

What's in Prefab Construction for Teaching Academics and Researchers

Research Week and Construction Management at Western Sydney University

Research week at Western Sydney University provides the opportunity to showcase successes from research and practice. The School of Computing, Engineering and Mathematics is home to the University's Construction Management Programs. Construction Management at Western Sydney University has recently celebrated its 25th Anniversary. Looking forward, the School concurrently announced a new initiative known as the Centre for Smart Modern Construction (c4SMC). This initiative has the potential to help position the Construction Management program as a leader in developing new evidence based insights into smarter modern construction practices. c4SMC involves an industry and academic collaboration to invest in the advancement of new construction related knowledge to shape the necessary capabilities modern constructors and their enterprises will need to thrive.

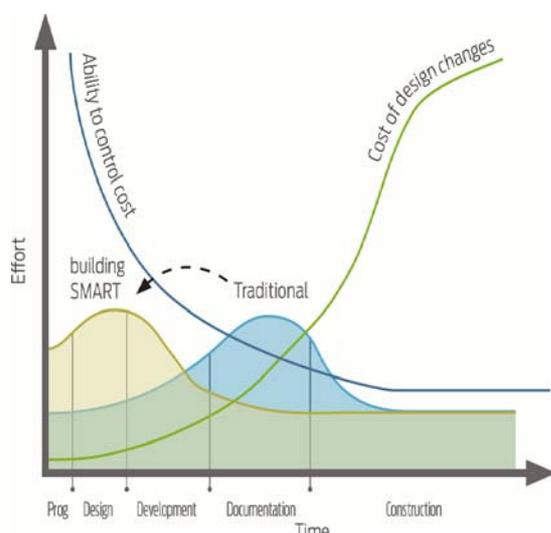
The importance of Construction Management expertise to successfully deliver Western Sydney's Built environment over the next 20-years cannot be over-stated. The importance of the knowledge to be gained about Smart Modern Construction (SMC) and promoting new capabilities to help develop Western Sydney into one of Australia's leading SMC hubs clearly embraces Research Week's aspiration to secure success from research and practice.

This paper centres on Prefabricated Construction (Prefab) which is also known as Off-Site Construction Manufacturing (OSCM). The discussion poses the question, 'Is Prefab the Solution or a Symptom' in the current state of global construction transformation. It seeks to expand on the thinking related to Prefab and SMC in an effort to explain the research and academic opportunities in Construction Management at Western Sydney University, and for the multi-disciplines within and external to the university who join this exciting endeavour.

See c4SMC Launch 8th August 2017: <https://youtu.be/dcHpzhiQGGQ>

Expanding the context of Prefab in a Smarter Modern Construction World

'The construction industry is not immune from the transformations effecting all global industries. These are driven by changing technologies, big data, low cost transportation and meeting customer fulfilment expectations competitively, reliably and quickly'. [BuiltWorlds](#)



Questions to be posed include:

Where does Prefab stand in all of this?
How can a modern construction future be informed by developments in Prefab?
How might the Construction Management Program at Western Sydney benefit from new areas of modern construction research and academic expertise?
How can this research and expertise help convince construction clients to buy-into new SMC procurement practices?
How can the Western Sydney construction economy collectively achieve and leverage sustainable SMC success as a result?

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A Modern Construction Industry Conversation with Researchers and Academics

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Industry Engagement Lead – c4SMC

Construction Management at Western Sydney University.

Research Week - October 2017

What is Prefab Construction?

Definitions for most things I have observed over 40-years in construction seem to morph into what presenters want to say or the audience wants to hear. Words like productivity, sustainable or resilience mean differing things to different people. 'In accordance with the contract' is another definition that has long lost its literal meaning to the point where one frequently hears platitudes like, 'it's the best that is possible given the circumstances'.

Prefab in construction has been on a journey for a long time. Its meaning can conjure up images of temporary or permanent, part or process, and of cheap or quality. Of modular or flat-pack or of having a particular material persona. One architect has even proclaimed 'prefabedness' as a new design vernacular to rank alongside Corbusier or Lloyd-Wright. Others see Prefab as a movement, part of a seismic shift to redress many of traditional constructions ails. Others see Prefab as enabling efficient distribution of the built world to meet the needs of transforming communities, wherever they may be. In these contexts, Prefab conveys meanings including smart, timely, spatial, practical, social and economic.

Prefab in other forums will be defined as the panacea to waste and uncertainty. That it can embrace fast and responsive. In others, it infers constrained and compromised. And, Prefab is the off-site industrialisation of traditional on-site construction methods. Prefab suggests innovative and entrepreneurial personas, just as it does the risky and unresolved ones. Irrespective of all these possibilities, Prefab seems more about the vendor than customer.

Wikipedia defines prefabrication, as the practice of assembling components of a structure (or building) in a factory or other manufacturing site, and transporting complete assemblies or sub-assemblies to the construction site where the structure is to be located. The Encyclopaedia Britannica defines prefabrication as the assembly of buildings or their components at a location other than the building site. The method controls construction costs by economising on time, wages and materials. Both definitions are process orientated.

These definitions do little to define the problems that prefabrication may be seeking to solve. They lack a value proposition that customers of the construction industry could take away understanding 'what's in it for them'. Is prefabrication a symptom of an industry that has lost its way. Is prefabrication just another tool available to constructors, like BIM, DfMA, Lean or CPM. Are they all just parts of the whole in making today's construction, that never seem to add up to measurably better, smarter, safer, faster and cheaper. Does Prefab assert an aspiration that will make a meaningful and quantifiable difference to construction's past?

Have the root-causes that underpinned the case for prefab to where it is today, changed?

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What's in Prefab for Teaching Academics, Researchers and Industry

As an industry and as academics, do we have sufficiently broad insights to inform the clients of construction of the opportunities to get more out of the investments they are making in today's built world? Are our insights sufficient to inform construction enterprises of the opportunities to be more successful? And are our insights sufficient to inform the next generation of constructors about the challenges, the skills and the applications they need?

Construction is a chaotic incremental business. Most adaptations are marginal at best and quantifiably difficult to appraise. Most research in construction assumes the conclusions reached in the past are sufficient evidence to move ahead. Often academic process is slave to past research in pursuing the least resistant path to qualification and publication. Often academic teaching content further embeds acceptance that construction's chaos is reality.

Some enterprises accept that business-as-usual is not viable and they are charting a new course without the need for industry-wide change as a precursor. Some are claiming achievements of as much as 40-percent reduction in waste, in embedded carbon, in on-site construction time and workforce. Some are claiming a 40-percent lift in off-site productivity. Of course, these gains are difficult to evidence and their full potential is not revealed because the benefits only need to be tabled if a competitor looks like closing in. Most of the 'how to achieve any real or perceived competitiveness' is secreted away as intellectual property. All the while, there are no baseline determinants in place to point to those on a truly viable future trajectory, versus those who are only launching from sub-par flat-lines.

In this context, prefab construction may need to re-define its current trajectory from one of 'launch and hope' to one of 'purpose and quantification'. Prefab may need to be re-scoped and perhaps even re-badged. Perhaps a bigger picture of construction's future needs to be considered. From a strategic perspective, considering how changing technologies, big data, low cost transportation and meeting customer fulfilment expectations competitively, reliably and quickly in other industries should soon apply to the modern construction era, is obvious.

At Western Sydney University, the new Centre for Smart Modern Construction (c4SMC) is tasked with re-thinking construction's future. It is tasked with investigating and investing in new lines of academic research and teaching content. The Centre is not about abandoning the past, it is about examining how both old and new may be better synthesised to deliver measurably better and smarter construction outcomes. The Centre is to be focused on impact, via projects that are well defined and scalable. A time of 3 to 5-years is a priority of the industry sponsors of c4SMC. They want to achieve usable, shareable, evidence-based insights into how a local Smart Modern Construction enterprise hub may be the legacy of the large amount of new construction that will be performed in NSW over the 20-years.

The Centre will embrace the logic that 'Smarter Construction' is needed make tomorrow's 'Smart Buildings'. That 'Smart Buildings' will need to have their 'Smartness' embedded early in their making. That 'Smart Enterprises' are needed to deliver 'Smart Construction Projects'. That smarter, effective construction must evidence quantifiable sustainability,

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assurance and resilience. Smarter construction will embrace the globalisation, digitisation and industrialisation in future construction scoping, procurement, delivery and built use.

Smarter construction will re-think construction supply chain interfaces and how 'Smart-Contracts' will enable clearer performance and accountability, absent the uncertainty of historical scoping, risk allocation and combative industry culture. It will translate how this type of thinking has been rooted-out in most industries who understand that short-changing customers to drive profits is a bad idea. It will show how smart enterprises realise exceeding customer expectations with reliable products and services is an antidote for their survival.

And these challenges are applicable to how university research and academic teaching in Construction Management and related programs could be informed and delivered in future.

Why Universities have the advantage of credibility in a Modern Construction Industry

The traditional institutions of construction are at sea with the transformations occurring in construction today. The primary reason for this, is that construction has always seen itself as a protected eco-system either by physical isolation, by standards and regulations, by profession or skill, by sovereign jurisdiction or industrial boundaries. These institutions have been under delivering on the built-world sureties that they have long claimed as justification for their reasons for being. The biggest challenge for construction today, is not unpacking what Prefab means, but rethinking the context and framework into which the modern construction industry will be shaped. Universities have the credentials to approach these challenges with un-conflicted rigour, to evidence base reasoning and to consult widely.

There has never been a better and more opportunistic time for academics, researchers and most importantly industry collaborators to develop shared pre-competitive insights about how Smart Modern Construction may be performed more effectively and profitably. Once informed pre-competitive, evidence based knowledge and capabilities are shared, the quality and value of competitive innovations and customer focused value propositions will evolve. With this knowledge, both industry and academia will be better prepared to adjust their ecosystems to the new conditions. Preparing modern constructors for these conditions is the legacy that today's academics and researchers can collaboratively create and deliver.

Universities have always been at the forefront of new knowledge discovery and delivering the applied leaning that ought to follow. But, the construction industry has become an extractive cash cow for governments, universities, investors and contractors. And, the time has come to put back. c4SMC is a collaborative initiative to enable fresh investment in defining and evidencing modern construction's potential. Through industry engagement this investment should translate to develop the learning and capability building the industry wants and expects programs like Construction Management at Western Sydney to deliver.

It is for forward looking academics to determine if Prefab is in fact a symptom or a solution. It is more likely that quest will find a smarter construction future will firstly involve deeper understanding of the problems that the industry needs to solve. This may point to the need for a more joined up approach to organising construction's pieces and parts than ever, to fulfil the expectations of the industry's customers and the community, than Prefab alone.