CENTRE FOR COMPARATIVE CONSTRUCTION RESEARCH

RESEARCH HIGHLIGHTS 2018

New research incubators

CCCR launched three new research incubators in 2018.

TAED is a research incubator within CCCR dedicated to exploring the fusion between tectonic architecture and ecological design. (Con)structural forms are prioritise as art and therefore take a prominent role in aesthetic design decisions. Equally important, ecological principles such as biomimicry must be integrated with tectonics to provide solutions that reflect a long life, loose fit, low energy mandate. TAED's mission is to develop new practice-based ideas that adequately mediate between the anthro-sphere and eco-sphere, and thereby inform sociocultural objectives such as human well-being through excellence in architecture and urbanism.

The TAED Lead is Associate Professor Daniela Ottmann.

PMI_LAB is a research incubator within CCCR dedicated to exploring innovation within project management. A particular focus is measuring and benchmarking project success across a wide variety of project types and life cycle phases for which several research awards have already been won (i3d3 project). Linked to this is the measurement of maturity levels in project management organisations (MMM project), which is expected to be highly correlated with successful outcomes. PMI_LAB is also undertaking research and development into the use of chat-bots and other forms of artificial intelligence (PM-BOT project) to augment educational objectives for project and program management at Bond University.

The PMI_LAB Lead is Professor Craig Langston.

OPIC is a research incubator within CCCR dedicated to exploring construction productivity in the context of BIM, LEAN and IPD (Integrated Project Delivery). Therefore, OPIC researchers are interested in issues concerning tools, processes and people to improve productivity on construction sites. OPIC’s mission is to research intelligent construction solutions, including a special interest in virtual, augmented and mixed reality technologies, that can be potential ‘game-changers’ for construction industry performance. This incubator supports our new Master of Building Information Modelling and Integrated Project Delivery degree launching in 2019. The OPIC Lead is Associate Professor Jasper Mbachu.

Infrastructure roadBLOCs

CCCR collaborated with The Economist Intelligence Unit (EIU) and the Asian Infrastructure Investment Bank (AIIB) in 2018 to develop ways to assess the construction costs of public infrastructure in developing countries. Our role was focused on the comparative cost performance of road and highway construction. A basket of representative labour, material and plant items (known as a roadBLOC) was priced in eight different locations (Russia, Philippines, Pakistan, India, China, Turkey, Bangladesh and Indonesia) to enable projects to be compared based on the number of BLOC baskets needed per unit of measure. For example, how many baskets per metre are required to build a new four-lane arterial road in Istanbul?

The results were compared with a baseline for Sydney of 14,516 roadBLOCs/m. Dhaka had the highest equivalent ‘cost’ of 24,029 roadBLOCs/m, while Manila had the lowest equivalent ‘cost’ of 5,111 roadBLOCs/m. This approach enables different geographic locations
to be evaluated using purchasing power parity, avoiding temporal currency fluctuations and inflation. This global report is available at https://www.aiib.org/en/news-events/Asian-infrastructure-finance/index.html.

From onsite to offsite construction: implications for construction skill profiles

This research explores an evolving shift in construction practice from onsite to offsite construction methodologies, including trends in technical, managerial and generic skill-sets for the wider industry. There is an emphasis on emerging digital technologies which are shaping the future directions of the construction practice. CCCR and the OPIC team are collaborating with Western Sydney University’s Centre for Smart Modern Construction (c4SMC) and leading construction academics from around Australia. Associate Professor Jasper Mbachu represented CCCR at the roundtable in Sydney on 14 November 2018.

Assessing mobile mixed reality affordances as a comparative visualisation pedagogy for design communication

Associate Professor James Birt has been looking at the impact of mixed reality technologies on the constructed environment. In a paper published together with Michael Cowling in Research in Learning Technology (26 November 2018), James evaluated insights from a first-year architectural design classroom at Bond University through studying the impact and use of a range of mobile comparative visualisation technologies. Applying a design-based research methodology and a usability framework for accessing comparative visualisation, he explored the complexities of spatial design, and highlighted not only the positives of the approach but also the improvements required in the delivery of the visualisations to reduce errors caused by the lack of mobile processing. His full paper can be found at DOI: 10.25304/rlt.v26.2128.

Event-led Regeneration (ELR) projects

Professor Craig Langston is part of an international team led by The Hong Kong Polytechnic University that has submitted a bid for HKD 6,898,000 (AUD 1.25 million) to develop a strategic urban development framework based on PMI_LAB team’s award-winning i3d3 model for measuring project success. The bid involves applying i3d3 to sports-based ELR projects, developing guiding principles to incorporate local needs and wants into ELR project planning and area-based urban renewal, formulating protocols for collection and modelling of legacy benefits using systems thinking techniques and big data, and making recommendations for specific planning and policy instruments addressing ELR projects in Hong Kong and the Guangdong Big Bay Area. The framework will be based on legacy benefit analysis arising from the XXI Commonwealth Games held on the Gold Coast in 2018.

Advanced fabrication of eco-composite materials

The research project, commenced and funded by CCCR, is investigating the potential of local resources as ecological building materials to support bioclimatic design strategies for subtropical climates zones. Associate Professor Daniela Ottmann and the TAED team are looking into not only natural resources, but also industrial by-products as resources per region. In 2018, a pilot study for experiments of available ecological building materials in Queensland was undertaken.

Initial experiments and tests in the Robotics Lab around nature fibre reinforced geo-polymer in low emission concrete could be used to establish an ARC industry linkage grant with Wagners Concrete, Toowoomba. Research towards this goal is proceeding.

PM Clinic

Since 1 August 2018, PMI_LAB has been running a project management clinic for students and staff of Bond University. Clinic opening hours are every Wednesday during teaching weeks from 1:00 pm to 4:00 pm in BLD03b_1_01. This is a free service.