



The UK experience of  
**Driving construction  
sector change**  
and lessons for New Zealand

December 2023





Cast is a UK-based specialist construction consultancy providing solutions for developers, investors, policymakers and the supply chain.

Supported by:



# About Cast, and this report

Cast was appointed by the Construction Sector Accord (the Accord) in New Zealand to provide insight and learning from the United Kingdom's (UK) journey towards transformation in the construction sector through the use of Modern Methods of Construction (MMC).

Referred to as Offsite Manufacturing (OSM) in New Zealand (NZ), MMC refers to a wide range of construction modernisation approaches. These are linked through their shared goal of driving greater productivity, efficiency and quality in construction delivery.

**Cast has a unique perspective on the UK's experience, and of the lessons that can be drawn from successes and setbacks in recent MMC implementation.**

In 2016 Cast CEO and Founding Director, Mark Farmer, authored the *Farmer Review of the Construction Labour Model: Modernise or Die* which had significant impact on the UK Government, including in relation to MMC. In 2019 Mark was appointed UK Government Champion for MMC in Homebuilding, acting as a voice for change in the industry and working alongside MMC suppliers to advocate for sustainable changes to how new homes are built.

Our commission had three aims:

- 1. To provide a comprehensive review of the lessons learned in the UK in driving greater adoption of MMC.**
- 2. To place those into the New Zealand context.**
- 3. To set out recommendations for the Accord to consider adopting in guiding New Zealand's journey to enhanced OSM delivery.**

Our work has been based on a combination of bespoke research, supported by our partners in this exercise Harlow Consulting and Stacx International, alongside the insight Cast has developed in seven years at the forefront of industry change. We have reviewed and tested our findings with the Accord team and with a number of industry figures.

This document is intended to provide a high level, visual and accessible summary of our conclusions. It sits alongside a comprehensive and detailed research report that we have provided to the Accord team separately.

# Executive summary



Mark Farmer

Founding Director & CEO

Cast 

When I delivered the UK Government-sponsored *Farmer Review* in 2016, I observed a construction sector characterised by endemic poor productivity and a declining workforce in the UK. I argued that construction in the UK needed to “Modernise or Die,” and I am proud to have been part of driving a sector-wide response and improvement journey in the past seven years.

When I look at the New Zealand construction sector, I see a lot of similarities to the UK, combined with some unique factors. Below-average productivity growth, a massive reliance on increasing human capital as a means of increasing output, the need to decarbonise, and the cost impact of global political shocks are familiar challenges to our sector around the world.

**Construction remains one of the last remaining industries to fully embrace technology driven change.**

All around the world, the construction industry struggles to reform itself in response to the challenges it faces. This is a consequence of the way our business models have developed – fragmented, low overhead, subcontract-dependent, and adversarial businesses that tend to lack the capability to collaborate. We tend to fight for a bigger share for each of us, rather than working together to grow the market for everyone.

This means that government leadership is a crucial enabling factor for change, supported by industry engagement, collaboration, and, ultimately, delivery. As such, I am grateful to the Accord team for asking Cast to provide this review, looking at what can be learned from the UK’s change journey. I see the Accord itself as a significant strength in New Zealand, and a springboard for meaningful improvement in the quality of the new built environment in the future.

Over the past seven years, the UK Government has led a multi-faceted approach to driving change using OSM. This has included direct investment into the supply chain, a range of mandates and incentives to use OSM, a collaborative programme of research and development, and working across the industry to formalise our language, definitions, measures, and standards for OSM.

In this time, we have seen notable successes and the UK should be proud of the globally leading role it has played. At the same time, we learn as much from the failures as the successes, and we will only reach maturity by learning and evolving when experience tells us we are on the wrong track.

So what have we learned? First, government leadership is critical. However, there is a limit to what government can achieve, and our second lesson is that the shape, dynamics, behaviours, and market forces that impact our industry cannot be overcome by willpower and policy prescription alone. Third, emergent businesses that set out with the wrong business model, are overly ambitious, or that do not execute well, will never succeed whatever the policy and regulatory context.

We have created what we refer to as an OSM maturity model based on these lessons, and our own experience of delivering OSM products on site. We use this as the basis for setting out what our learning has taught us about how OSM can scale. In this report we use it to organise our conclusions on how the Accord can act as an enabler and integrator of industry and government action.



Our framework includes four types of activity, which set the basis for moving forward. First, the Accord should **define** what is meant by OSM in the New Zealand context. Our view is that this definition needs to be broad and encompass a wide range of technical and process improvements. This should be embedded into policy and funding decisions to drive understanding and confidence, while measurement of pre-manufactured value can operate as a solution-agnostic measure of success in driving OSM uptake.

Second, the Accord should work collaboratively with government and key industry bodies to **determine** the nature of the change journey that will work in the New Zealand context. The trend emerging from the UK is one where a maturing sector is incrementally changing, using small and targeted steps to increase the extent of OSM on projects. At the same time, a small number of emergent challenger businesses are driving more disruptive change, and a number of these have failed to reach maturity. The questions for New Zealand are, what is the right balance in your context and how does that vary by sub-sector? Our analysis points to a differentiated approach, consciously choosing the best-fit model according to market dynamics and the realistic extent to which demand can be guaranteed.

With the scope of action in place, and the range of models for change agreed upon, the third step is to **align** the programme of action and intervention appropriately.

The ultimate driver for change will be demand. With demand comes certainty and scale for manufacturers, funding can be obtained without government intervention, and products and processes will improve over time. However, the Accord should learn from the UK experience that in many sub-sectors it is difficult to mandate demand to provide a sufficiently granular and transparent volume for manufacturers. Where this is the case different approaches such as demand aggregation platforms or a nuanced use of incentives can help shift the dial.

Finally, it is critical to **enable** progress in a range of areas, and not focus solely on technologies. This includes capitalising on the opportunities for lean methodologies to transform manufacturing processes, and not simply assuming that by moving a process off-site it will automatically improve. Digital processes can unlock similar efficiencies, while the Accord should establish a programme of outcome measure data capture, as it is the benefits of OSM and not the process itself that will help shift the industry. The cultural, contractual, and collaborative environment needs to act as an enabler and not a blocker.

The UK has much to be proud of, but the challenges we have seen offer equally powerful insight to help shape the journey in New Zealand. While the need is significant the opportunity is greater still.

# The construction challenge

Our research, our engagement with the Accord team, and our consultation with stakeholders has identified five areas of challenge in the NZ construction sector.



## Poor productivity<sup>1</sup>

The New Zealand economy has achieved below average productivity growth compared to OECD peers since 1970. Over that period the construction sector has relied on increasing the number of workers to achieve growth, rather than improvements in technology and process. Construction productivity underperforms many other sectors including manufacturing, transport and professional services.

A more productive construction sector would be less labour dependent, more resilient, and contribute to a more productive NZ economy overall.



## Workforce and skills<sup>2</sup>

The New Zealand construction sector accounts for around 10% of the country's workforce. The workforce is ageing, and more than 5% of workers have passed retirement age. Average wages for skilled workers in Australia are now 37% higher than in New Zealand, creating risks around the workforce size generally, and the loss of skilled workers particularly.

While the workforce has been sustained through strong recruitment into training programmes and through migrant labour, a recent survey found that 90% of construction companies had experienced difficulty finding skilled labour.



## Limited competition<sup>3</sup>

In 2022 a market study into residential building supplies by Commerce Commission (ComCom) New Zealand found *"competition for the supply and acquisition of key building supplies is not working as well as it could if it was easier for building products to be introduced and for competing suppliers to expand their businesses."*

This situation was found to be making market entry for SME/ startups more difficult and was not serving the needs of Māori. Greater competition could be a factor in driving investment in innovation, and thereby productivity, whilst establishing less labour-intensive models of production.



## Material cost inflation<sup>4</sup>

Construction material pricing has been affected by global supply chain shocks, a factor exacerbated by New Zealand's heavy reliance on international supply, with 90% of building products sourced as finished goods or relying on overseas components.

Recent data from EBOSS show that 78% of suppliers had faced challenges in meeting market demands, while the ComCom review showed that New Zealand pricing for key construction materials such as plumbing materials and concrete was the second highest out of 10 comparator economies.



## Decarbonisation<sup>5</sup>

New Zealand has committed to an economy-wide decarbonisation trajectory aligned to the Paris Agreement of 2015 and the need to limit global temperature increases to well below 2°C. A first emissions reduction plan, published in 2022, included commitments for the role the built environment sector, which contributes nearly 10% of overall emissions, would play in achieving that trajectory.

Key steps include working with industry to drive a shift towards new homes that are more energy efficient and create lower emissions in use, consulting on and implementing a requirement to reduce the embodied carbon of construction materials, a focus on waste minimisation, and on maximising timber use to aid carbon sequestration. New entrants, and efficient processes, are also likely enablers of innovation in this area.

1 NZ Productivity Institute

2 MBIE, Commerce Commission

3 Commerce Commission

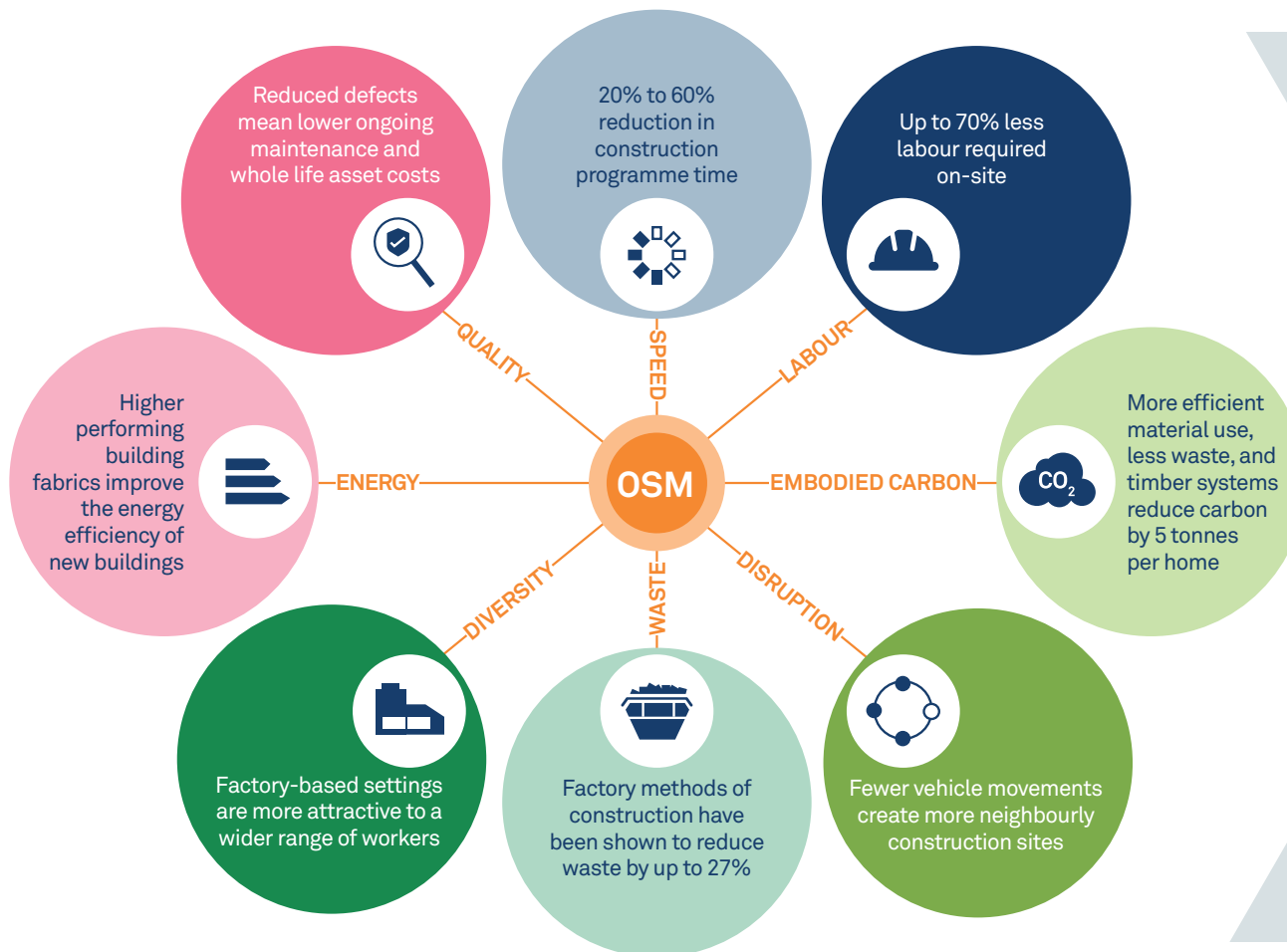
4 EBOSS, Commerce Commission

5 Ministry for the Environment

# Enabling improvement using OSM

Offsite manufacturing has the potential to enable construction sector change. It reduces reliance on site labour and enables building elements to be created in clean, safe, and controlled conditions. Extensive evidence from the UK shows the range of potential benefits that OSM can deliver, and which can respond to the challenges seen in the New Zealand construction sector.

## EVIDENCE FROM THE UK SHOWS EIGHT CLEAR BENEFITS THAT OSM CAN DELIVER:



Over the past decade the UK has seen a range of government and industry initiatives designed to maximise the impact of offsite manufacturing in delivering these outcomes.

Cast has been integral to a number of those initiatives and has supported developers to implement OSM solutions on projects across the UK and beyond.


On the following pages we set out our observations and learnings from that period, in the context of the challenges that New Zealand faces.




# Case study: Utilising OSM

The benefits of OSM are being proved in practice in the UK. Vision Modular and its sister company Tide Construction provides the most compelling case study. The integrated delivery model, which aligns the benefits of OSM investor priorities, has become a world leading and award-winning model of disruptive innovation.

Diversifying supply through new technical solutions, vertical integration and aligned investment models





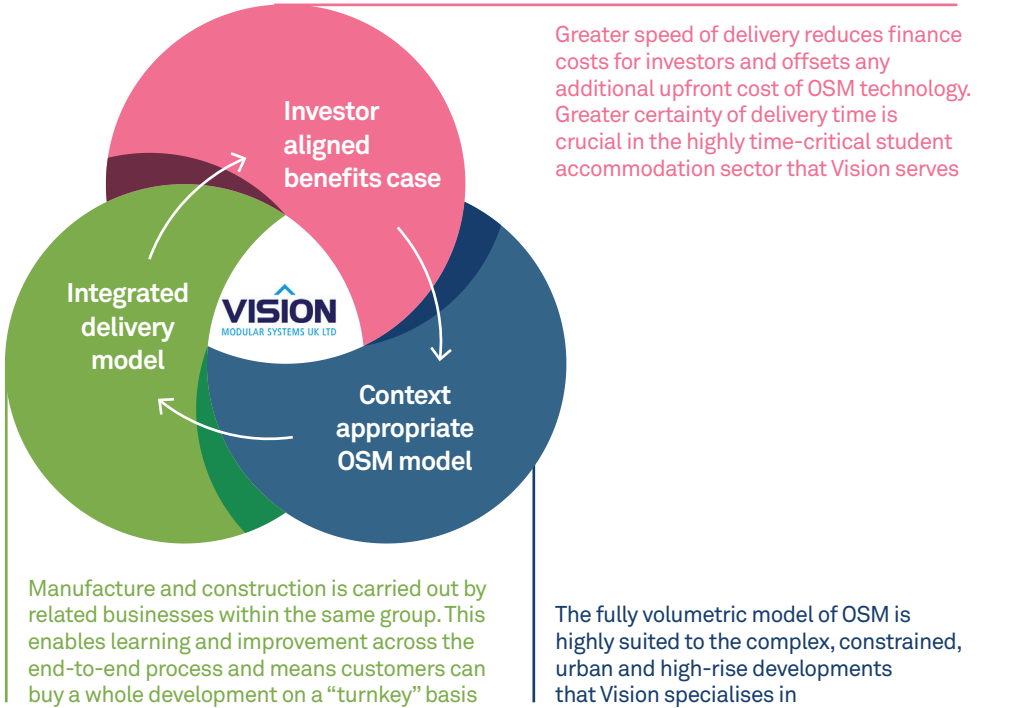
Vision Modular is a leading example of a successful and disruptive force in the delivery of new residential developments in the UK. Using volumetric modular construction vertically integrated alongside in-house specialist construction capability and partnered with institutionally funded asset owner/operators such as Greystar and Outpost, this model offers genuine additionality of supply.

The model capitalises on the inherent speed benefits of volumetric MMC (see right) and aligns those to specific use cases where that generates commercial benefit, in this case complex urban development for investors keen to recycle their funds quickly.

A study by the University of Cambridge found that the Vision model saved between 40% and 55% embodied carbon, compared to traditional construction.

The development on the left, known as *Enclave: Craydon* is Europe's largest volumetric MMC building at 158m, 50 storeys high, and was completed by Vision Modular on behalf of Outpost in just 28 months. Vision has the capability to deliver approximately 2,000 homes per year using this approach.

## AN ALIGNED DELIVERY MODEL THAT DRIVES SUCCESS



★ This example demonstrates that OSM models which align technologies, benefits, and investor interests have the greatest potential to scale. For the Accord, the focus should be on identifying similar alignments that work with the NZ supply chain context, demand profile, and investor requirements.

# Lessons to inform New Zealand

Over the past decade the UK Government has worked with industry to implement policy, technical and enabling measures aimed at driving greater use of OSM. Cast has supported elements of this policy development and has enabled numerous OSM projects on site. We have identified eight lessons from our experience to inform New Zealand's approach to OSM.

1

A shared language for OSM is a critical enabler of sector maturity and developer confidence.

In the UK, government and industry collaborated to define the meaning of OSM and the range of technologies and process improvements that was in scope. This process was successful, and the outcome has proved valuable in enabling supply chain mapping, in creating clarity and maturity in the insurance and warranty market, and in building confidence among developers.

2

An incremental OSM strategy that progressively adjusts the construction model and that works with the grain of the sector is more likely to be successful.

The focus of UK policy and investment support for OSM has been mainly on disruptive new entrants. These promised additionality in supply and a break from traditional methods but have proved exceptionally difficult to scale. New entrants were still scaling and increasing their resilience when the economic downturn hit, leaving them more exposed than older businesses. At the same time, large and long-established companies are successfully driving progressive, incremental change to business models and delivery processes.

3

The optimum approach to OSM varies across real estate sectors according to the fundamental characteristics of each sector.

UK policy and investment focussed on general support for OSM rather than a differentiated approach based on the specific characteristics of sub-sectors. Different OSM technologies and business models are more easily aligned to different sectors. Policy, investment, and regulatory change should be aligned to OSM models most likely to be commercially efficient and scalable in the specific contexts they will operate in.

4

Clarity and consistency on the role that government will play is crucial in driving confidence and creating sustainable programmes of change.

In the UK, initial government support has recently started to fall away, and some funding incentives have been insufficiently robust. This shift has coincided with challenging market conditions exacerbating difficulties for suppliers. Key structural barriers to scale such as maturity in warranty provision have yet to be resolved. A clearly understood and sustained government role is critical to driving maturity in an emerging sector.

5

Effective demand is key to scaling the industry.

The ultimate unlock of demand will be proof that OSM drives commercial benefits. In the UK good progress has been made in developing outcome measures to generate data-led evidence of the value of OSM. The Accord can work with industry to build on this approach in New Zealand, establishing its own success metrics and embedding data collection as widely as possible.

6

Proportionate, collaborative R&D programmes work and can support the development of digital tools and lean methodologies to unlock efficiency.

The UK Transforming Construction Programme enabled several successful initiatives, securing industry match funding and demonstrating that government can provide the leadership needed to give the private sector the confidence to invest in R&D.

7

Collaborative, value driven and OSM aligned approaches to contract, procurement, risk, and partnership can underpin the potential of new technologies.

Products, processes, and technical improvements in construction cannot exist in a vacuum. To help address this there has been extensive cross-industry collaboration to establish "playbooks" setting out a blueprint for best practice. The Accord can act as a convenor across industry and create a New Zealand specific blueprint for success.

8

Skills shortages continue to be a critical bottleneck to the adoption of OSM at scale.

OSM has the potential to attract new talent, but structures and resources need to be established to develop the skills necessary for OSM, with a particular focus on design for manufacturer and assembly, DfMA, manufacturing, logistics, site assembly, project management and, crucially, the skills required to manage the interfaces between on-site and off-site processes.



# Defining and understanding the use of OSM

The UK has developed a common language to define MMC and the types of technologies and process improvements the term relates to.

This has proved to be a valuable step towards increasing confidence and understanding by ensuring that, when discussing, people speak with a common language and meaning. Crucially, the UK definition framework (outlined on the right), incorporates a broad range of solutions, each of which can make a meaningful contribution to improving productivity, efficiency and quality in the built environment.

Previously in the UK, as we have noted is also the case in New Zealand, MMC was typically conflated mainly with 3D volumetric modular forms of construction. However, the UK definition framework, developed by a cross-industry working group led by Cast CEO Mark Farmer, incorporates seven categories.

**The key factor for inclusion is whether the product or process is carried out away from the final workforce in controlled conditions.**

This still includes volumetric construction, but also includes panelised structures, componentised structural elements, longer established non-structural components such as bathroom pods or utility cupboards, and the application of improvements to traditional building materials and construction processes.



**The UK framework is context specific, and so the Accord should consider establishing a New Zealand specific definition and language for OSM, drawing on the UK model and evolving that as appropriate to New Zealand.**

The UK prioritised defining and measuring OSM, an important first step which improved understanding and confidence in the sector. Crucially, the UK definition includes a broad range of technical and process improvements, all of which should be considered as in scope for New Zealand. A broader understanding of OSM, that doesn't focus solely on volumetric modular, will enable a more incremental approach to change.

## EXAMPLE OSM SOLUTIONS DEFINED IN THE UK AND LESSONS FROM THEIR USE



### 3D structural solutions

Involve the greatest extent of off-site manufacture and in theory offer the greatest extent of the benefits of OSM in terms of labour reduction and productivity increase. However, in reality these systems are often constrained in their use, for instance where site access is problematic or on sloping sites, while the commercial benefit is most readily achieved in higher rise developments.



### 2D structural solutions

The next highest level of pre-manufacture volumetric modular. In the UK and in New Zealand these are a considerably longer established solution and supply chain. Can vary significantly in the extent of pre-manufacture from a basic open frame through levels of greater consolidation by adding further content to such as insulation or windows. The UK created grades to reflect this range and a shift to greater consolidation, which would be applicable to the New Zealand sector given that open timber frame is the typical start point.



### Non-structural solutions

Pre-manufactured elements of buildings, outside of the structure. This includes the pre-manufacture of more complex and labour-intensive elements of fit-out and mechanical, electrical and plumbing assemblies. These are increasingly common in the UK, can be combined with 2D structures, and tend to be more easily accommodated into typical delivery models. There is great scope for these approaches to augment the traditional timber frame solutions used in New Zealand.



### Process led productivity gains

These two forms of change are critical enablers of more efficient ways of working yet can often be lost in dialogue about modernising the sector as they are less visible than other forms. They offer great scope for incremental change through, for instance, using larger format materials or digitising the delivery process. The Accord can consider these forms of improvement on an equal footing to the other types, and as part of the incremental approach to sector change that we advocate on the next page.

# Striking a balance between disruptive and incremental change

One of the perceived benefits of MMC in the UK has been its potential to drive disruptive change into a largely traditional sector. The model has tended to include a combination of maximum extent MMC in the form of volumetric modular construction, offered to market as an end-to-end delivery solution incorporating pre-construction and construction phases in addition to MMC manufacture. The concept offers a range of benefits but has also faced significant challenges in execution, as we set out opposite.

The companies shown below experienced a range of challenges, key amongst which was the inability to secure sufficient volume of work, in a reliable flow, to improve the efficiency of production and benefit from investment in factories and plant.

The recent industry downturn has compounded broader problems experienced by these companies including poor execution of manufactured products on site, pressure to scale quickly without fully establishing cost-effective and high-quality methods first, and exposure to the full development cycle increased overall risk.

None of these companies was able to reach a resilient, mature, position before an economic downturn hit the wider UK economy, and they have all entered administration over the past two years.

**This has significantly affected market perceptions of and confidence in MMC, which has exacerbated the fall in demand and risks contagion across the wider sector.**

The UK's experience shows the importance of establishing an appropriate strategy for driving change. The UK Government strategy of focussing investment and support mainly on a small number of disruptive new entrants has seen mixed success and some high-profile failures.

## BALANCING OPPORTUNITY AND RISK IN DISRUPTIVE NEW OSM MODELS

### OPPORTUNITIES



- Creates additional new supply –
- Tests disruptive new technologies –
- Maximises extent and benefits of OSM –
- Uses new workforce, adds to labour pool –



### RISKS

- Highly capital intensive
- Requires high volume of demand
- Technically complex to deliver at scale
- Exposed to risk across whole development cycle
- Slow to reach scale so requires patient investment

## DEMAND IS CRITICAL TO UNDERPIN THIS BALANCE

Exemplar models such as Vision Modular achieve demand certainty through developer/investor partnership at scale. This arrangement is currently unique in the UK.



The lesson for the Accord from the UK's experience is that disruptive models depend on significant visibility of real, effective demand. The UK strategy has been to invest on the supply side, to encourage a shift to OSM among developers, but has not meaningfully driven demand through incentives or mandates. On reflection, a more coherent strategy would champion these forms of delivery only where sufficient demand can realistically be mandated or incentivised. Where demand cannot be underwritten by government, incremental models of change are likely to be more successful.

**modulous**  
**urbansplash**

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MODULAR HOMES

# Striking a balance between disruptive and incremental change

Here we set out a range of examples from the UK that show how change and improvement can also be achieved in incremental steps, testing the use of new technologies with a focus on those elements of build projects that are most complex, prone to human error, require the greatest labour input, or all these factors.

With more complex tasks undertaken away from site, the remaining site processes can then increasingly be carried out by multi-skilled workers rather than trade specialists.

**Models of this nature can be aligned to long-term, programmes of business, cultural and behavioural change, while retaining the ability to accelerate in the future as technologies emerge and/or mature.**

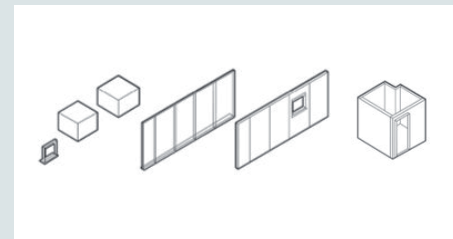
While some high-profile businesses have failed, there is an emergent trend in the UK towards hybrid on-site/off-site models, with a focus on elements of construction where OSM achieves the greatest benefit, with the remainder delivered on-site. This points to the likely future of OSM adoption and the potential optimum approach for New Zealand.

## Mace Tech: Portlands Place



Mace Tech is an innovator in the delivery of MMC, most notable for the combination of multiple MMC categories within a single construction model, under a tier 1 contractor, and aligned to high rise typologies. Portlands Place, a development of 524 homes across two residential towers incorporated MMC pre-cast structural frame, structural components such as staircases, walls, and columns along with bathroom pods and utility cupboards and riser modules. Key client benefits from this approach included a 30% time saving on the structure allowing the fit-out stage to commence 18 weeks sooner, a 75% reduction in site waste, and a 15% reduction in embodied carbon.

## Multiple UK developers: panelised frames plus non-structural components



There is a trend in the UK towards the use of combinations of MMC of all forms except volumetric 3D modular, particularly for low rise housing. This tends to incorporate panelised frames, which are becoming more advanced over time as insulation, façades, windows, and doors are added to the frames in factory conditions. These enhanced frames are then augmented by other forms of MMC such as podded bathrooms or utility cupboards which focus the off-site content on the more complex building elements. Recent Cast research shows this approach can reduce labour requirements and programme duration by a third, while reducing embodied carbon by five tonnes per home.

## Increasing supply chain vertical integration

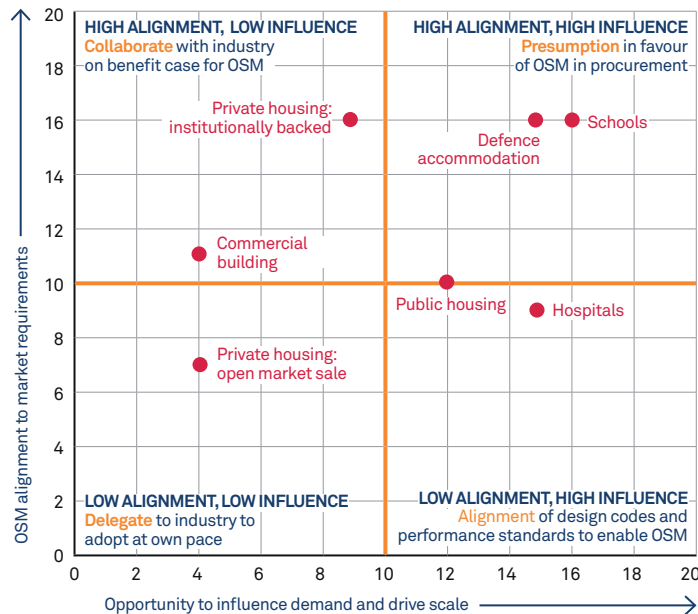


Several notable acquisitions and mergers have taken place across the MMC and construction supply chains over the past two years. These have coincided with high profile business failures (see next page) and point to a maturing model of supply chain integration between established developer/contractors and MMC systems suppliers. A number of transactions has taken place once MMC suppliers have failed and entered administration, indicating residual value in the technologies and processes, even where business models have failed. The majority of acquisitions have combined developer/contractor capability and development pipelines with panelised MMC systems, amplifying the trend to hybrid on-site/off-site construction models.



# Optimising OSM to the characteristics of real estate sectors

Broadly the UK approach has been to drive a single uniform strategy for OSM. Our view is that the optimum approach to OSM will vary according to key underlying parameters in different real estate sectors. As such, the enablers for growth will also vary.



For New Zealand, the opportunity is to learn from the UK and develop a differentiated strategy from the outset. A whole-of-Government strategy, would utilise OSM in a best-fit manner aligned to the characteristics of the asset types in question. Industry incentives can also be aligned to a realistic assessment of the requirements of each market sector.

In the UK the starting position has been to use the housing sector as a scalable pilot for pre-manufacture, a logical starting point given the relative scale of housing output in the UK relative to all other construction sectors.

However, given the lessons learned over the past six years, our reflection is that a more differentiated approach to OSM adoption could be pursued. In this model, while the end goal of greater OSM adoption applies equally to all sectors, the means of achieving that goal should vary according to the characteristics of the sector in question.

We show this concept visually on the left, using our own appraisal of (1) the extent to which OSM aligns to market requirements, considering e.g. the potential for design standardisation, and the value that developers will place on the benefits OSM can offer, and (2) the extent to which demand for OSM can be purposefully driven, e.g. the extent to which projects might be aggregated either through government procurement, developer collaboration, or platforms that align requirements and favour OSM models.

In this analysis, four segments emerge:

## High alignment, high influence

The end product is naturally highly standardised and Government has significant influence through programme and procurement. This is a natural starting point for OSM and likely best environment to test and scale new technologies. See the [NSW Schools](#) programme in Australia as a leading example of this.

## High alignment, low influence

The market requirement here is aligned to the benefits of OSM as developers value speed and certainty, while typical developments utilise relatively standardised designs and layouts. Whilst scale and output will be driven largely by market forces, we note the tripling of multi-unit residential buildings completed between 2017 and 2022, and see a similar if smaller opportunity for the Vision model (see page 6) in the rental sector.

## Low alignment, high influence

In this segment there is greater variation in the end product and greater risk of variability in flow linked to market dynamics. The UK experience shows that OSM has been difficult to scale in both public housing and health as a result. The likely best driver for scale here is the alignment of design and/or technical requirements, as has been pursued in the UK by [OSHA](#), [WMCA](#) and the [NHS](#).

## Low alignment, low influence

This segment is driven by consumer preference and economic cycles. We note from our research the preference of New Zealand purchasers for bespoke design. Output will be cyclical and this mitigates against OSM models that need high fixed throughput. The OSM model here is likely to be incremental, hybrid, and aligned to OSM benefits around sustainability and quality.

# The role of government

The UK experience, which is borne out globally, shows that government has a crucial role as an enabler and convenor of industry change. While the response to each of our four challenges will vary according to local conditions, each will need to be resolved to drive OSM at scale.

	Theme	The challenge	The role of government
1	Responding to market failure	There is a co-ordination failure between supply and demand in the market for advanced construction solutions. Without aggregation and certainty of demand for suppliers, the confidence to invest in and grow production capacity is limited. In 2022 ComCom recommended the development of an “all-of-government” strategy to drive greater coordination between government and industry.	Whereas in traditional construction, increasing demand will lead to price increases (all else being equal), over time efficiencies in production and the use of an additional, different, labour model means MMC will eventually become cheaper as demand increases. This creates a role for priming the market, either through direct purchasing commitment, by acting as a convenor and aggregating scale through collaboration. Government support needs to be consistent, long-term, and it needs to be sustained through economic downturns. Where hard levers such as demand mandates will not be appropriate, soft levers such as enhanced technical standards or incentives such as a faster route through planning, have a role in enabling incremental improvement.
2	Unifying technical assurance and addressing regulatory barriers	Confidence in new OSM solutions will remain limited without clarity on the technical standards and assurance that apply. In the UK this has acted as a significant drag on the scaling of the MMC sector.	Government and industry should work together to provide clarity on the testing and accreditation regimes that apply to OSM, and to effectively communicate the rigour of those to drive confidence. New Zealand is ahead of many other economies given the voluntary BuiltReady scheme introduced last year. This needs to be scaled, and wider barriers such as the consenting regime need to be addressed.
3	Enabling effective R&D	In a fragmented emergent sector, there is insufficient scale in any one player to drive effective, collaborative R&D. At the same time, “knotty problems” such as the need to decarbonise materials and processes, or to prototype new technologies across a fragmented supply chain, mean collaborative R&D is essential to drive progress.	Government and industry in partnership can enable effective R&D as shown by the UK’s Transforming Construction Challenge. The UK example shows how the government can provide the leadership needed to give the private sector the confidence to invest.
4	Addressing skills and capability gaps	OSM requires new and different skills relative to traditional construction, as we outline on page 17. A 2023 study found that the OSM industry needed to attract between 4,800 and 8,800 people by 2026, up to a 220% increase in workforce demand.	Government and industry need to work together to address the sectoral workforce challenge. The UK experience shows that despite investment elsewhere in the OSM ecosystem, there has been little change in skills training, demonstrating the importance of a clear and co-ordinated plan.

# Unlocking efficiency

OSM products are one part of the solution, but the technologies need to be enabled by process improvement. Digital tools and lean methodologies will unlock efficiency across the construction sector.

In order to maximise the benefit of new OSM technologies, the construction sector needs investment in digital and manufacturing capability. The learning from the UK, where a Transforming Construction Challenge (TCC) was created in response to the need to radically improve productivity and reduce workforce reliance in the industry, is that government can provide the leadership needed to give the private sector the confidence to make that investment.

The TCC made £250m of public investment available for digital and lean R&D projects, with a view to securing match funding from industry. An independent economic analysis commissioned before the end of the Challenge found that this target was likely to be hit, and that £29.3bn of construction projects had been influenced in some way by the R&D projects delivered under the challenge.

More broadly, our view is that lean is a great way to think of the culture that needs to be instilled in New Zealand's construction industry. A lean system should be the focus, rather than seeking clever 'cutting edge' solutions. Lean in construction starts with leadership to mobilise all the factors and stakeholders needed to create a lean value chain.





**COLAB**  
DfMA Toolkit

The COLAB project created a toolkit to enable design for manufacture and assembly. The collaboration, including two UK architect practices, a housing association, and a technology specialist, developed a toolkit and processes with the aim of speeding the end-to-end development process by up to 30%.



**LAING O'ROURKE**

Laing O'Rourke (LOR) led an R&D project to test augmented reality and digital process technology in partnership with Trimble, at the Hinkley Point nuclear reactor construction project. Through this and related testing, LOR showed the ability to reduce rework and process waste, achieving 25% materials savings, and 20% carbon reductions.



**MMC Market**

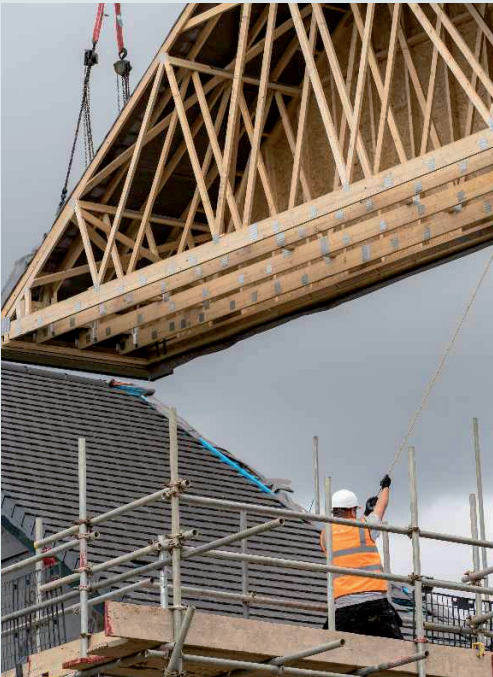
MMC market is a comprehensive supply chain listing and capability appraisal, mapped against the UK MMC definition framework. Developed in partnership between Cast and construction technology specialist KOPE, and supported by MMC certification bodies NHBC and BOPAS, it enables developers to confidently access an MMC supply chain, driving confidence into the sector.



# Case study – The value of R&D

According to StatsNZ, in-house expenditure on R&D in the construction sector in New Zealand fell from \$51m in 2012 to \$18m in 2022. Examples from the UK, such as the AIMCH collaborative R&D project, showcase the benefit of R&D in demonstrating the benefit of OSM and supporting technical product development.

Driving productivity and  
decarbonisation through  
collaborative R&D



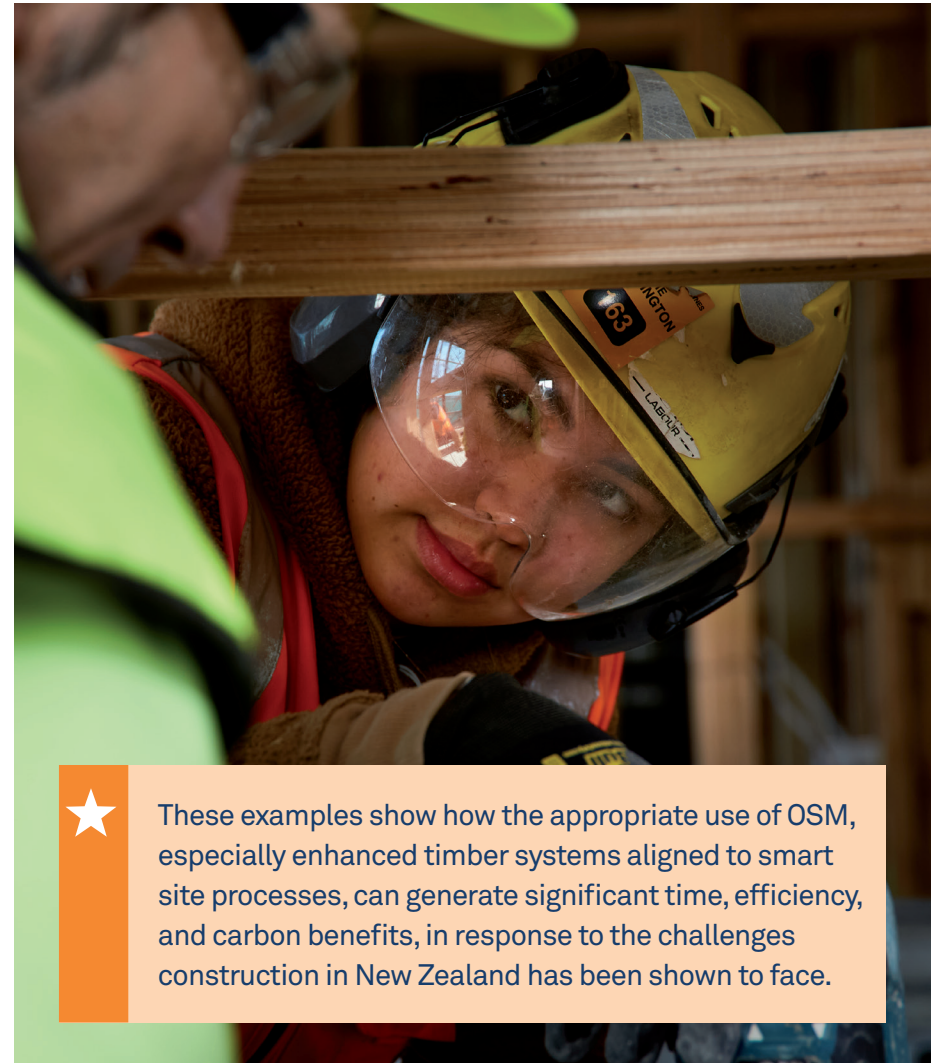
The Advanced Industrialised Methods for the Construction of Homes (AIMCH) project, funded by Innovate UK, is a good example of cross-sector R&D, enabled by government, through a programme set up to test how homes are built through industrialisation.

The project was carried out in partnership between major housebuilder Barratt Developments, timber MMC manufacturer Stewart Milne (now Donaldson Timber Systems) and affordable housing provider L&Q.

Systematic testing of a number of potential innovation was carried, supported by extensive evidence gathering and sharing.

Key findings relevant to New Zealand include:

- Homes designed and built with efficient timber structures created five tonnes of CO<sub>2</sub>e per home than homes built using masonry construction
- Proving the speed of construction benefits of OSM including showing that modular roof installation could be 50% faster than in-situ, and that off-site ground floor systems could be 60% more efficient than traditional systems



These examples show how the appropriate use of OSM, especially enhanced timber systems aligned to smart site processes, can generate significant time, efficiency, and carbon benefits, in response to the challenges construction in New Zealand has been shown to face.

# Clarifying OSM value and benefits

Ultimately the key driver of demand for OSM will be proof points that demonstrate the benefits case and that align to commercial imperatives. In the UK, well-designed metrics and data capture methods are starting to demonstrate the benefits of OSM. A similar approach in New Zealand can help clarify the value of OSM and act as a catalyst for developer and investor engagement.

OSM is only a means to the end of achieving better project outcomes, and it is these outcomes that will be the key driver of demand and scale in the industry.

In the UK, efforts have been made to collect metrics on MMC projects, led by Homes England. Cast has built on this approach by measuring performance on all projects we support, and we also capture data from a wide range of sources to prove the MMC benefits case.

The Homes England project has yet to deliver significant insight, largely as a result of delays in the delivery of the small sample of sites it chose to measure. However, we show on the right examples of the benefits that Cast and others have been able to evidence outside of the Homes England programme, and the sectors of the market in which those benefits will drive real commercial value.



The Accord should consider implementing a New Zealand specific set of outcome metrics and, learning from the UK experience, measure these as widely as possible, to prove the OSM benefits case.

## KEY BENEFITS OF OSM



Speed of construction



Cost and programme certainty



Productivity of site workers



Whole-life and up-front embodied carbon

## EXAMPLE PROOF POINTS FROM THE UK

Data on completed projects show on-site development period reduced by 33% using both 3D and 2D forms of OSM.

Cast data show a positive relationship between the use of OSM and projects achieving planned programme and budget.

The highest levels of OSM have been shown to deliver up to five times the output per worker compared to traditional methods.

UK industry data show that enhanced timber systems achieve 5 tonnes per home reduction in embodied carbon and 27% less waste.

## POTENTIAL COMMERCIAL APPLICATION IN NEW ZEALAND

In investor backed asset classes, such as purpose build rented or student accommodation, quicker delivery reduces financing cost and enables funds to be reinvested more rapidly.

Certainty of delivery builds confidence and can act as an enabler to large scale delivery platforms, drawing in institutional-grade investment to deliver at scale.

Businesses seeking to grow their output over the medium to long-term need to find more efficient methods of delivery. Greater productivity in manufacture and delivery will allow a higher output per worker and enable companies to grow despite a shrinking and ageing workforce.

Suppliers can evolve the typical New Zealand timber frame product, by increasing the extent of off-site manufacture, in order to reduce the embodied carbon of their products. Higher performing products could be used to target investor/developers seeking to achieve enhanced sustainability standards.

# Culture and collaboration

Products, processes and technical improvements in construction cannot exist in a vacuum. The UK sector suffers many structural challenges which our engagement with the Accord team tells us also apply in New Zealand. These include:

- Falling real productivity, which means it now needs a larger workforce input to deliver the same construction output than it did in the past. Page 3 shows this is also the case in New Zealand
- High levels of fragmentation, with the multiple layers of sub-contracting typical, means that it is very difficult to drive innovation across the industry
- Adversarial behaviours and pricing practices, with pricing and risk pressure passed down the supply chain, which encourages opaque cost management and non-aligned objectives

These behaviours do not encourage optimised design or aligned procurement processes generally and act as barriers to OSM specifically.

New forms of construction technology and process cannot transform the industry alone. For maximum benefit to be obtained from OSM, a collaborative, value-driven and OSM-aligned approach to contract, procurement, risk, and partnership is required. In the UK government and industry have collaborated to create a blueprint for best practice, and the Accord can do the same for New Zealand.

The benefits of OSM are best unlocked through early supply chain engagement, design for manufacture principles, and a mature approach to understanding value as opposed to cost.

Process and lowest cost driven procurement practices are discounted. These practices act as a barrier to scale for OSM.

In the past year in the UK two wide-ranging playbooks have been developed, bringing government and industry together to develop a blueprint for best practice, and to create a foundation for increasing trust and productivity across the sector.

We note that the Accord has already collated several best practice guidance notes covering, for instance, alliance contracting and risk allocation on projects.



We recommend that the Accord builds on these by acting as a convenor of government and industry, and creating a New Zealand specific blueprint, or playbook, for how the industry should operate in the future.



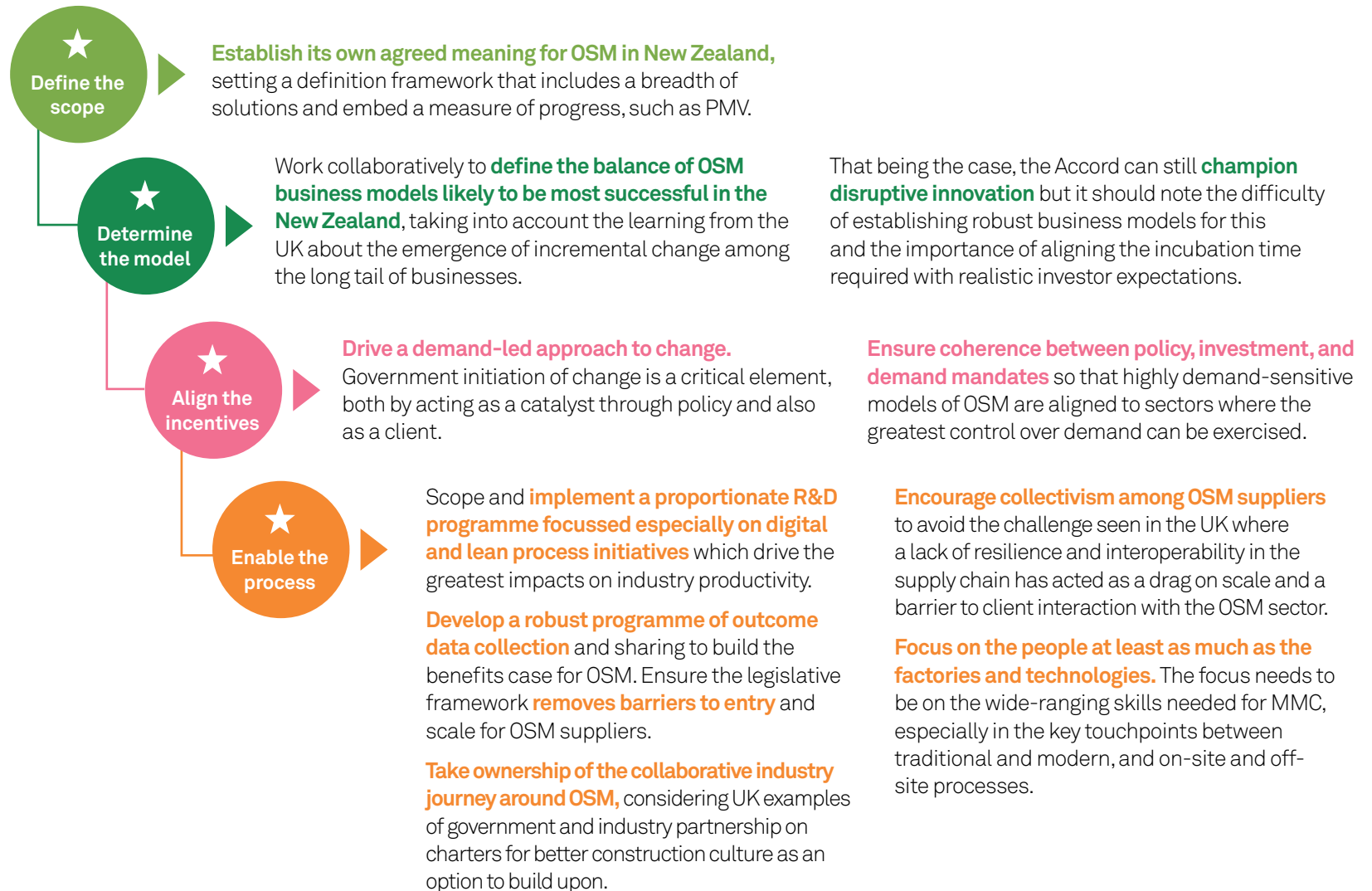


# Achieving long-term change

Effective, long-term change in New Zealand will be achieved mainly through incremental, progressive steps that work with the fabric and culture of the industry, although disruptive new entrants will still have an important role. Industry collaboration is key to establishing the wider enablers of change including a proportionate R&D programme, data-led benefit verification, and a focus on the shift in skills required.

## FOUR-STAGE ROADMAP FOR CHANGE

Based on our analysis and experience, we recommend that the Accord and partners should:



## Contact us

Cast is a specialist construction consultancy providing solutions for developers, investors, policymakers and the supply chain. We are focused on helping deliver great homes and places viably whilst also addressing bigger economic, societal and environmental challenges.



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