

# Centre for Comparative Construction Research

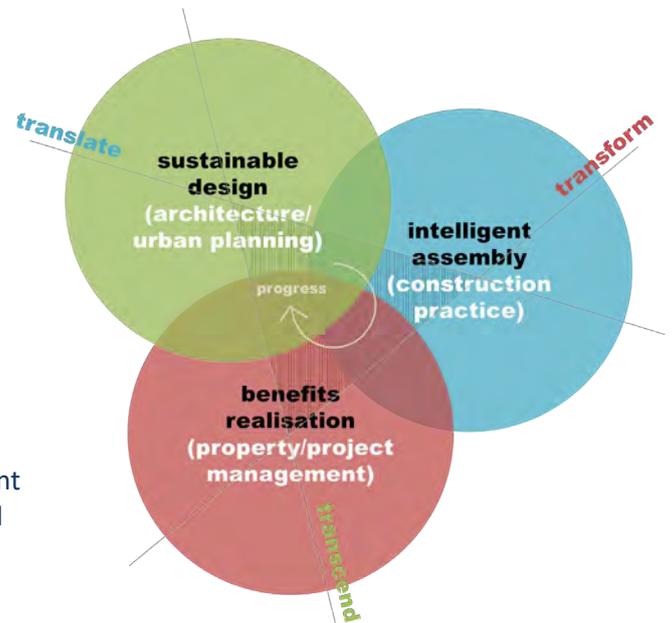
## Annual Report: 2020

### Research Mission and Vision

The Centre for Comparative Construction Research (CCCR) is focused on creating new insight into the performance of the built environment through an interdisciplinary evidence-based process of:

- > **translating** sustainable design into superior urban infrastructure,
- > **transforming** intelligent assembly into safer and more productive construction practices, and
- > **transcending** benefits realisation into successful financial, social, ethical and environmental outcomes.

Our vision is to be a respected and independent source of research concerning the contribution that the built environment makes to our collective prosperity. Our impact can be assessed in terms of collaborative industry links and funding support. Bond University is, unsurprisingly, a signatory to the United Nations Sustainable Development Goals (SDG1-17).



### Capabilities

Our Centre comprises three research incubators that explore the *Built Environment and Design* Field of Research (FoR) according to the above niche areas:

- > **TAED** – sustainable design (architectural/urban planning focus, led by Associate Professor Daniela Ottmann). Other members are Professor Adrian Carter, Associate Professor Marja Sarvimaki, Associate Professor Danny O’Hare, Associate Professor Bhisna Bajracharya and Assistant Professor Vanessa Menadue [6].
- > **OPiC** – intelligent assembly (construction practice focus, led by Associate Professor Jasper Mbachu). Other members are Associate Professor James Birt, Associate Professor Dane Miller, Assistant Professor Noor Azeyah Khyon, Assistant Professor Danielle Lester and Dr Rosemarie Rusch [6].
- > **PMI\_LAB** – benefits realisation (property/project management focus, led by Professor Craig Langston). Other members are Professor Alan Patching, Associate Professor Greg Skulmoski, Assistant Professor Alexander Lang, Assistant Professor Amir Ghanbaripour and Assistant Professor Matthew Moorhead [6].

The strength of CCCR lies in its interdisciplinary collaboration combining, but not limited to, architecture, construction and urban planning expertise. Buildings and other urban infrastructure have become complicated and expensive assets that reflect a mix of financial, social, ethical and environmental characteristics. Our research is cognisant of expected trends in future practice – climate change, automation and globalisation. The nexus of our research interests is achieving progressive built environment infrastructure.

### Membership

CCCR has 18 researchers as at the end of 2020. We are expecting several more to join us in 2021. CCCR contributed both of our Faculty’s nominations for the Vice-Chancellor’s Research Excellence Award (Professor Craig Langston) and Early Career Researcher Award (Assistant Professor Amir Ghanbaripour) in 2020.

## Highlights for 2020

Our main highlights for 2020 are described in the context of the research incubators within CCCR that helped create them.



**TAED**  
TECTONIC ARCHITECTURE X ECOLOGICAL DESIGN

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### Uncomfortable heritage

It is often said that the greenest buildings are the ones we already have. But not all old or heritage buildings are loved enough to have a life after they become obsolete. Some have a history of violence, incarceration, torture and death. Adaptively reusing these buildings can pose many challenges. Waled Shehata investigated these challenges in the context of Australian heritage goals. He submitted his thesis in December as a 'PhD by compilation', where each chapter was double-blind peer reviewed as the work progressed. Waled finished a conference paper (best paper award), plus two Q1 and two Q2 journal papers – all five now published or in-press – over his 3-year candidature. His supervisors were Professor Craig Langston and Associate Professor Marja Sarvimaki.

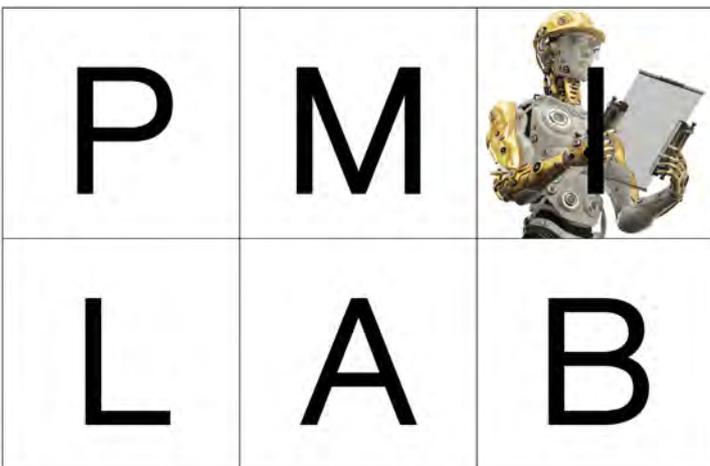


Optimizing Productivity  
in Construction

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### Innovation Connections funding

Associate Professor Dane Miller secured an Innovation Connections (IC) grant (\$100,000) in 2020 to investigate the viability and accuracy of the use of wireless sensors in determining in-situ compressive strength developments in concrete. This research aims to streamline the existing, labour intensive and costly quality control and quality assurance process used in concrete construction. This project has been conducted in collaboration with EDGE consulting engineers who have provided 50% of the research funding. Associate Professor James Birt is part of another successful IC grant (\$58,679) in 2020 on the effects of acoustic treatment in open-plan offices on psychophysiological and cognitive responses to noise and distraction (with the Bond Business School).



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### Commercialisation of our *i3d3* model

2020 was intended to be the year of *i3d3*. Instead, it turned out to be the year of a worldwide pandemic. Nevertheless, a case study of the Gold Coast Light Rail (GCLR) project (Stages 1 and 2) was completed for GoldLinQ. Negotiations were also advanced for Innovation Connections funding with Turner and Townsend based on developing *i3d3* for measuring cost and time performance during construction, which could replace the well-accepted Earned Value technique. The *i3d3* model was endorsed by the Global Alliance for the Project Professions (GAPPS), who are now helping to promote it internationally. A PhD graduate in *i3d3*-related studies completed his thesis in 2020 (three more students in the pipeline). Professor Craig Langston is the project leader.

## Research Infrastructure

Professor Craig Langston successfully bid for \$104,051 of central research funds to purchase cutting-edge FARO laser scanning equipment and software. The purpose of this bid was to enable CCCR researchers and PhD candidates to construct 3D BIM models of existing buildings using point clouds and then model them using specialist software to determine strategies to improve their sustainability performance. Existing buildings represent the best chance of making the built environment more sustainable. Renovation and/or adaptive reuse strategies are superior to demolition and reconstruction, even when materials are salvaged and recycled. There is also the advantage of earning consulting income while collecting data to research the effectiveness of interventions to existing facility performance.

This was the only bid put forward from our Faculty.

## Publications

The following 2020 outputs published by CCCR researchers (shown as **bold** text) were downloaded from Bond's PURE database on 09/02/2021:

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A cartography of delay risks in the Australian construction industry: impact, correlations and timing, Derakhshanfar, H., Ochoa, J. J., Kirytopoulos, K., Mayer, W. & **Langston**, C. A., 2020, In: Engineering, Construction and Architectural Management (published online 30 September 2020). [Q1]

Analysing construction student experiences of mobile mixed reality enhanced learning in virtual and augmented reality environments, Vasilevski, N. & **Birt**, J. R., 2020, In: Research in Learning Technology. 28, p. 1-23. [Q2]

Circular Cities Careers: Sustainable Careers enabling Sustainable Cities, **Ottmann**, D. & **Skulmoski**, G. J., 2020, Online Conference Presentation, Dubai, 22 Nov 2020. [paper to follow]

Co+living Design: Participatory design simulation gamification for life-enhancing built environments in age-appropriate, inclusive and multi-generational co-living buildings without limitation, **Ottmann**, D. A., 2020, In: Pixa: Journal on Architecture, City and Contemporaneity. 4, 14, p. 16-29. [unranked]

Critical success factors for subway construction projects—main contractors' perspectives, **Ghanbaripour**, A. N., Sher, W. & Yousefi, A., 2020, In: International Journal of Construction Management. 20, 3, p. 177-195. [Q2]

From hard bed to luxury home: impacts of reusing HM Prison Pentridge on property values, Shehata, W., Abu Arqoub, M., **Langston**, C. A., Elkheshien, R. & **Sarvimaki**, M., 2020, In: Journal of Housing and the Built Environment, (published online 24 July 2020). [Q1]

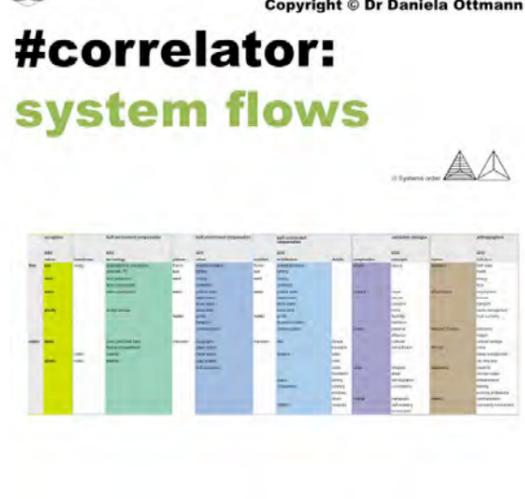
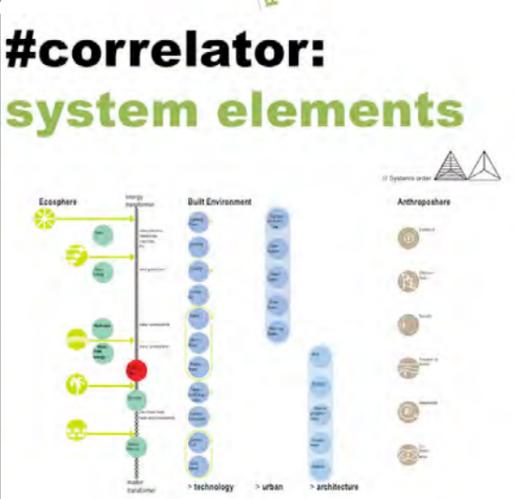
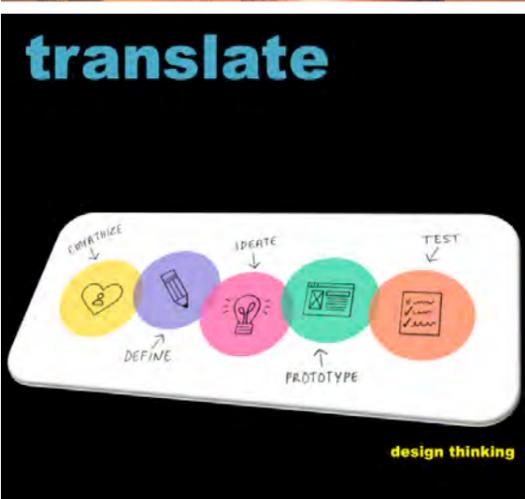
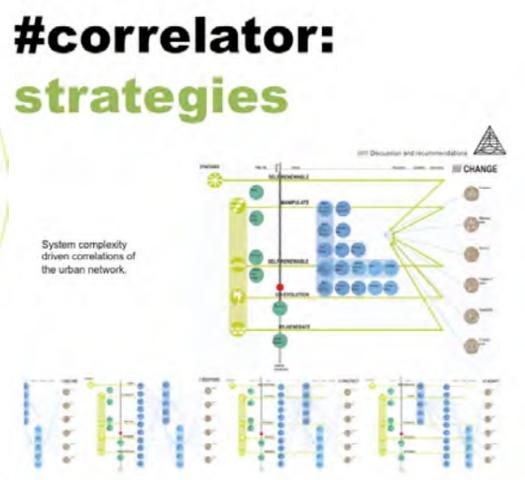
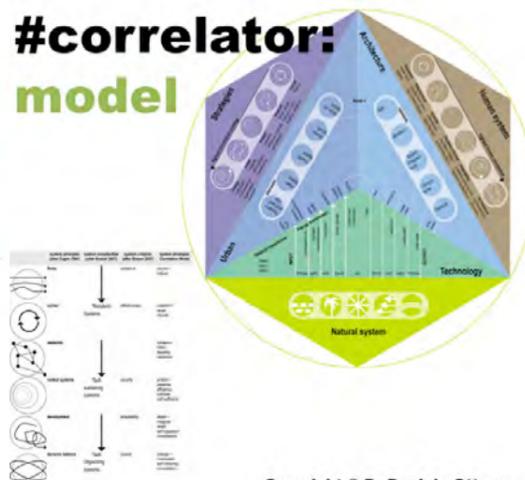
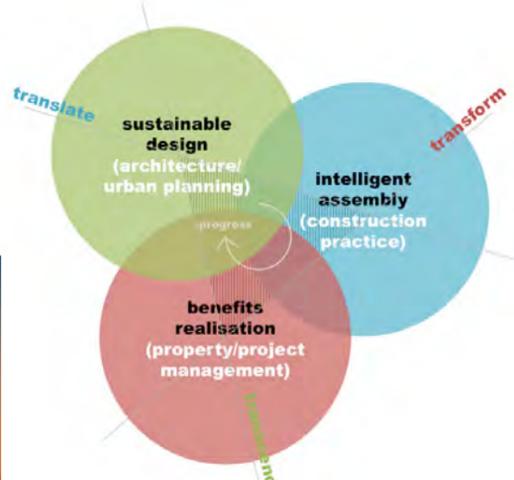
Innovation in project management education - let's get serious!, Tews, T., **Skulmoski**, G. J., **Langston**, C. A. & **Patching**, A., 2020, In: Construction Economics and Building. 20, 3, p. 124-141. [Q2]

The effect of project manager's management style on project delivery success in construction projects, **Ghanbaripour**, A. N., Golmoradi, M., **Langston**, C. A., **Skulmoski**, G. J. & Abu Arqoub, M., 2020, In: International Journal of Construction Management (published online 23 October 2020). [Q2]

## Research Incubator Synergies

During 2020 the three research incubators within CCCR worked to develop maps of how their research activity connects to each other and how this aligns with our ERA Field of Research *Built Environment and Design*. These connections are described as **TRANSLATE** > **TRANSFORM** > **TRANSCEND** and are founded on key developments of the *Correlator* model for sustainable design, BIM-LEAN-IPD integration for intelligent assembly, and the *i3d3* model for measuring project success.

Three synergy maps (for *TAED*, *OPIc* and *PMI\_LAB* respectively) are each presented in the form of a collage on the following pages.



**sustainable design needs to be green**

**TAED**  
architecture/urban planning



**intelligent assembly needs to be lean**

**OPIc**  
construction practice



**organizational maturity**

DELIVERY SUCCESS	ORGANISATIONAL STRATEGY	ORGANISATIONAL CAPABILITY	EXAMPLE ORGANISATION
1.0 vision management	1.1 strategic alignment	1.2 shared client work	1.3 shareholder return
2.0 efficiency management	2.1 productive work environment	2.2 gain and retain staff	2.3 leadership mentoring
3.0 speed management	3.1 supply chain logistics	3.2 effective PMO support	3.3 vertical integration
4.0 innovation management	4.1 competitive advantage	4.2 information systems	4.3 R&D investment
5.0 compliance quality management	5.1 benchmark best practice	5.2 quality assurance	5.3 international standards
6.0 impact management	6.1 environmental management	6.2 sustainable practices	6.3 triple bottom line reporting
7.0 brand management	7.1 integrated management	7.2 brand construction	7.3 brand loyalty

**benefits realisation needs to be seen**

**PMI\_LAB**  
property/project management



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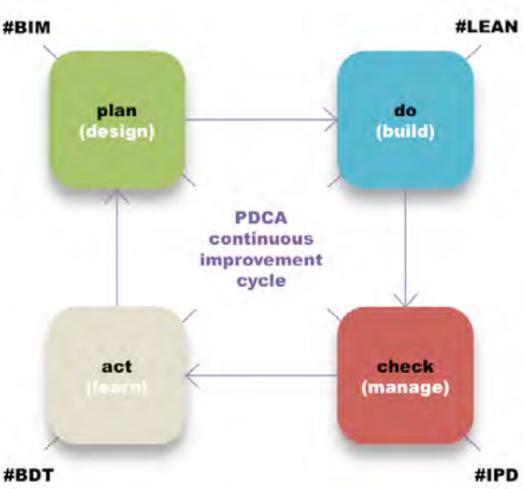
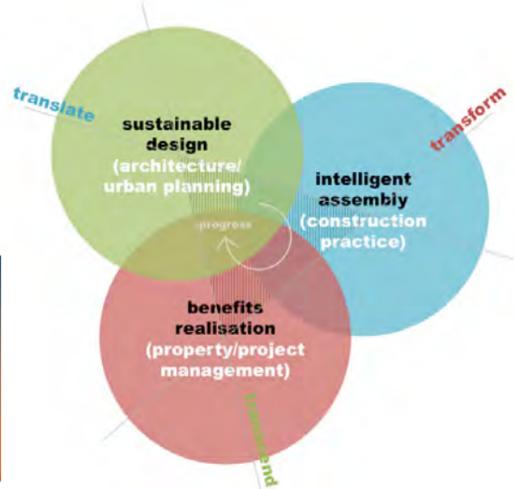
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**green lean seen**

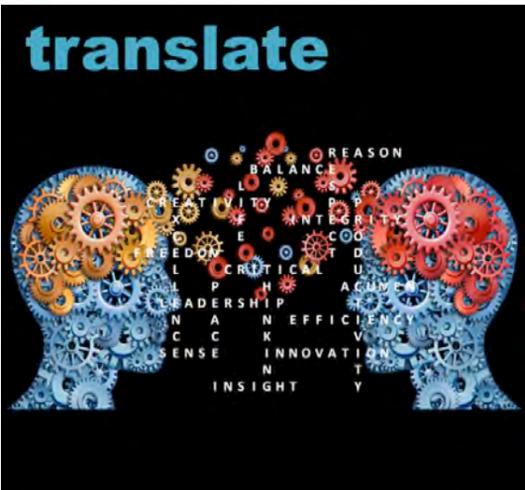
Progressive projects should aim to bring a positive collective utility to our society, even though there will always be winners and losers. For a project to be successful, it must show this consistently over time (i.e. reflect good design, effective delivery and make a lasting contribution).

Professor Cris Lounsbury  
Director  
Centre for Comparative Construction Research

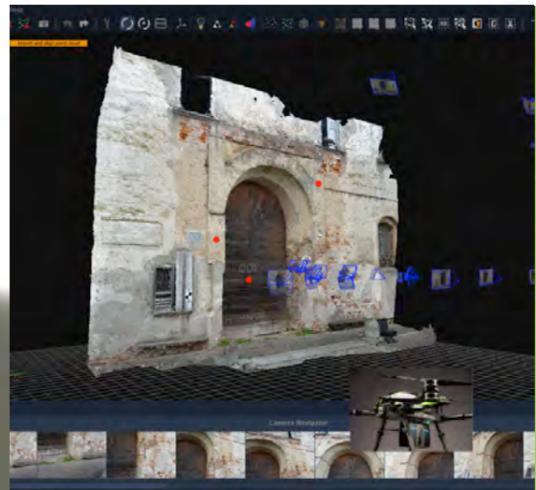




**DfMA**  
design for manufacture and assembly  
strategies improve productivity



**#BIM: building information model**

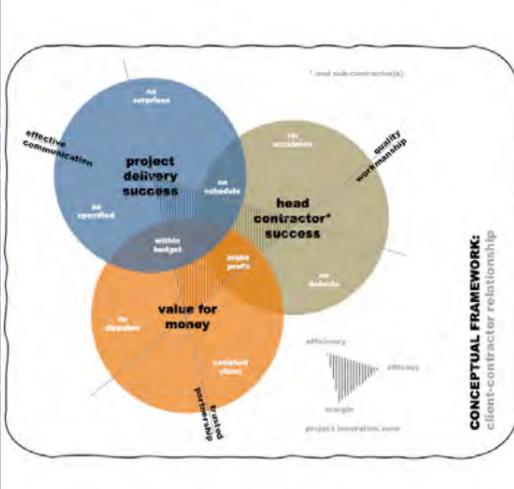


**sustainable design needs to be green**  
**TAED**  
architecture/urban planning

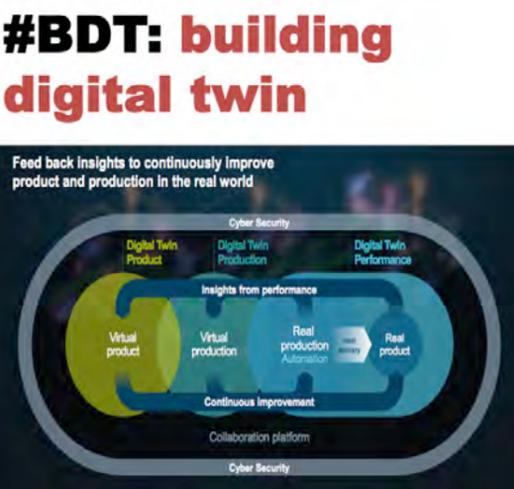


**intelligent assembly needs to be lean**

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construction practice



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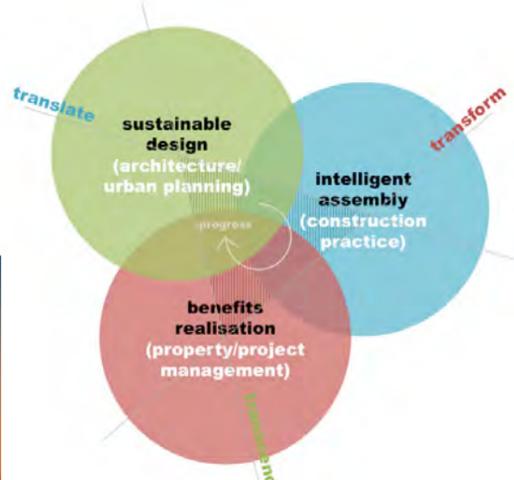
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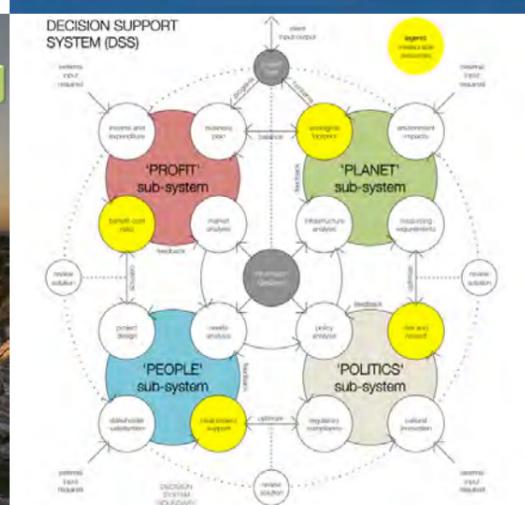
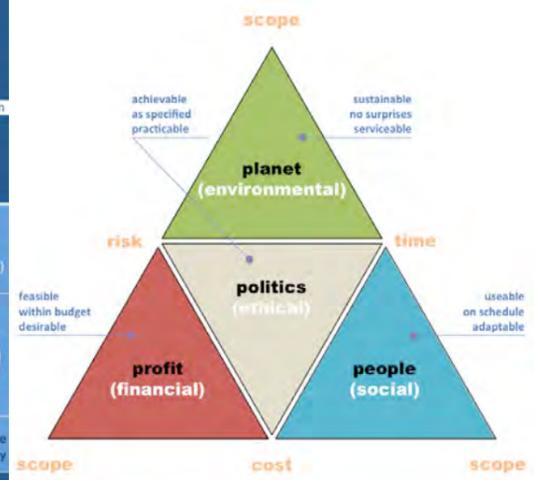
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### i3d3:

Project Initiate (develop/plan phase)	Project Implement (execute/control phase)	Project Influence (operate/utilise phase)
owner/sponsor shareholders	project team regulatory authorities	client/end-user local community
design: feasible (profit), usable (people), achievable (politics), sustainable (planet)	deliver: within budget (cost) on schedule (time) as specified (scope) no surprises (risk)	delight: desirable (attractiveness), adaptable (flexibility), practicable (fit for purpose), serviceable (enduring)
> do the right project	> do the project right	> do the right project right
project success =	+	+
benefits realisation	evaluate success over time	collective utility



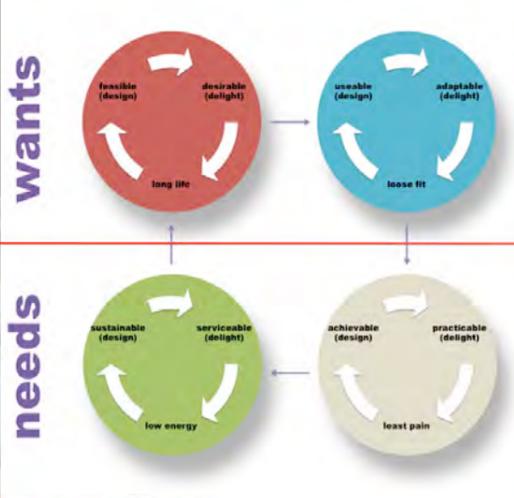
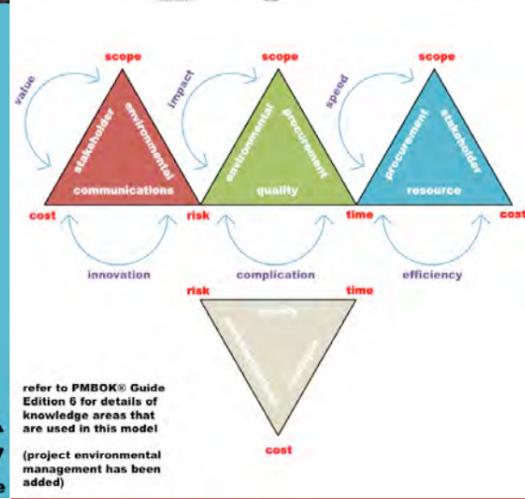
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architecture/urban planning



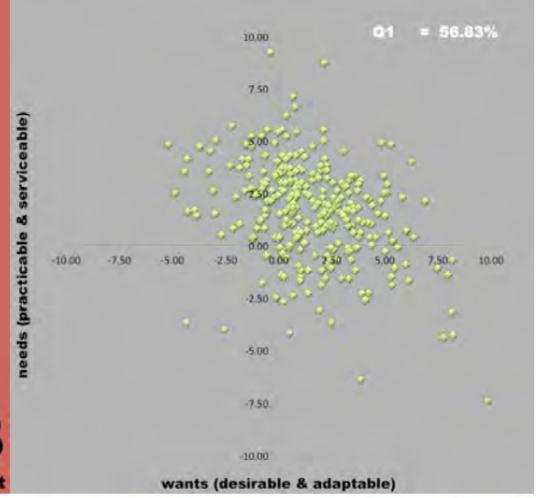
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**PMI\_LAB**  
property/project management



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