
23	When prefab hits the ground: Barriers and opportunities in the Australian housing market	Fleetwood Building Solutions, Sumitomo Forestry, Monash University, Queensland University of Technology
25	Operational Excellence framework of steel fabrication and processing in the OSM and prefabrication sector (Phase 1)	BlueScope, Fleetwood Building Solutions, Monash University, The University of Melbourne, Ynomia
26	New materials for windows of the future	Ultimate Windows, Monash University
28	Componentised Internal Wall Systems for Multi-residential Applications	Lendlease Digital, Monash University, The University of Melbourne
30	Critical Path IMPACT through Productisation	Lendlease Digital, Monash University, The University of Melbourne

31	Demystifying Volumetric Construction: A Study of the Bathroom Pod	Lendlease Digital, Monash University, Queensland University of Technology, The University of Melbourne
34	Acoustic flanking performance of mid-rise Light Gauge Steel (LGS) structures – Phase 1 Scoping Study	BlueScope, Monash University, The University of Melbourne
35	Prefab Housing Solutions for Bushfire & Disaster Relief	University of Melbourne
42	Workflow Automation Tools for Home Designs Phase 1 Scoping Study	A.G. Coombs, BlueScope, BRB Modular, Fleetwood, Coresteel Australia, Department of Treasury and Finance through the Office of Projects Victoria and the Department of Jobs, Precincts and Regions, Lendlease Digital, Monash University, SFDC Australia, Sumitomo Forestry Australia, The Master Builders Association of Victoria,