

# OSM COLLABORATION TRAINING

## BUILT ENVIRONMENT & URBAN TRANSFORMATION:

### OFF SITE MANUFACTURING COLLABORATIVE PRACTICES TO DELIVER CHANGE

There are many reasons why the cost of building a new house in Australia has increased dramatically over the years. Demand for larger homes has been a significant contributor, but one of the hidden causes of high costs has been identified as ongoing inefficiencies in on-site construction techniques. Fragmentation of the construction supply chain has led to inefficiencies with average building time of new houses jumping significantly over the past 15 years.

#### INNOVATIVE CONSTRUCTION TECHNOLOGIES

Construction supply chain integration has been proposed as an overarching industry solution but practices have been slow to change. Off site manufacturing (OSM) which is at times referred to as prefabrication, modern methods of construction or industrialised building, seeks to achieve integration but requires extensive collaboration across all the industry. Significant advancement has taken place overseas. Australia has recently adopted various OSM technologies.

OSM is diverse and includes the manufacture and pre-assembly of components, systems or modules before installation into their final location. The decision to shift to the use of OSM can alter the sequence of steps in project planning and implementation, with key processes in design, construction methodology and quality control being carried out much earlier.

#### FUNDED COLLABORATIVE RESEARCH

Universities and industry have funded a national research project concentrating on OSM as a means of delivering dramatic improvement in supply and affordability.

Professor London and her team in collaboration drive the half-million dollar, three-year project, funded by the Australian Research Council, with industry partners Frasers Property Pty Ltd, Metricon Homes Pty Ltd, FMG Engineering and the Master Builders Association of Victoria.

All four industry partners are strong believers in the benefits, which can flow from industry and academic joint research projects with MBAV's Sustainable Building Advisor Philip Alviano saying the partnership "brought quality and relevance together".

Michael Meehan, National Manager - Business Process & Systems at Frasers Property said the benefits were "the ability of the academics to be able to coordinate and undertake research that the industry would otherwise not have the resources to apply to itself, with the industry applying real life information and robust review of the research".

*"I am confident the housing industry will embrace change providing the solutions and practical and sound economically. The industry is constantly evolving, albeit incrementally."*

*Mike Castles,  
Metricon Homes*

## BUILT ENVIRONMENT & URBAN TRANSFORMATION:

Off Site Manufacturing Collaborative Practices to Deliver Change

# OSM COLLABORATION TRAINING



*“The target was to improve building efficiency. We have gathered evidence as to how, by collaborative effort, the Housing Supply Chain is capable of adopting OSM at scales suitable for a range of builders to achieve this.”*

Peter Bayetto,  
FMG Engineering

## PROJECT PROGRESS

The operational timeline of the project, Built Environment & Urban Transformation: Off Site Manufacturing Collaborative Practices to Deliver Change has three stages - Year One (Case Studies); Year Two (Model Building); Year Three (Model Validation and Training). The final report will be delivered in December 2017.

Chief Investigator Professor Kerry London of Western Sydney University, said there was international evidence that OSM would bring a whole range of benefits including; reduce construction time, boost housing supply, deliver better quality design, reduce materials waste, improve productivity, improve safety and wellbeing and reduce rework. Such a raft of benefits could lead to an overall improvement in housing affordability.

This project does not go over old ground about the potential benefits of off site manufacturing, nor does it launch into motherhood statements about transforming the housing sector catalysing whole scale urban transformation. These paths are well trodden. The project's main premise is that the success of OSM depends on enabling collaboration for such innovations across the entire supply chain which could include; house builders, designers, project managers, land developers, financiers, manufacturers and trade subcontractors.

Two and a half years into the three-year project the research team is at a crucial stage as it completes a set of collaborative practice models for industry, which are emerging as vital to OSM success. The team is preparing to test one model in the context of a new training initiative, in partnership with Master Builders' Association of Victoria.

Prof London leads a team of researchers including her colleagues, Dr Zelinna Pablo, Associate Professor Peter Wong, Associate Professor Malik Khalfan (RMIT University) and Olutope Ibidapo (PhD Scholar). Professor London said the collaborative practice models being developed seek to address fragmentation and encourage innovation and the integration of organisations in the supply chain.

## UNCOVERING NEW KNOWLEDGE

The study is based on 29 interviews conducted across five case studies of supply chains. Dr Zelinna Pablo has conducted detailed high quality fieldwork on five case studies which were located in Victoria, Tasmania and South Australia and involved one early stage small start-up, a small to medium sized start up, and two mid sized house builders and a leading multi national housing developer. The cases' examples involved component, systems and complete housing modules.

This diversity and the findings are relevant to many different types of organisations in the housing sector.

Mr Meehan said the inclusion of the two start-up operations; two small/medium enterprises and a multi-national firm had delivered “great diversified research results”.

To analyse the interview data, the research team used actor-network theory, an analytical approach from the social sciences, to explore the inter-relationships between various actors.

Analysis of the case studies provided insights into how recent successful OSM examples sought to address barriers to OSM implementation, achieve meaningful collaboration across supply chains and to later achieve improved outcomes for business.



*“Decreased errors, onsite efficiency and improved quality can only be good.”*

*Philip Alviano,  
Master Builders Association  
of Victoria*

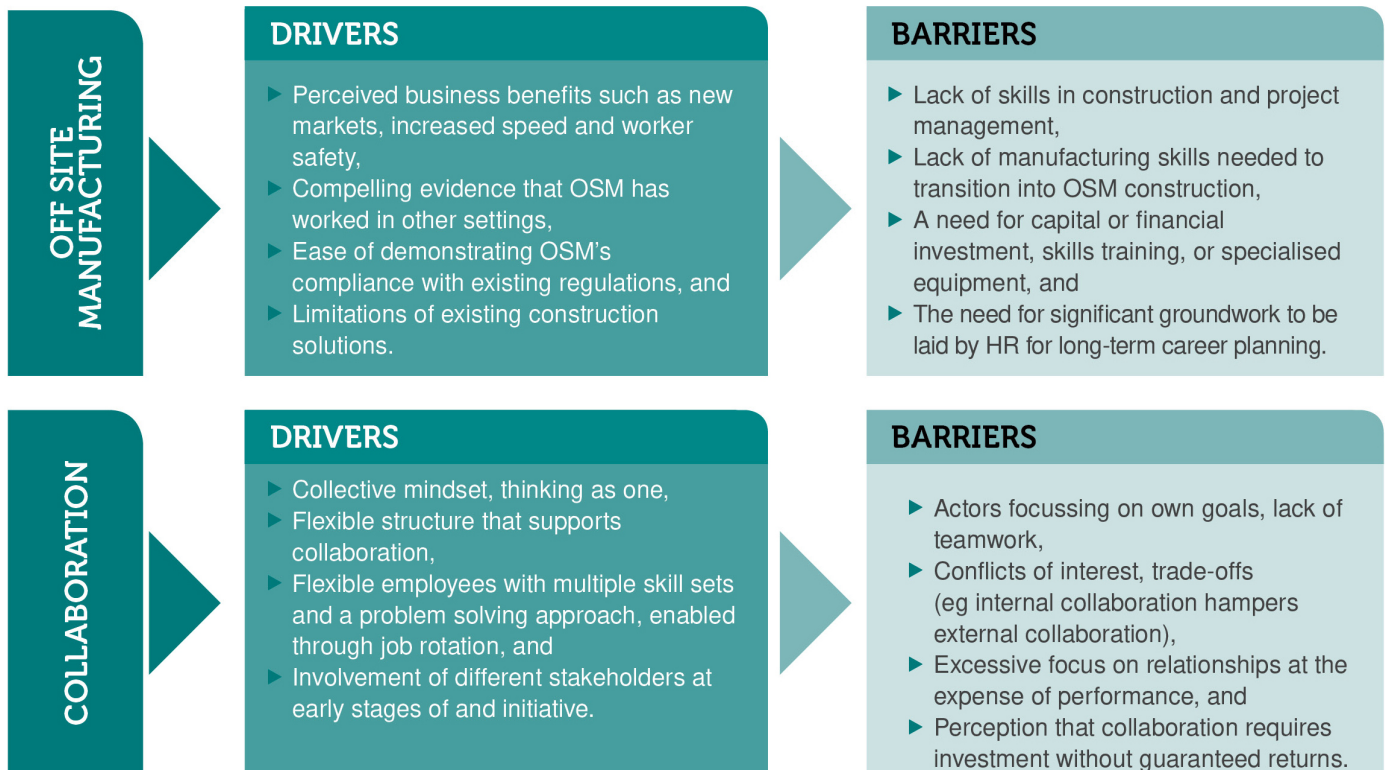
## WIDESPREAD POSITIVES REVEALED

When asked about their views on such OSM drivers, Mr Alviano identified decreased errors, onsite efficiency and improved quality, while Mr Meehan noted improved quality and reduced delivery time.

Findings from the research confirm these views, and simultaneously broaden current understandings about OSM’s benefits. For example, findings from all five cases suggest that key drivers of OSM include an enhanced ability to capture new markets or market niches, worker comfort and safety, increased environmental performance of finished products and exceptionally high levels of process predictability, precision and control. Possible links and tradeoffs between benefits are also emerging.

## DRIVERS AND BARRIERS

Analysis of the interviews found over 100 themes across four categories - OSM Drivers, OSM Barriers, Collaboration Drivers and Collaboration Barriers.





## CASE STUDIES

The myth that off site manufacturing is for the ‘big end of town’ has been well and truly explored as part of this study. Across the five case studies the team examined one company, which was a large multinational housing developer, and three small to medium sized companies and then one start up.

ANALYSIS OF INTEGRATED SUPPLY CHAINS FOR INNOVATIVE OFF SITE MANUFACTURING	
CASE STUDY 1	Case study one is a multinational enterprise based in Victoria, building single to five-storied housing. The company recently led the development of an off site innovation in the form of a timber cassette flooring system that can be manufactured on a large scale then craned into place, resulting in faster construction times and improved worker safety.
CASE STUDY 2	Case study two is a small/medium enterprise based in country South Australia manufacturing single storey detached transportable housing. The company has also developed an innovative concrete slab that is light enough to be transported and allows houses to be installed at ground level.
CASE STUDY 3	Case study three is a Tasmanian-based small/medium enterprise that manufactures prefabricated components and structural systems for housing and commercial low-rise up to detached three-storeys. One of its earliest initiatives was complex housing project, which was eventually recognised for its exceptional energy efficiency rating.
CASE STUDY 4	Case study four is a Victorian start-up manufacturing prefabricated timber components for low-rise detached housing. Yet to begin operation, it’s mission is to manufacture precision-engineered wall and roof elements for timber frame construction in a fully automated factory using German technology.
CASE STUDY 5	Case study five is a company whose main operations are similar to Case Study 4, involving the manufacture of housing components and systems and their subsequent assembly on site. As a piece of timber is fed into equipment, the equipment cuts it to a specific size, drills holes, and even puts tongue-in-groove in a piece if necessary. The machine also installs electrical wiring, plumbing, insulation and plaster. At the time of the case study, it had just completed its first project and was moving into its second.



## COLLABORATIVE PRACTICE TRAINING FRAMEWORK

Having completed the initial analysis of the interviews and case studies the research team conducted a second process of analysis of collaboration barriers and drivers leading to a Collaborative Practice Training Framework. It became very apparent that common to many of the OSM initiatives that are currently being introduced is that to achieve such large scale innovation, integration of processes is needed for success and that underpinning this collaborative practice is the common denominator.. Construction researchers and practitioners often talk about ‘collaboration’ but now the research team has proposed a very rigorous, systematic and detailed approach to training for dedicated collaboration rather than hoping that it will happen. Their argument is that the industry cannot rely on such rhetoric as ‘good teamwork’ and ‘good communication’. The team has now created a clear pathway customised for this fast growing sector.

The Collaborative Practice Training Framework involves six key elements that were explicitly designed to be delivered through the MBAV Building Leadership Simulation Centre. The included a Collaborative Practice Model, a Collaborative Practices Actions (CPA) and Position Competency Matrix, a CPA Index, Indicator Descriptors, Training Scenarios and Collaborative Practice Training.

The cornerstone of the Framework is the Collaborative Practice Model, which includes nine elements. The elements are Leadership, Goals and Norms, Expertise, Change, Resource Investment, Shared Space, Problem Solving, Organising Mechanisms and Technical Standards.

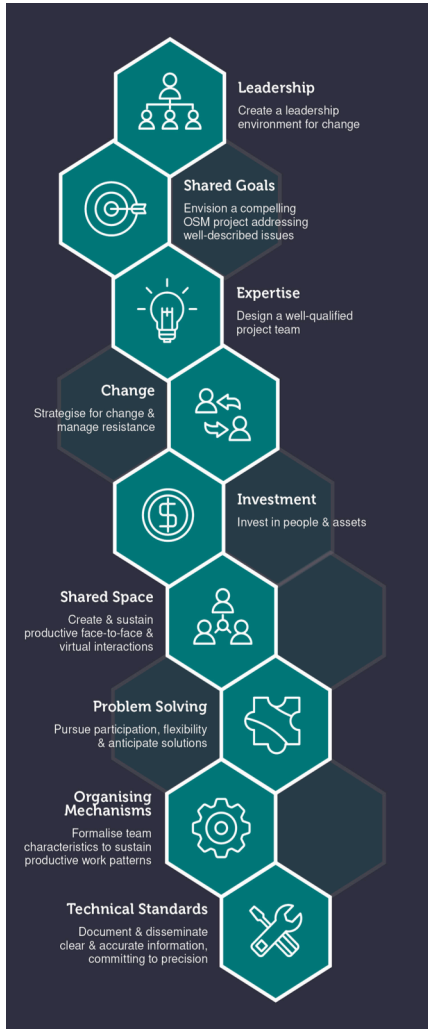
The next stage of validation will be the creation of innovative materials for new training programs focused on strategic and operational collaboration. The training scenarios are being developed into detailed scripts by professional writers and transformed into interactive simulations involving professional actors.

Mr Meehan said collaborative practice training would have “substantial impact on the housing sector through its simulation training that enabled trainees to be fully immersed in the practices that it is delivering”.

Simulation-based training will be conducted at the virtual simulation training laboratory at the MBAV’s innovative Building Leadership Simulation Centre which is the only one of its kind in the southern hemisphere.

Participants in simulations will be presented with different dilemmas and challenges, and then asked to respond. At the end of the training session, participants will be given feedback and input on their performance. Outcomes of the training programs will also be used to refine the collaborative practice models.

[End.]



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