Funded by
Innovate UK

Enabling Housing Innovation for Inclusive Growth

Innovation Enabling Model: Modern Methods of Construction

Contents

CONTEXT

INNOVATE UK

In April 2020, a consortium of partners was awarded an Innovate UK grant for their project Enabling Housing Innovation for Inclusive Growth. This project was led by YTKO and included Bristol City Council, Bristol Housing Festival, BRE, Arcadis, Unit 9, and nine leading modular housing companies.

This is an 18-month programme working with multiple partners towards the delivery of a major Research, Development, and Innovation project in the use of Modern Methods of Construction (MMC).

Nationally, Bristol City Council is increasingly being seen as a leader in the use of MMC housing solutions, an exemplar for the wider UK. However, it must be recognised that there are challenges and risks of 'going first'.

Bristol has a range of social and community-led housing developments planned for 2020-21 using a spectrum of innovative MMC solutions. The council views these housing developments as a unique opportunity for this step-changing 'demonstrator' project, to quantify the benefits of MMC and deliver product, process and supply chain improvement. *See box 1 in the diagram below.*

The resource provided by Innovate UK is enabling Bristol City Council to address barriers to the delivery of new homes in a coordinated manner. In doing this the Council is looking to create a nationally replicable delivery model that encourages the use of MMC solutions, balancing the supply of new homes with growing demand.

The project outcomes include a 'council change model' (since renamed to the Innovation Enabling Model) supported by a decision-support 'toolbox', with the ambition in the longer term for these to enable Local Authorities or Public Sector Bodies across the UK to address development challenges by using MMC. *See box 2 in the diagram below.*

The overall aim of the project was to unlock the scale of the MMC marketplace by driving research and development to improve the cost, performance, and speed of MMC building across the nine demonstrator sites and to create an exemplary model for other Local Authorities or Public Sector Bodies to invest in MMC across the UK. Another major opportunity was for this project to consider housing holistically, to not just build units, but to consider the implications in the way homes and communities are built and the knock-on effects of these decisions.

The aim of the Innovation Enabling Model (IEM) was for Bristol to learn how to effectively and efficiently use MMC, while ensuring policy lined up with delivery. The intended process was to. use the 9 sites as test cases (demonstrators) through which the council and partners could evaluate and learn from the practical use of MMC in 'real-world' scenarios.
See box 3 in the diagram below.

DEMONSTRATOR SITES

- 9 MMC projects to test and deploy R&D
- Full spectrum of MMC - volumetric / panellised/ local SMEs
- Over 400 homes across 9 sites of which over 50% affordable
- Improved manufacturing processes
- KPIs inform outputs

MMC procurement framework

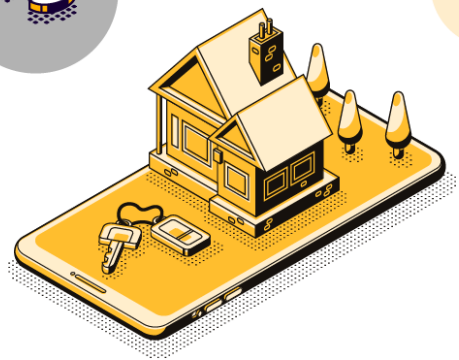
OPTIONEERING TOOL

Matching spec against KPI's from 9 exemplers to build MMC business case. This outcome led to the digital toolkit Constructing Modern Methods. CMM works within a procurement wrapper - provided by SWPA's DPS

Supply Chain

Other - local SME co-op, MMC factory / hub

Place Intelligence → Planning Process → Viable sites identified



INNOVATION ENABLING MODEL

- Internal best practice
- Knowledge repository
- Map to show decision pathway
- Revisiting of policy, decision making processes and governance to better support MMC

BRISTOL HOUSING FESTIVAL

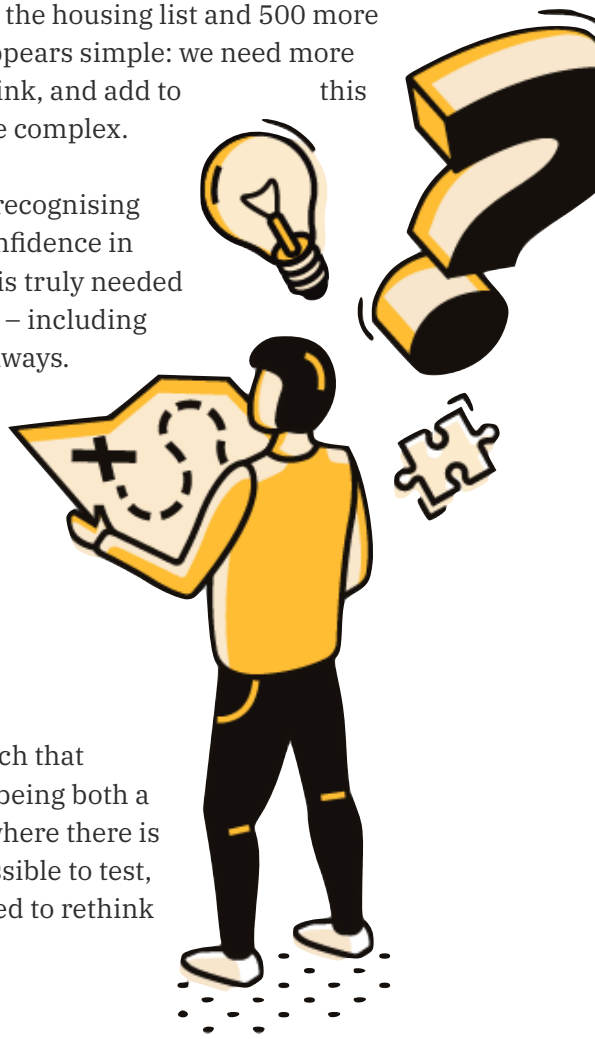
The Bristol Housing Festival was established in 2018 in partnership with Bristol City Council who, along with WECA (West of England Combined Authority), provided the initial seed funding for the project and established an MOU to determine oversight and governance.

The Festival launched with a public exhibition in Bristol's Waterfront Square to showcase modern methods of construction (MMC) and attracted more than 6,000 visitors. It is the ambition of the Bristol Housing Festival to use the mechanism of MMC to bring together the industry, local government, residents and other partners and stakeholders to rethink the system and deliver homes that are good for residents, good for the planet and that deliver real societal value.

This is done in three primary ways: by hosting exhibitions, events and roundtables to stimulate relevant conversations. By partnering with Bristol City Council and others to pilot and test innovation with the goal of finding scalable solutions, and by evaluating progress and publishing lessons learnt reports to inform best practice at the cutting edge of housing innovation.

THE 'PROBLEM'

Bristol, like many cities, is currently facing three major challenges: a housing crisis, the climate crisis, and a construction skills shortage. With 12,000 people on the housing list and 500 more in emergency accommodation in our city, the problem at first appears simple: we need more housing. However, when we consider how these problems interlink, and add to this that housing is at the core of social inequalities, it becomes more complex.



In principle, the housing technology is already available, whilst recognising that supply chains coupled with institutional experience and confidence in that 'new technology' needs to be developed. Where innovation is truly needed is in the model used to deliver housing by multiple stakeholders – including different local authority departments and decision-making pathways. The challenge is both in the collaboration and courage required to unlock innovation and the financial models and mindsets that determine value. In the current development appraisal orthodoxy, the return on capital is too simplistic and not equipped to consider the wisdom of real value as opposed to cost.

THE OPPORTUNITY

In these challenges, there is an opportunity for a holistic approach that considers and delivers value into all these areas, but it requires being both a "think" and a "do" tank. By creating an environment in Bristol where there is space to do research and development in the real world, it is possible to test, evaluate and find scalable solutions and data can also be collected to rethink how social value can be measured.

THE DEMONSTRATORS

ZED PODS

Demonstrator site:
Complete

Bristol Housing Festival project page
www.zedpods.com

The net zero-carbon development of 11 number residential dwellings, working with the Bristol City Council, Bristol Housing Festival and YMCA, is an example of innovative sustainable development above an existing public car park (including improvements to the car park layout and other associated works) with retention of the site's use as a public car park.

Chalks Road development in Bristol is an exemplar of low carbon high performance dwellings to design and build a 100% affordable housing scheme using off-site volumetric construction methodology.

The Chalks Road development is unique in that the 9 x 1 bed units are being built out of cross laminated timber but the 2 x 2 beds are being built out of our hot rolled steel portal frames with light gauge steel and timber infill panels.

There are significant learnings being made on this demonstrator project to compare and contrast the benefits of CLT and steel frame in terms of:

- Speed of construction in the factory
- Cost (predicted versus actual)
- Understanding time and motion studies
- Production line management and flow through the factory
- Environmental performance of as built dwellings
- Impacts on the overall programme from initiation to completion on site
- Streamlining site processes and offsite activities for improved co-ordination
- Implications for snagging and quality control
- Monitoring of zero defects policy at factory gate

TEMPO HOUSING

Demonstrator site:
Pre-planning phase

Bristol Housing Festival project page
www.tempohousing.org.uk

The Innovate UK project has assisted Tempohousing Modular UK in developing their housing system for the UK market from the level of proof-of-concept to pilot scale. The funding has allowed them to look at every aspect of the development of their products. They have shared their data to help develop KPIs to measure the advantages of MMC against traditional construction.

Tempo have worked with partners to develop the process mapping of the supply chain and manufacturing side, along with the stages at which MMC must be considered as part of the RIBA design stages (naming it as stage 2). They developed process maps for the contractor and the factory for quality control linked to their BIM model.

The pandemic could have derailed this project, but they took a leaf out of the aviation rulebook and turned to modelling to understand how their designs would work for energy use, thermal comfort and overheating, dynamic modelling, thermal bridging, and acoustics.

The results were very encouraging, justifying the design decisions and material choices. These results along with a durability study will contribute towards a 3rd party certification linked to a warranty enabling their homes to be insurable and mortgageable.

Tempo have worked closely with Bristol City Council to create a pilot project demonstrating their modular solution, which delivers a zero-carbon housing scheme, while addressing fuel poverty and homelessness.

The Innovate UK funding has helped Tempo accelerate their MMC solution to the market. They have covered fuel poverty as a key driver to accelerate their product to market, one of the aims of this funding opportunity. As an SME, the testing, demonstration of compliance, and certification is costly and time consuming in a normal situation, so any acceleration is key. By engaging the right experts, Tempohousing have developed the modular unit from concept stage to pilot scale, and in the process developed our design to a zero-carbon exemplar, achieving the UKRI aims.

MODULOUS

Demonstrator site:
Pre-planning phase

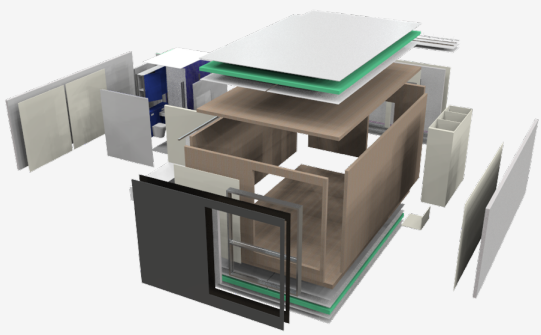
Bristol Housing Festival project page
www.modulous.com

The Modulous mission is to enable the rapid delivery of high-performance, affordable homes by bringing together the digitisation of processes and the ‘productisation’ of construction materials. Key to this has been the development of an adaptive ‘Kit of Parts’, procured from the existing supply chain and designed for rapid offsite volumetric assembly by reskilled local labour forces. This work has been supported by Innovate UK through the Bristol MMC Project.

The Kit of Parts is a comprehensive system of accredited sub-assemblies including wall panels, columns, floor and ceiling cassettes and MEP units. These are designed by Modulous and manufactured by market-leading suppliers to meet the highest standards of environmental performance. As such, they are Part L 2025 compliant and Net Zero Carbon ready.

To maximise efficiency, the Kit of Parts are corralled by the Modulous logistics partner and delivered ‘flat pack’ to local assemblers just in time, just in sequence. Here they are assembled into modules before being transported the short distance to site where they are deployed in multi-storey, multi-tenant residential schemes.

The Innovate UK project scope covered the design of the Kit of Parts; engagement with the supply chain for the procurement of the components of the Kit; assembly of module 1; lessons learnt and design refinement; procurement and assembly of module 2; testing of vertical connections; fit out of modules 1 and 2; transportation; vertical and horizontal assembly; finishing including glazing and façade; testing including thermal performance and air permeability; lessons learnt and design finalisation for manufacture.



PROJECT ETOPIA

Demonstrator site:
Pre-planning phase

Bristol Housing Festival project page
www.projectetopia.com

MMC 1.5

Project Etopia has developed an enhanced large panel format build system that utilises our current build method. MMC 1.5, a hybrid between MMC 1 and MMC 2 uses the panels used in our current MMC 2 method but with preinstalled first fix MEP.

Within the project:

- BIM modelling – Providing precise representation of the house design, allowing for clash detection, and providing scheduling of all house components for internal and external manufacture/supply
- Failure Mode and Effect Analysis (FMEA) for design and Processes – Developed in conjunction with BRE and CIH to ensure that the format and methodology is appropriate for the industry
- Design For Manufacture (DFMA) – By adopting BIM modelling and implementing precision alignment and QC checking we have introduced the principals of DFMA practices to our facilities
- Large panel format pressing – The panels are required to be pressed for large panel format so we built a prototype panel press to produce our first examples
- Large panel format lifting – Optioneering and first method testing
- Factory application of MEP and Battening – By working with industry partners we have developed a method for applying first fix of MEP and battening
- E-Smart – Permed product development on an Environmental Monitoring Unit that maximus the benefits of our built homes.
- Impact assessment – Using data, industry partners and conducting our own analysis we have evaluated the differentials between current methods and the potential of MMC 1

TOTALLY MODULAR

Demonstrator site:
In production
www.totallymodular.co.uk

The Innovate UK project has assisted Totally Modular in developing their improved “Eco” performance house types. Improving the wall fabric to increase the fabric first approach achieving an improved U-value and fabric only EPC rating. The funding has allowed them to look at the efficiency of their product and improve this against several standards, as well as designing in monitoring. The data obtained through this process has been shared with the consortium to help develop KPIs to measure traditional construction against offsite MMC offerings.

Totally Modular main drivers for the project were:

- Developing a more eco-efficient product, that improves the fabric of the building against various standards including the Future Homes standard.
- Working with monitoring providers and integrating the monitoring of the house performance via sensors. This integration has included the production of BIM models including the improved building fabric as well as the sensor technology.
- Working with a performance testing provider to allow them to test the building ‘As built’ rather than via a desktop test. This has helped to show an increase in performance and improvement to prevent cold bridging.

Totally Modulars demonstrator site in Coventry is in progress and will be the first site to be manufactured using the upgraded fabric, monitoring and ‘as built’ performance testing.

SNUG

Demonstrator site:
Complete
Bristol Housing Festival project page
www.snughomes.co.uk

SNUG Homes' objective for the Innovate UK programme was to investigate how modern methods of construction can work at a local level, within a pop-up community-based facility. This approach to housing construction enabled them to create enhanced social value through local community involvement, while benefiting from the efficiencies of building off-site.

The Innovate UK programme supported SNUG to evaluate and evolve their core design and method of construction, which is based on volumetric timber frame modules. They have tested the performance and cost-effectiveness of their structural elements, methods of assembly, lifting of modules, module connection and airtightness detailing, and energy efficiency. SNUG were able to monitor the environmental performance of the construction process, products and materials, and projected life cycle performance of their homes, and compare speed, cost effectiveness and logistics of production using a range of alternative natural building materials, helping them refine the list of potential materials choices available to customers. Through assessing both the sustainable and ethical performance of products and materials used within their homes, SNUG have created a Products and Construction Charter to guide future procurement choices.

Within the research programme SNUG were also able to trial and refine the allocation and management of construction tasks, highlighting which roles are suitable for community participants (trainees and/or future residents), local subcontractors and their core team.

SNUG's off-site production space has used 100% renewable energy throughout the programme, which has committed to creating a carbon-positive construction facility and housing product.

Their simple yet flexible design, their commitment to sustainability and their community involvement programme have led to SNUG Homes winning the 2020 William Sutton Prize for Placemaking and Affordable Housing, and have recently been shortlisted by the Timber Construction Awards for Low Energy Project of the Year.

To find out more about SNUG homes, including a 360-degree virtual tour inside the first completed home in Hillfields, Bristol, please visit their website.

KNOWLE WEST MEDIA CENTRE

Demonstrator site:
Planning granted
https://kwmc.org.uk/projects/wecanmake/

We Can Make: localised “Modern Methods of Construction” for community wealth building

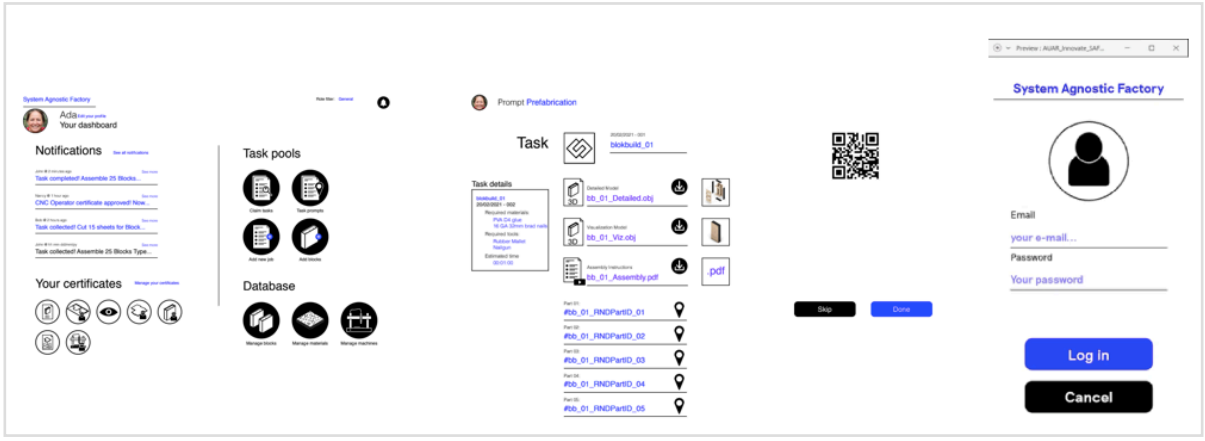
Construction is currently the second least digitised industry in the world - just above hunting! As new “Modern Methods of Construction” (MMC) enter the UK housing sector, there is real potential for MMC to deliver good quality homes *and* support neighbourhood regeneration by ensuring these new digital design and construction tools are in the hands of communities.

We Can Make collaborated with four different MMC companies:

- Automated Archetecture
- BlokBuild
- MassBespoke
- U-Build

Over 18 months – through Lockdown- we shared, experimented and developed together ways to localise the knowhow and infrastructure needed for digital fabrication, using our community maker space in Knowle West (KWMC The Factory) as the test space to try things out.

The result? By bringing together people and new technologies together, we have created a “system-agnostic” fabrication process that can support the production of a range of different MMC housing systems locally. This includes:



(1) A **digital platform** that helps manage the fabrication process from “designs-in” to “goods-out” shipped to construction site, ensuring quality control and efficiency.

(2) A growing **crew of local people** skilled in the design, fabrication, and making of different MMC systems, with their human knowhow and creativity frequently feeding back into improving the design and production process of the MMC systems themselves.

(3) Mapping **the most promising opportunities and benefits of localising MMC**, including:
- Creating local jobs, skills and infrastructure which enables communities to capture more of the value of development that happens in their area.
- Developing “system-agnostic” cladding that can use be **customised to use local materials and reflect the character and feel of local places.**
- Helping build in the **capacity and knowhow for communities to maintain, repair, and adapt** the MMC homes and buildings over time.

The first two full-scale homes using the system-agnostic process and learning are currently in production and will be on site in Knowle West in September 2021.

BOKLOK UK

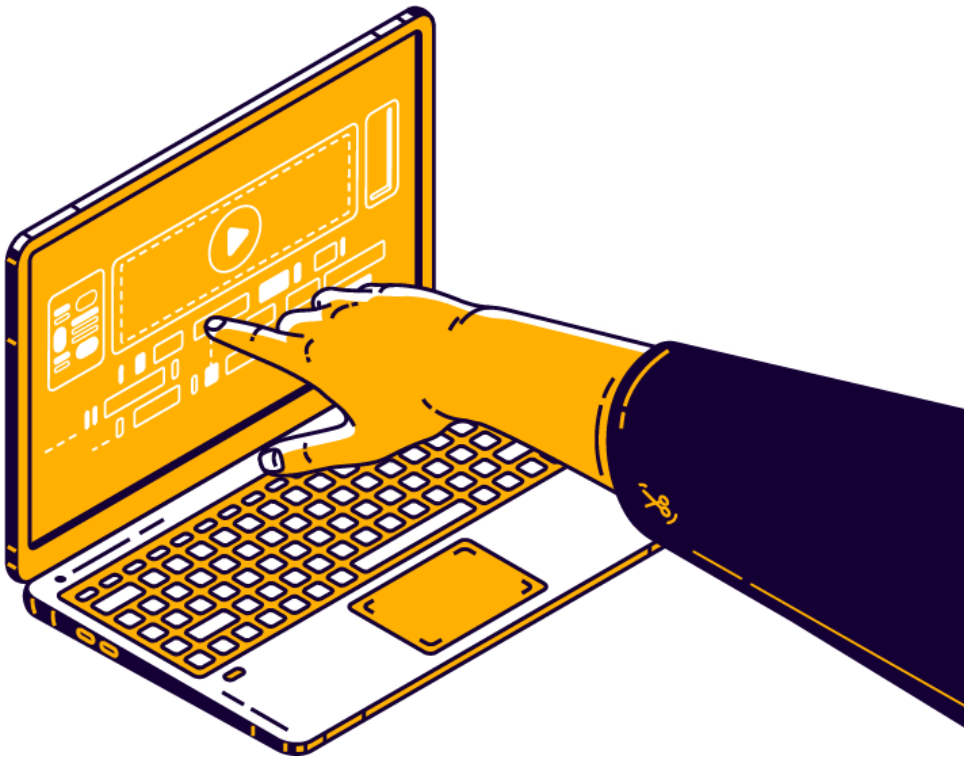
Demonstrator site:
Under construction
Bristol Housing Festival project page
https://www.boklokonthebrook.co.uk

The funding from Innovate UK has enabled us to address needed product improvement.

The product needing improvement is the interface between substructure, incoming services, floor structure and superstructure. Traditionally, this area is complicated and difficult to co-ordinate. Requirements are often poorly communicated, activities misaligned, and this results in extensive rework on site. In modular construction, the coordination of this area is therefore critical if the programme and quality benefits are to be realised.

As a result of the funding, we have been able to review interfaces, stakeholder requirements and sequencing for this area. We have developed details and guidance for best practice which in turn gives a model solution for the interface between project specific civil engineering details, and the modular off-site manufactured residential product.

We have also developed two reports which further advance our work.



LEGAL AND GENERAL MODULAR HOMES

Demonstrator site:
Under construction

Bristol Housing Festival project page
Legal & General Modular Homes

As part of the Innovate UK project, Legal and General Modular Homes (LGMH) undertook a programme of works to replace boilers in our current 2- and 3-bed homes with Air Source Heat Pumps (ASHP). The ASHP provides heating and hot water.

The driver for this programme reflects the priority that Legal and General places on reducing its Climate Change impacts. At present we have two core climate change commitments:

- To achieve net zero carbon homes by 2030. Achieving this will involve a number of product iterations in the next ten years; and,
- All our products must, as a minimum, achieve an EPC rating of A. Only 1.4% of new build houses in the UK currently achieve this level of performance.

The first step in our journey to Net Zero Carbon has been substitute gas boilers with ASHP's.

The future direction of travel for homes is to move away from using natural gas – and the government has set this as an objective as part of its proposed 2025 Future Homes standard. Removing gas from a property challenges conventional wisdom – as boilers have been a key feature of the home for decades. However, the progressive decarbonisation of the electricity grid has put the UK in a position where electricity has similar carbon emissions to gas. Future trends show that the carbon intensity of electricity will further reduce and will outperform gas as more low or zero carbon electricity sources come on stream.

Our development site at Bonnington Walk in Bristol will be the first site to receive these upgraded homes.

BENEFITS OF MODERN METHODS OF CONSTRUCTION IN HOUSING BY BRE

BRE comprises an innovative group of researchers, scientists, engineers, and technicians who share a common goal – to make the built environment better for all. In the project, we wanted to collect key KPIs to provide real data to prove that MMC housing can be delivered 50% faster and 33% cheaper. We also wanted to assess the benefits of MMC housing for Local Authorities, in particular to provide social housing. This report provides solid evidence for the commercial viability of MMC housing solutions for Local Authorities, but more importantly for the wider impact for council services and citizens in financial terms but also in terms of quality of life. We will produce a free MMC Housing KPI report with data illustrating the benefits relative to traditional housing, which will be published by Constructing Excellence in November 2021.

PLACE INTELLIGENCE BY ARCADIS

Enabling improved MMC housing delivery planning through use of digital.

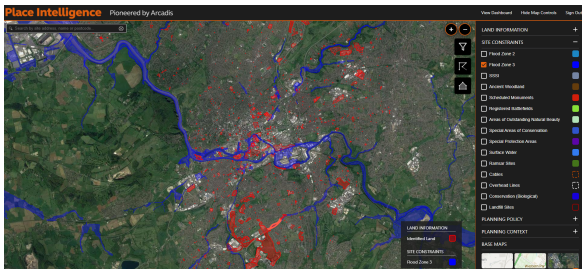
Arcadis has pioneered the Place Intelligence digital planning tool to speed up the delivery of housing by placing data and automation in the hands of the user.

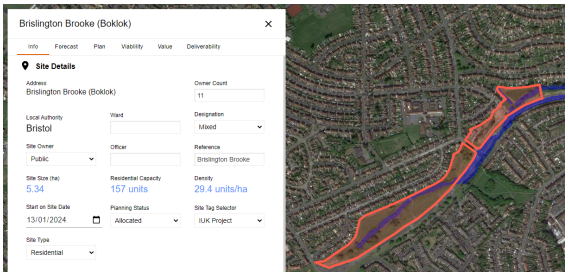
Through the Innovate UK project the tool has seen significant development which will enable those with responsibility for delivering homes across a borough, district, region or nationally to better plan for developments using Modern Methods of Construction.

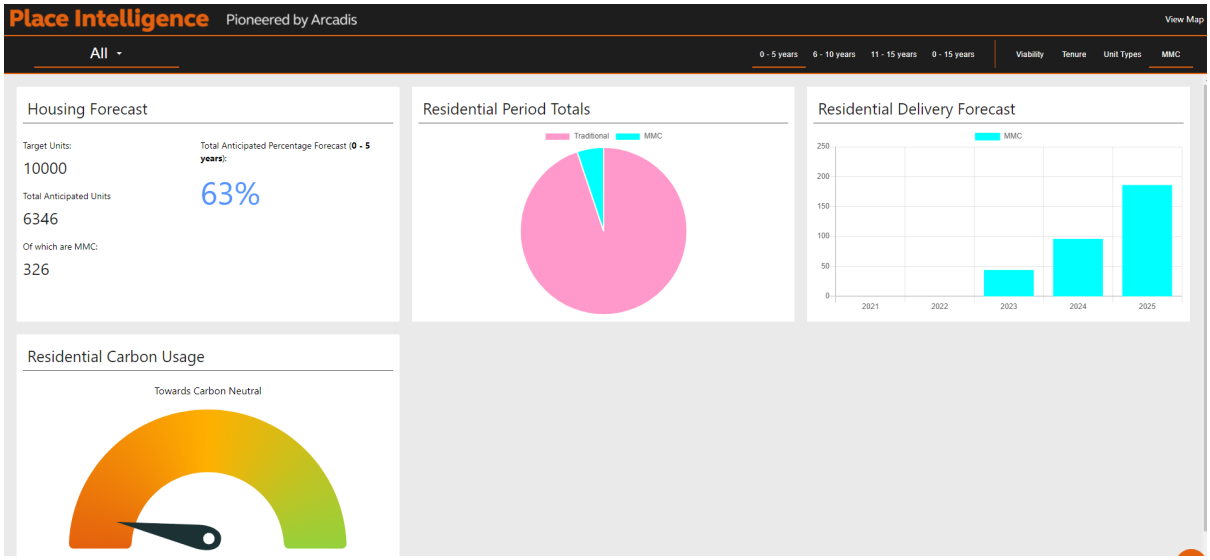
The platform automatically calculates the capacity and viability of development opportunities across a region, assessing thousands of sites instantaneously. This then produces a regional (borough, district, region) housing delivery plan forecasting annual housing outputs over a 15-year period and allowing manufacturers and developers to identify an investible pipeline of MMC projects.

Through this project Arcadis has created an MMC dashboard which demonstrates the outputs from sites identified for MMC development. The tool will also calculate the broader socio-economic and environmental benefits of MMC against traditional build. This provides Local Authorities with data required for business case development and investment justification.

Place Intelligence provides the data and digital capability to assess large numbers of development sites quickly. It enables decision-making and collaboration and provides a live platform which enables investment into MMC at a district or regional level.







OPTIONEERING TOOL: CONSTRUCTING MODERN METHODS (CMM) BY YTKO

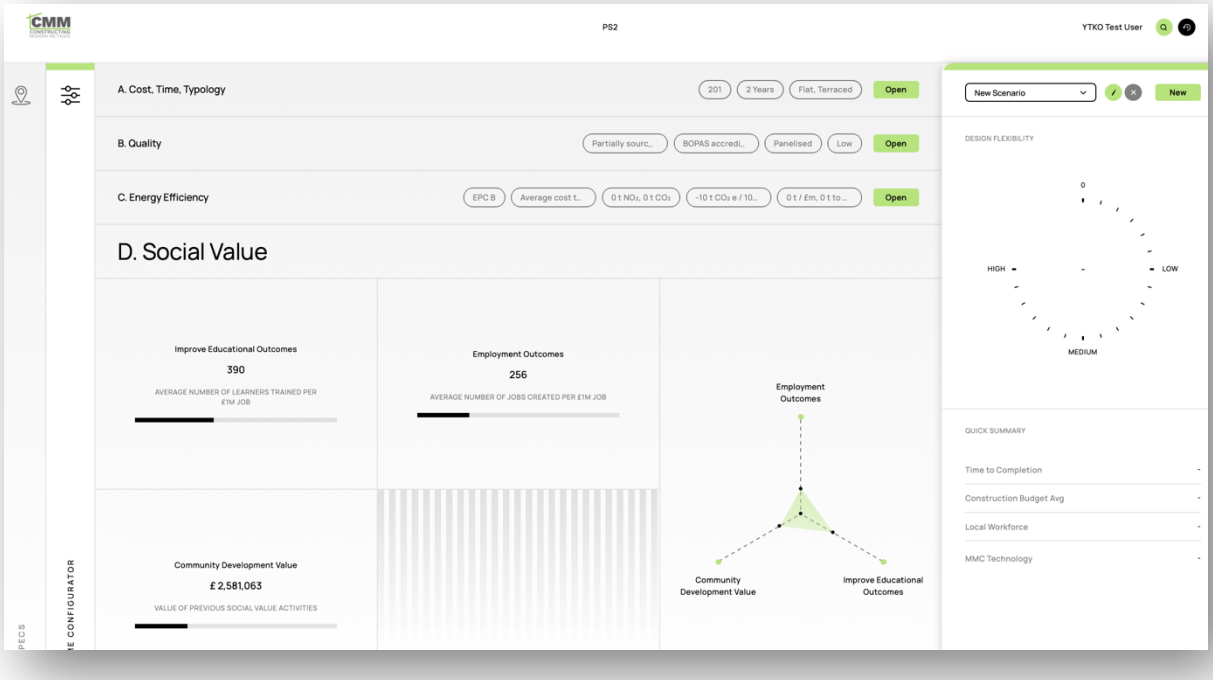
WHAT IS CMM?

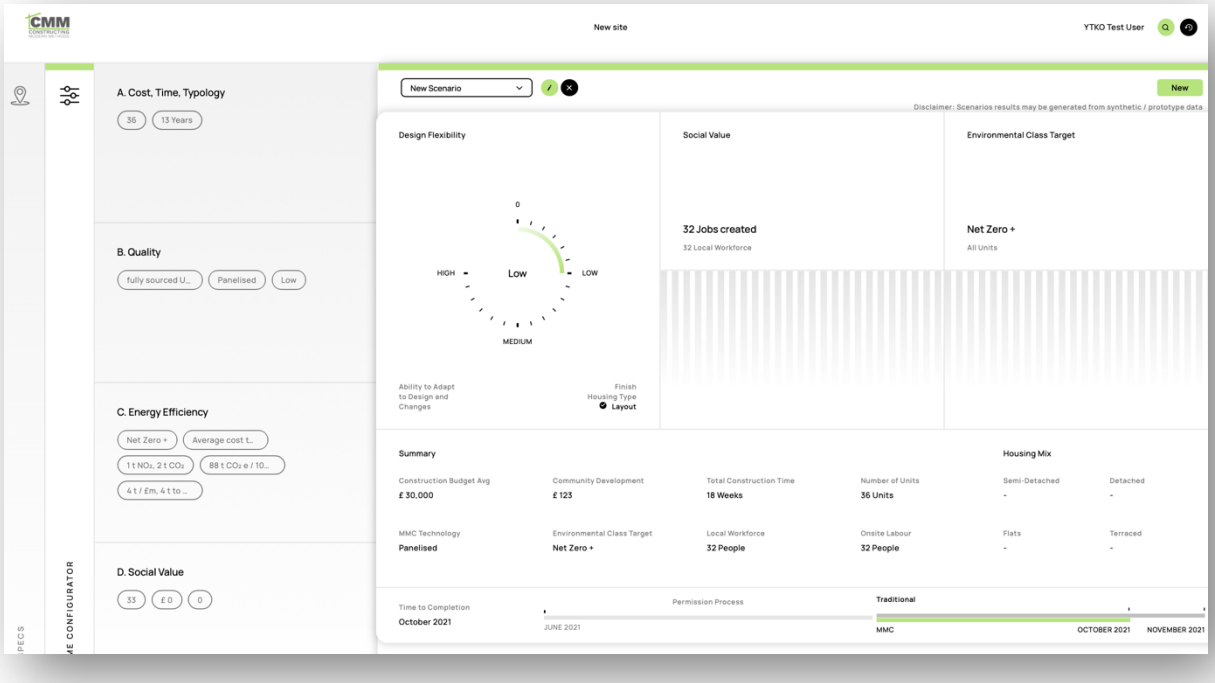
The Optioneering Tool was a key output of the Innovate UK project. Meeting a long-held need for clear and accessible market data to demystify MMC housing systems and expedite strategic decision-making processes within a Local Authority or housing association.

Led by YTKO in partnership with Unit 9, the tool was informed by several workshops with Bristol City Council stakeholders. Tackling silos and creating a cohesive vision with vital input from key departments such as legal, procurement, housing delivery and sustainability.

These workshops helped to shape the data that the team would collect, validate and then build into the user interface. Metrics around energy performance, build timescales, social value, cost, and scale were central to help create a simple “one-stop-shop” for the strategic decision-making process.

The central pillar of the project’s legacy, several partners came together to create a brand which could help commercialise the Optioneering Tool – Constructing Modern Methods (CMM). The brand has been heavily promoted over the final eight months of the project and a partnership has secured investment from the South West Procurement Alliance to help create an end-to-end offering.





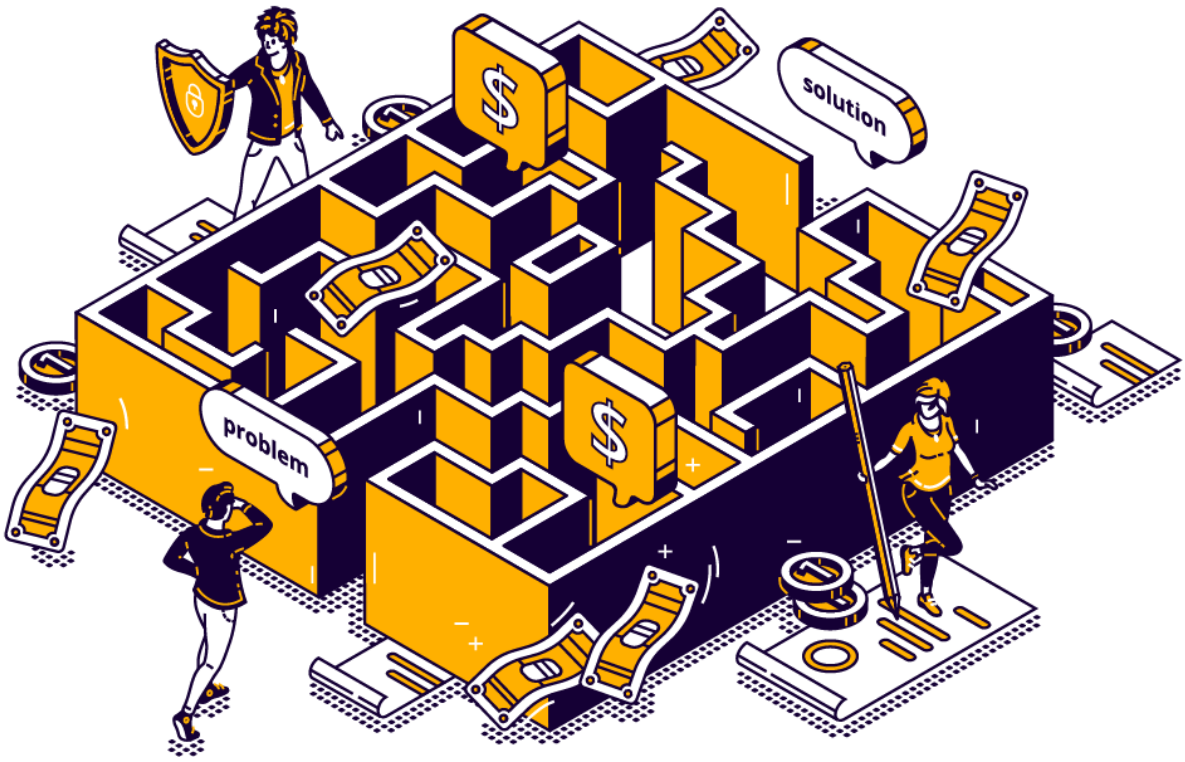
Officers in Local Authorities or Housing Associations can use the CMM tool to assess and compare different MMC providers in the market and can now procure their chosen provider using the SWPA £1.1bn dynamic purchasing system. Potentially a process which could take years has been reduced to clicks of a button and a series of weeks.

Visit the CMM website.

DYNAMIC PURCHASING SYSTEM (DPS) BY SWPA

Working with the South West Procurement Alliance (SWPA) a DPS wrapper for CMM has been launched that offers a compliant route to market for public sector commissioners. The DPS can take the output from CMM to enable the commissioner to have a shortlist of prospective suppliers from whom to procure the required product, services and/or works.

See the opportunity on ProContract



THE INNOVATION ENABLING MODEL (IEM) BY BRISTOL CITY COUNCIL

THE PROJECT

The overarching aim of the Innovation Enabling Model (IEM) was to create and build institutional experience and confidence in the use of MMC, with a view to then sharing best practice with other Local Authorities or Public Sector Bodies. By consolidating the nine demonstrator sites under one research project, the focus shifted from a pilot scheme (where the usual rules can be justifiably stretched to achieve a positive outcome) to a system and governance review. This enabled exploration of the ways in which existing governance, sequencing of decision making, cultural experience, and value process inadvertently or deliberately create barriers to the adoption of MMC.

The IEM research and development programme in BCC was approached in four phases:

- Phase 1: Understanding where 'we' (BCC) are now, Point a)
- Phase 2: Understanding where we want to be, Point b)
- Phase 3: Identify a strategy for getting from a) to b)
- Phase 4: Implementation, monitoring and evaluation

A Design Thinking framework was used to structure the development of the IEM programme, based on the work of Jeanne Liedtka, author of *Design Thinking for the Greater Good: Innovation in the Social Sector, a study of design-led innovation projects in government and social sectors*.

WHAT IS? —> WHAT IF? —> WHAT WOWS? —> WHAT WORKS?

PHASE 1: WHERE WE ARE NOW (WHAT IS?)

Initially a survey was carried out among officers working across housing delivery and enabling, to highlight case-study projects of particular interest. The survey led to 13 one-to-one semi-structured interviews, in which individuals were asked to talk through their experience of being involved in one of the projects they had identified. If they had identified an innovative/MMC project this was typically chosen as the project used as the subject of the interview.

The results of these interviews were used to loosely 'map' the current processes and compare them to the intended process as well as comparing to the RIBA workstages, the previous research conducted by the Bristol Housing Festival in partnership with Arcadis and funded by the LGA, and a summary of these findings were shared with the Bristol City Council heads of service.

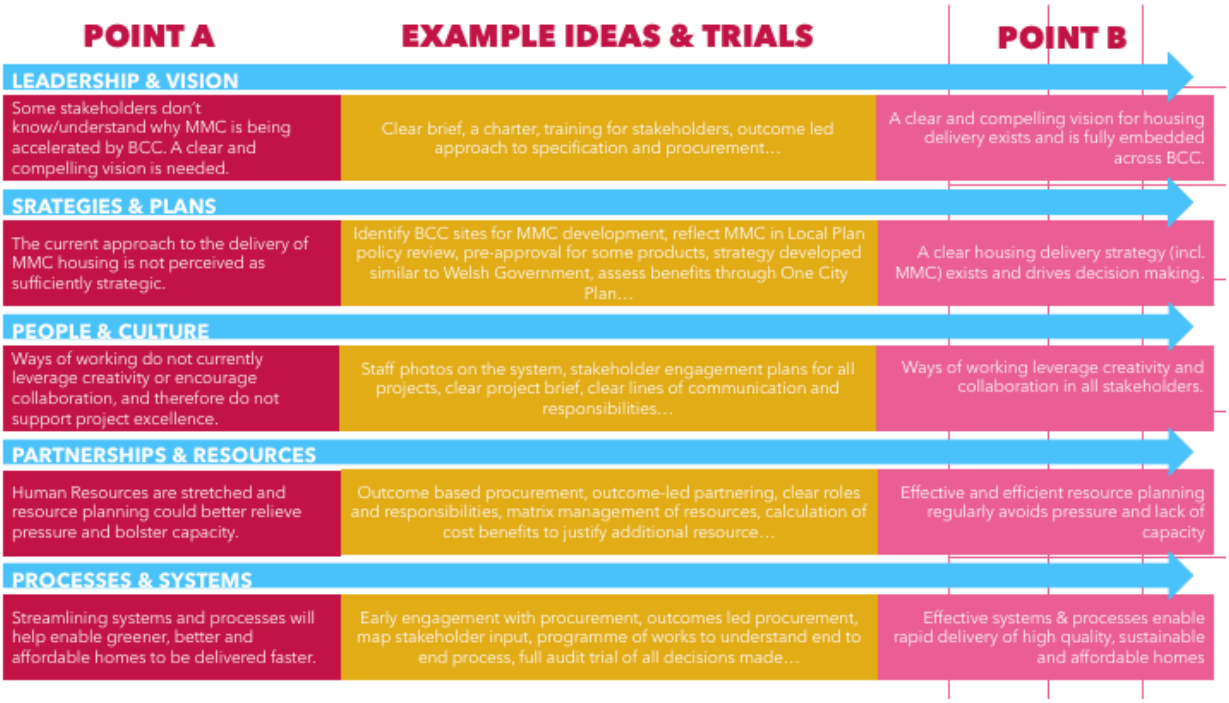
PHASE 2: WHERE DO WE WANT TO BE (WHAT IF?)

The findings from phase 1 were presented back to officers and heads of service for comment in order to validate the results and begin the conversation about what c*ould be*.

Following identification of key themes, the findings were presented in five categories aligning with the European Foundation for Quality Management (**EQFM**) Excellence Framework, a framework developed to support excellence in organisational management.

1. Leadership & Vision
2. Strategies & Plans
3. People & Culture
4. Partnerships & Resourcing (Capacity)
5. Processes & Systems

For each category we developed a 'problem statement' to try and encapsulate the essence of each challenge and mapped the direction of travel.

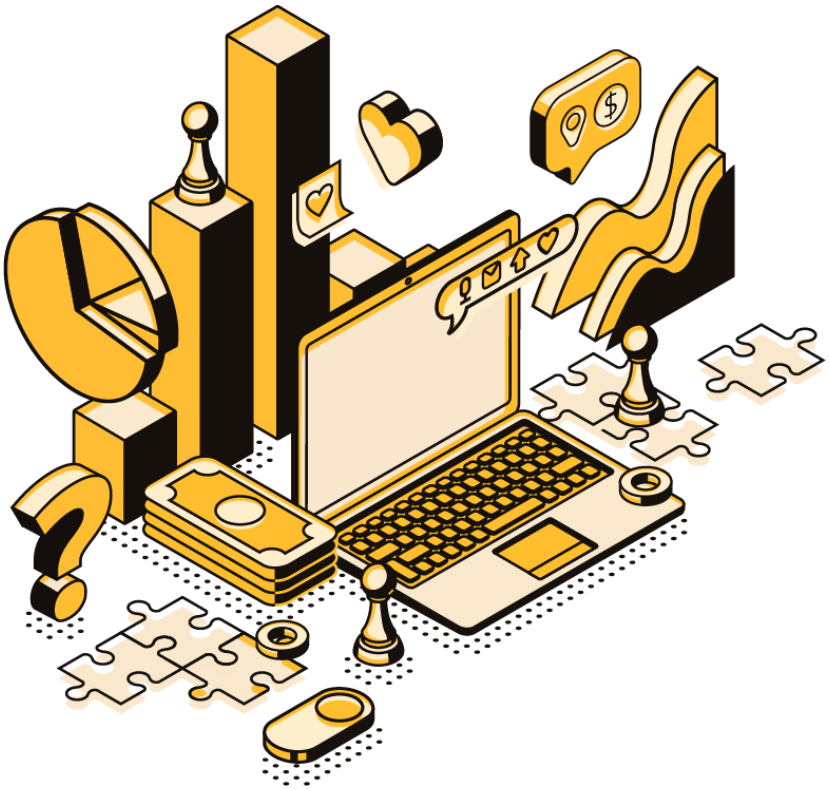


PHASE 3: IDENTIFY THE STRATEGY TO MOVE FROM A) TO B) (WHAT WOWS?)

It was important to continue to build consensus around need to move from a) to b) and identify the best strategy for moving in this direction. Using the surveys, interviews and feedback a long list of recommendations was collated.

PHASE 4: IMPLEMENTATION, MONITORING AND EVALUATION (WHAT WORKS?)

Assessing 'what works' and what should be implemented across the council long term will be an ongoing piece of work beyond the life of the Innovate UK funded project *Enabling Housing Innovation for Inclusive Growth.*



THE OUTCOMES AND OUTPUTS

The Innovation Enabling Model was always intended to be about a culture change and enhanced institutional confidence within the council to engage with innovation, specifically MMC. This is manifesting itself in the delivery of the nine demonstrator sites (ongoing), and observable within the ongoing work of the council outside the Innovate UK project. One of the key outcomes of the IEM programme was the focus on capturing and sharing project-based lessons learnt, both for the benefit of the wider organisation and for other Local Authorities.

The outputs of the IEM help to demonstrate this progress and, while some of specific to Bristol City Council, some of the outputs can be shared to enable other Local Authorities and Housing Associations to learn from this demonstrator programme. Click the links below to access those documents that are available.

	Item	Access
01	Recommendations summary	Public
02	RIBA work stages commentary and Miro board	Internal
03	Policy mapping (against BCC activity) Governance/Policy Mapping Miro Board	Internal
04	MMC Procurement review	Internal
05	User Requirements Document template – Draft	Public
06	Lessons learnt – ZED PODS	Public
07	Lessons learnt – BoKlok UK	Expected Oct ‘21
08	Lessons learnt – LGMH	TBC
09	Lessons learnt – Snug Homes	Expected Dec ‘21
10	Post Occupancy Evaluation – ZED PODS	Expected Dec ‘21
11	Considerations of value for money	Internal
12	Overarching MMC strategy	Internal
13	Guidance notes for BCC – legal	Internal
14	Guidance notes for BCC – procurement	Internal
15	Guidance notes for BCC – finance	Internal
16	Overarching final report for IUK	Public

ON-GOING WORK

Demonstrator Schemes

Funding for the builds was not included in the Innovate UK funding, however the project was built on the understanding that learning would be gathered from the development process of the nine partners (for details of each see below).

While some of the projects were completed within the 18-months of this project, some of them will continue to develop beyond the end of this funding.

Innovation Enabling Model (IEM)

The suite of guidance documents, templates, and tools produced as outputs of the IEM will continue to be updated and developed upon during the delivery of the nine demonstrator sites and beyond.

User Requirement Document (URD)

This is one of the key recommendations under the IEM. While a working version has been completed the template will continue to be tested on real projects within the council and then refined as necessary.

Working draft of URD can be accessed here.

SOCIAL VALUE

The Social Value Act whilst still maturing provides a critical framework for Local Authorities to consider best value in a wider context than cost. This is critical to develop an outcome led mindset. Arguably, the purpose of housing is not simply to build more housing but is, in fact, to create homes and communities which improve the mental and physical health of the population and the resilience of the planet.

As the debate around the softer measures of wellbeing (Green Book supplementary guidance on wellbeing) and toolkits to support outcome led procurement (CIH's Value Toolkit) become increasingly high profile, MMC provides a great test bed to develop some of this methodology. MMC as a 'tool' is agnostic – it can support the development and maturation of a new supply chain around high quality, zero carbon, affordable homes delivered at pace. It supports the creation and development of a new manufactured housing supply chain, anchored into a strong value proposition, based around a different capital expenditure model potentially decoupled from planning uplift (a manufactured housing supply chain is predicated on demand led aggregation and the ability to build).

However, those values will require a strategic rethink about cost and best value, and a redesign of the appraisal methodology and approach to the stewardship of land (the highest land receipt will rarely offer best value within the wider measure of value or achieve the best outcomes).

By way of example, consider what the value to a Local Authority is in building new affordable homes at pace for families in emergency accommodation. Much of that significant value (health and wellbeing/long term rental costs as opposed to investing in assets) is not counted in the traditional development appraisal. By way of another example, the increased cost per home to

build to higher sustainably standards today will save £20k - £30k per home in the cost of retrofit in 10 years' time.

As we consider the value of better-quality housing, MMC provides a great opportunity to rethink value. The challenge to decarbonise our heating, create a fabric first approach, and build with sympathy to support and protect our ecology suggests we do not require cheaper homes. Arguably, the blunt measure of 'build cost' is the wrong economy of scale. Considering inflationary pressures on materials, labour, and land coupled with increasing housing standards we risk creating a viability cliff edge that can no longer be bridged with increased levels of grant (which in turn support further inflationary pressure on land values).

Conversely, MMC can be left to develop as the 'market' sees fit – the risk is that its value is shifted to produce policy compliant homes that are quicker and cheaper to build to increase profits. The debate needs to move from cost to value shaped by the context of defined outcomes. MMC is an opportunity to rethink and reset with a supply chain wanting to support and engage in healthy collaboration.

SOCIAL VALUE PORTAL

As part of this project the Social Value Portal were engaged by Bristol City Council to consider the thinking on social value in MMC, which is still in its early stages. The SVP's report recognises that although a general range of arguments are put forward for MMC, there is not always a consensus on the nature of its wider societal benefits and a limited amount of data is available as evidence.

It shows that social value can't bridge the current cost gap between MMC and traditional built options by just focusing on the measurable social value benefits from the construction activity; a whole life perspective is required. As MMC gets closer to cost parity with traditional housebuilding and it becomes a question not of whether MMC will go mainstream, but how and when, consideration should be given to the ways that its development as a sector can be influenced to optimise social value outcomes.

So, it seems to make sense to concentrate on how to ensure that MMC, where used, can be a force for positive social change and to continue to gather data on built out MMC projects well into their occupancy phase to get a better understanding of "whole life" social value in MMC.

Ultimately, perhaps the most significant role for MMC is as a potential trigger point for a rethink of every aspect of housing delivery, from land allocation, through to planning and construction, with a view to addressing endemic and systemic inequalities. Additional social value elements such as jobs, skills and sustainable supply chains may not yet be baked into the MMC model, but the potential also exists to do just that, but just like MMC itself, the social value needs to be planned systemically.

NEXT STEPS

Bristol City Council

The next step for Bristol City Council is to determine its ongoing MMC strategy post the Innovate UK funded project. Moving forward with the learning from this successful demonstrator project and the significant investment in lessons learnt and overcoming innovation barriers, BCC needs to quickly capitalise on this work by developing and implementing an MMC strategy, solidifying its position of leadership and enabling MMC to be part of the mainstay of its housing delivery.

This MMC strategy needs to encompass the learning so far embedding policy into delivery methods for the Housing Delivery team, the HRA's 30-year plan, as well as the climate and biodiversity emergency strategies.

Building on the work undertaken in the last 18 months, the next steps within BCC will ideally include the development of their data capture, learning, monitoring and 360 review of sites. This will build on the Innovation Enabling Model (IEM) which was designed as an iterative process, continuing to develop as the demonstrator schemes complete, and on new schemes as the scale and pace of MMC in housing delivery increase and as the market evolves.

Construction Innovation Hub Value Toolkit

As part of the opportunity to rethink and reframe the challenge on value vs cost, Bristol City Council is now setting up a series of workshops with the Construction Innovation Hub to test and apply the methodology of the Value Toolkit. The Value Toolkit, as referenced in the Construction Playbook and the Transforming Infrastructure Performance Roadmap, is currently being piloted with both public and private sector clients. As part of this project Bristol City Council have been given the opportunity to pilot the Value Toolkit, to establish the outcomes that they wish to deliver for a specific investment and appraise options against these outcomes. In the context of MMC and 'Enabling Housing for Inclusive Growth' it is the intention for one of the IUK sites to be part of those workshops (due to take place by end of October).

Workforce for the future

YTKO, in partnership with the Bristol Housing Festival and MOBIE, have secured a new training project to help support local construction employers to access new housing developments in the city backed by the West of England Combined Authority, via their Workforce for the Future initiative.

The Unlocking MMC for SMEs project will see hundreds of local trades given the skills and funding to explore offsite modular housing technologies or modern methods of construction (MMC). This critical project will help to safeguard local employment by bringing together the leading modular housing companies to agree a set of joint skills and training programmes. Funding will then be made available to these local SMEs to help them undergo the training.

RECOMMENDATIONS FOR OTHER COUNCILS

1. **Be ready to genuinely invest in MMC, be strategic in your engagement with the new technology.**
   MMC is a significant change to the development model and therefore, pilot projects can be very costly in terms of time money and resource making it inefficient to engage with a pilot without a broader strategy and a pipeline.

2. **Strategically support the development of good values in the MMC supply chain.**
   Local Authorities and Housing Associations as housing commissioners and/or significant landowners, have a strategic opportunity to support MMC so that the supply chain matures along a good value chain as the new housing supply comes online.

3. **Strategically support the development of the MMC supply chain to increase supply.**
   MMC is offering an additional housing supply at pace rather than replacing what already exists. By strategically engaging with the MMC supply chain organisations can support upskilling of the workforce through companies whose business model rests on the quick delivery of homes.

4. **Know what you want and be clear in your communication**.
   There needs to be a clear link between Local Authority policy and political ambition, and the delivery. Ensure there is a strategy to implement the ambition on the ground among officers, communicate clearly internally, ensuring there is a strong narrative to explain the use of MMC and the need for change.

5. **Utilise a 'one stop shop' approach.**
   We recommend a multi-disciplinary team approach and ensuring high level buy in. The novelty needs to be flushed out within the organisation as timings, governance, and sequencing is different. It is important to ensure cross departmental communication and the sharing of expertise between teams involved.

6. **Recognise that not all value is created equal and know the constraints of your tools**
   (i.e. ProVal). Cost and value are different things, and it is important to consider the whole-life value proposition, how this can be defined and quantified within a value for money assessment. This will need to be beyond traditionally recognised financial indicators to account for additional economic, social, and environmental benefits and savings. It will also need to more carefully consider the value exchange between increased upfront capex and revenue (whether by way of savings or by income over the life of the housing).

7. **Be willing to learn and open to change.**

   It is essential to acknowledge that there will be uncertainty and iteration when working with new technologies and supply chains. Honest articulation about MMC in its current lack of maturity is important and engaging with MMC will require a different risk management culture. In our opinion it is important to find the time to invest staff learning, even though people are stretched as embedding institutional learning is vital.

8. **Engage with the supply chain as early as possible to understand and influence the design and system application**.

   It is important to recognise that there is a resequencing of decision making when using MMC. Early engagement with suppliers is essential to ensure requirements are met and to drive value. Recognise that MMC is a tool and there are a diverse range of MMC products and systems available but there are tools out there (such as CMM and Place Intelligence) to help navigate the market.

9. **Collaborate from the beginning.**

   Collaboration around MMC has the potential to change the culture of the construction industry. Replication, repeat business and scale are vital in leveraging the production efficiencies and economies of scale associated with the manufacture of new homes. This manufacturing approach puts the onus on establishing long-term partnerships and maintaining healthy and effective working relationships. This will include elements such as adopting the appropriate contract as soon as possible to facilitate collaboration and risk sharing. Alliance contracting has emerged as one of the most effective tools in maximising the impact and value of MMC demonstrator schemes.

10. **Embrace the change.**

    Nationally we are in an urgent situation. We have a housing shortage, a context of social inequality and brokenness, ongoing destruction of our planet, ecology, and climate emergencies. We are in URGENT need to change the ‘norm’ and defending the status quo is no longer excusable.

RESOURCES

- Re-imagining social house building in Wales: A modern methods of construction strategy for social housing, 2020
- Lessons Learnt Series: 2 Hope Rise – Innovation in Practice
- Constructing Modern Methods
- Meeting the Housing Needs of the City of Bristol: Procuring for Triple Bottom Line Value
- RIBA Plan of work
- Green Book supplementary guidance: wellbeing
- CIH Value Toolkit
- DfMA Overlay to the RIBA Plan of Work: Mainstreaming Design For Manufacture And Assembly In Construction
- The Construction Playbook
- Transforming Infrastructure Performance: Roadmap to 2030