The Modular Market in Numbers

1 Million
- The UK government is encouraging new innovative entrants to the housing market to help deliver its housing objective of one million homes by the end of 2020.

142,890
- In 2015, just 142,890 homes were built, way below the 250,000-a-year target.

15,000
- At the moment, around 15,000 modular homes are constructed in the UK each year. Within the UK, capacity is constrained because there are only a small number of factories that are able to produce modular housing, although the private sector has a vision for more UK factory capacity to meet demand.

67%
- In a survey of 230 house-builders by the Build Show, a trade event, 67pc said that off-site construction will play a key role in new-home supply. The reason: speed. The build time for these homes is cut by six months or more.

100,000 by 2020
- Many in the house-building industry agree that the UK’s housing shortfall is only going to be addressed by radical innovation in building practices, opening the way for modular housing.
- UK housing minister Gavin Barwell indicated that this method of construction has potential to tackle long-term skills shortages and alleviate the housing shortage in the UK.
- In Oct 2016 he said that the government sees a huge opportunity in manufacturing houses off site and is looking to increase access to finance for modular housing providers to help secure the delivery of more than 100,000 ready-made homes by 2020.
The Market - Benefits and Barriers

Benefits
- A cocktail of scarcity in funding for housing, increasingly complex planning and environmental requirements, an anticipated shortage of manual labourers, a likely increase in the cost of building materials (expected to be experienced following Brexit) and an ever widening gap between supply and demand for housing is about to herald in the era of "modular" homes.
- Off-site construction may be key to allowing a construction industry facing skills shortages to grow. Off-site specialists have a permanent and highly-skilled workforce, and a robust, long-established supply chain reducing the reliance on subcontracted labour.
- Construction in a controlled factory environment also has the advantage of being more predictable and safer.
- Modular construction does have the ability to reduce timescales and may introduce economies of scale but it does not have to result in little boxes that all look the same. Architects can use modular construction to overcome the constraints of tight space requirements of inner cities whilst creating quality, inspirational design.
- It is said that the manufacturing of the homes in warehouse conditions, unaffected by the delays caused by weather and a varied labouring workforce, can save as much as six months.
- In addition to being quicker to build, factory built modular homes can result in significantly less disruption to local residents - with evidence already showing 60% fewer trucks coming to sites and 90% less waste.
- The beauty of the units being produced by the new wave

Barriers
- The biggest stumbling blocks that are holding back the delivery of new inner-city housing are the availability of sites at realistic prices, lack of funding to enable developers to build, and the large deposits required by first time buyers.
- Modular construction requires a huge up-front investment in developing a factory. L&G are investing £55m in their Leeds facility while Laing O'Rourke are spending £104m on a Worksop factory.
- Offsite construction requires a highly detailed design at an early stage. The downside is that this reduces the ability to influence the design as it progresses and if you want flexibility in the design or space planning where the programme permits, it may still be cheaper to build traditionally.
- One of the criticisms is that modular construction may be carried off site in distant locations which isn't particularly sustainable, nor does it utilise local labour.
- Cost and scale are one of the constraints of modular construction, repetitive design enables economies of scale but buyers don't all want to live in uniform buildings.
- Some argue that offsite construction is inflexible, expensive and results in ugly, identikit buildings. There is some truth in this - designing for a manufacturing process inevitably means some constraints on flexibility, in many instances, offsite systems cost more than traditional methods and there
The Farmer Review and Modular

- In his October 2016 report, *Modernise or Die*, consultant Mark Farmer says a combination of the failure to replace retiring workers and low productivity means construction faces "inexorable decline" unless it embraces modern methods of construction (MMC).

- A means of addressing the skills shortage and encouraging greater efficiency and higher productivity in the construction sector, says Farmer, is to embrace and adopt pre-manufacturing.

- Farmer's review indicates that over the next 10 years there will be an estimated 25% decline in the labour force. Combine this with the fact that a large part of the construction workforce are from other European countries and the problems of housing shortages and skills shortages will only be exacerbated.

- "Modular will develop most where there's cheap land, where the local authority is pragmatic and open to innovation, and where there's a desire for quick delivery," said Farmer.

- Farmer contends that it is in the build-to-rent and affordable rented sectors that offsite manufacturing is likely to have the biggest impact. "The rental sector, where investors are looking for products at scale and quickly, is an obvious opportunity to enable investment in offsite," he says.

- Farmer believes the government ought to have a role to play in encouraging clients to change their behaviours and buy manufacturing-led construction rather than traditional.

- He said: "That could be about creating the right conditions, the right incentives and the right sort of overall environment that makes clients start to change their mind about modular and think that it's a good thing and the right way forward - that it's the future of the industry."

- Government measures could include fiscal incentives in the form of tax reliefs on the start-up costs of factories or ring-fencing an element of the existing R&D tax credit scheme for modular construction, Farmer says.

- There could also be incentives through the planning system, with public bodies putting conditions on the development of public land to require modular construction.

- Farmer adds that the government could go even further and play a direct role by commissioning modular housing through the HCA, the mayor of London or other city region authorities.

- "I think there is an opportunity there for the government to say: 'You know what, we're going to directly commission factory-built housing.' That's the big elephant in the room," he says.

Further Reading
- The Farmer Review of the UK Construction Labour Model can be downloaded [HERE](#)
Government Initiatives to encourage modular building

- Both the Central Government (via the DCLG) and the Greater London Authority (GLA) have been visiting various modular sites to see what is involved.
- GLA officials have been to see Berkeley's first finished modular house, at Kidbrooke in south London, as have those from DCLG, who have also visited L&G's facility in Leeds. Meanwhile staff from Downing Street and the Homes and Communities Agency have visited Urban Splash's modular house scheme in Manchester's New Islington.
- The GLA has been rumoured to be weighing up directly commissioning modular housing - by buying a stake in a modular housing operation and using its factory to produce affordable housing in partnership with local authorities or housing associations. Deputy mayor for housing James Murray recently said modular construction was "one part of the answer" to the housing crisis.

Home Building Fund
- The government will directly commission housing projects that use off-site construction through a £3bn Home Building Fund in an attempt to promote innovation in the industry, the housing minister Gavin Barwell has revealed.
- The Home Building Fund, announced in the 2016 Autumn Statement, will focus on using loans to support small and medium-sized developers, as well as backing modular construction schemes, Barwell has said.
- There are a "wide range" of ways the government could use the fund to promote the construction method, including direct commissioning or adding conditions to housebuilding projects to say that homes must be built offsite.
- "Offsite construction is not just diversifying the industry but promoting innovation within the industry. The reason I'm interested in it fundamentally is that it's a way of building homes quicker," Barwell said.
- Read more here: https://www.gov.uk/homebuildingfund

Accelerated Construction Scheme
- At the Tory Party conference in October 2016, Communities secretary Sajid Javid announced extra money for housebuilding in the form of a £2bn Accelerated Construction Scheme, which will aim to speed up development on publicly owned brownfield land.
- This will involve making public land with outline planning permission available to developers, and paying for any remediation work associated with the site. It is hoped the Scheme will deliver up to 15,000 homes in this parliament on surplus public sector land.
- The focus of the fund will be getting sites developed quickly, and to support this goal the government will encourage applicants to use time-saving technologies, such as modular construction, to build out schemes.
- Although the fund is open to large housebuilders, small builders and modular construction firms are being encouraged to apply, and the small print says that applicants "will need to demonstrate that without this funding the scheme would not progress as quickly, or at all".
- Read more here: http://www.insidehousing.co.uk/government-unveils-3bn-home-building-fund/7017039.article

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- Read more here: http://www.insidehousing.co.uk/government-unveils-3bn-home-building-fund/7017039.article
The Government’s long-awaited Housing White Paper was published on 7th February 2017. It includes the following comments:

- Some firms are increasing their use of these (offsite construction) methods, but we need to go further. We will promote more modular and factory built homes.
- To underpin the growth of this sector we must ensure that homes built offsite can access finance on the same basis as traditionally built homes. The Buildoffsite Property Assurance Scheme, which provides assurance to lenders on methods of construction, has existed for some time but there is limited take-up among lenders, partly because of a lack of data to support them in making decisions.

The Government states it will:

- stimulate the growth of this sector through our Accelerated Construction programme and the Home Builders’ Fund. This will create new opportunities for the use of modern methods of construction to encourage investors into the sector and give current suppliers confidence to expand into the housing market. It will also support the delivery of high quality, energy efficient homes through these programmes;
- support a joint working group with lenders, valuers and the industry to ensure that mortgages are readily available across a range of tested methods of construction. This will include encouraging industry and lenders to develop a stronger set of core data to measure the use and performance of different technologies to encourage good decision-making;
- consider how the operation of the planning system is working for modern methods of construction (MMC) developments;
- work with local areas who are supportive of this type of manufacturing to deliver growth, provide jobs, and build local housing more quickly; and
- alongside the Home Building Fund, consider the opportunities for offsite firms to access innovation and growth funding and support for them to grow.
The Big Players

Laing O’Rourke

- In 2015, Laing O’Rourke announced plans to invest £104m in an offsite manufacturing facility in Worksop, Derbyshire and received a £22m grant from the Government to accelerate the use of pre-assembly systems in house building.

- When fully operational, the unit will be capable of delivering 10,000 new homes a year, with Laing O’Rourke believing it will be able to deliver quality homes a third cheaper in half the time, with a 50% saving in emissions.

- The Laing O’Rourke unit is part of a ‘best in class’ housing consortium with the following players: Airedale, Apex Cables, Armstrong, Arup, Beckhoff Automation, British Gypsum/Saint Gobain, BRE, Comau, Crane, Crown House Technologies, Expanded, Explore Manufacturing, Fulcro, Grundfos, Hamworthy Heating, Hoare Lea, Select, SIG, Thorn Lighting, University of Cambridge, University of Sheffield Advanced Manufacturing Research Centre, WSP.

- However, trying to make the unit profitable has so far proved difficult. Laing O’Rourke reported a £53.1m net loss in European operations last year, largely because of challenges with off-site building.

- The firm had hoped to produce the first prototypes in June 2016 and use them on their development in Crowthorne, Berkshire. However, recent reports indicated that this was at least six months behind schedule due to equipment delays at the plant.

Legal & General

- In early 2016, L&G announced its plan for a £55m, 550,000 sq ft offsite factory in Leeds.

- Legal & General is taking end-to-end control of development, design, delivery and in some cases operation, which places it in the same position as the car industry. L&G’s housing delivery boss Ian Eggers said its plan to build 3,000 modular homes a year was "just scratching the surface" and it could build further housing factories on top of its Leeds facility.

- Eggers said recently that the firm has installed 10 production lines and up to £60 million of manufacturing equipment in the factory, with the first prototypes set to roll off the production line by early 2017.

- Eggers has been sounding out housing associations and housebuilders as potential delivery partners for its modular homes arm L&G Homes.

- Meanwhile, Nick Frankland, chief executive of L&G Modular Homes, has said that L&G is so confident of this sector’s potential that it has plans to invest a further £500 million in similar factories around the UK.

- L&G aims to offer a wide variety of housing types, from 20-storey apartment blocks to rows of terraced, semi-detached and detached houses.

- These homes will be made using environmentally friendly cross laminated timber, which are energy efficient and can even be built to the rigorous Passivhaus energy-efficiency standard which means residents of a two-bedroom flat could expect to pay as little as £25 a year on gas central heating.
What the big players are saying...

**Offsite fabrication**

- 44% less cost
- 65% less time
- 73% fewer defects

Source: Thomas Faulkner, Skanska presentation, PM Modular event, May 2016

**The new market for housing, starter homes, students, care homes etc.**

- Student accommodation
- Private Rented Sector
- Affordable Homes
- Hotels
- Extra Care
- Retirement Homes

Source: L&G presentation, PM Modular event, May 2016
More Players

Berkeley

- In June 2016, Berkeley Group committed 20 per cent of its output to factory-built homes and plans a bigger amount in future via its own modular housing factory.
- The first “Urban Houses” for the company's 5,000-home scheme in Kidbrooke, south-east London, are already rolling off a Midlands production line, creating town houses with roof gardens.
- But to deliver a property of quality and durability and also one that has all the design features today's buyers want involves painstaking preparation, explained divisional managing director of Berkeley Homes Karl Whiteman. “The detailed design has to be correct at the outset. It's built in a factory to exacting standards and when it leaves the factory, that's it, whereas with traditional building we can make changes or tweak things as part of the process,” he says.
- The structural frame, walls and parts are made and assembled in a factory and then transported as “pods”, or modular units. They can have a brick skin or another type of cladding plus cosmetic architectural details added on-site. But the whole process is quicker and cheaper, being less prone to weather delays and skill shortages, which in theory makes the homes more affordable.
- Berkeley says the £800,000 Urban Houses at Kidbrooke are about £400,000 cheaper than similar-size houses up the road in leafy Blackheath.
- Green Park Village in Reading is the next location for Berkeley's terraced Urban Houses, which range up to 1,450sq ft internally and have an expansive roof terrace instead of a garden.
- The design took 10 years to evolve, and the house looks “normal”, with a handsome mellow brick façade and an open-plan, ground-floor kitchen and living area. One design Capital & Centric

- Fast-emerging North West developer Capital & Centric has a new modular building arm called Nowhaus - designed by Shedkm, the same architectural firm involved with Urban Splash’s hoUSE.
- C&C has filed an application to convert a Grade II mill complex near Manchester’s Piccadilly station into a £50m cluster of 201 one- to three-bed units called Crusader Works.
- Capital & Centric is also using modular building at Kampus, a £200m central Manchester scheme of 480 apartments mostly for private rent undertaken with joint venture partner Henry Boot.
More Players II

Yo! Homes

- **The Yo! Home concept** was launched in 2012 by Yo! Sushi founder Simon Woodruffe.
- Since then, the Yo! Home unit size has been reduced from 80 sq m to a “more commercially-viable” 41 sq m. This is the model for the New Islington properties in Manchester, expected to be completed in 2017 if they win planning approval.
- The 24 apartments will be stacked on top of each other in a four-across, six-high block. Designed by Glenn Howells Architects and built off-site by SIG Building Systems, the homes are reported to be a blend of ingenuity and “fold-down, slide-out, drop-down” engineering.
- "Moving parts draw on technology taken from yacht and automotive design, and the mechanics of stage production, allowing the transformation of a 40 sq m space into what feels like a much bigger home," said Woodruffe.
- Heavy reliance on technology such as counter-weighting and safety sensors in moving furniture - unfamiliar to the traditional building industry - means Yo! will have a dedicated block management team on call, as well as a warranty for each unit.
- The scale of the firm's ambition can be seen from comments by Jack Spurrier, managing director of Yo! Homes. "Our vision is tower blocks of single-space homes in city centres around the world from Manhattan to Buenos Aires, to Tokyo and Shanghai, changing the way people live in small spaces while addressing

HoUSe @ Urban Splash

- Urban Splash has teamed up with **architect ShedKM** to launch a customisable factory-built hoUSe product, erecting 43 homes at New Islington in Manchester and another 100 at sites in Tyneside and Salford.
- The most innovative features of this modular scheme are that, first, the units are large - 1,000 sq ft to 1,500 sq ft and up to five bedrooms - and, second, for perhaps the first time it gives customers real choice in design, fixtures and fittings. Purchasers are able to design their home off plan, opting for certain design finishes, colours for "spine" walls and even fitted furniture items. And because partition walls are non-structural, the floor plan can be altered to suit occupants' changing needs.
- Clad in man-made fibreboard, the steel-frame houses look distinctly modern rather than pastiche, having simple lines, square bay windows and pitched roofs for extra height. They cost from £260,000.
- Urban Splash has a target to deliver up to a 1,000 a year of the modular "hoUSe" product and says it will factory-build up to 80 per cent of the design.
Crest Nicholson
- Crest Nicholson recently announced it planned to build 2,000 modular homes a year, with a prototype being produced by February 2017. CN CEO Stephen Stone said the move was in part a response to looming skills shortages: "In 10 years' time, most of the current workforce will retire."

Persimmon
- Persimmon uses modular construction at its Space4 facility to make timber frames for homes, but has stopped short of manufacturing entire homes or sections of them off-site.

Swan Housing Association
- Swan is renting space at a production facility and forms part of NU Living. Swan's commercial sales and custom-build arm. The 40-strong group which will eventually form the factory team will assemble around 100 homes a year - though the factory space has the capacity to do three times that many. Swan has invested £3m in set up costs and has guaranteed the factory £30m worth of orders for the 570 new homes for Beechwood.

Pocket Living
- Currently building a 70-apartment development at the China Walk housing estate in Lambeth, south London. Units with finished kitchens and bathrooms were driven from a factory in Bedford, 60 miles away and bolted together in less than 30 days to create five storeys. The group's next project will be a 28-storey, £39m tower entirely of modular units, including 53 affordable flats, to be sold at a discount of at least 20% to local first time buyers.

Your Housing Group/WElink Group
- Dec 2016 – Your Housing Group (YHG) and WElink Group set up a £2.5bn JV that will see the creation of 25,000 modular, low-carbon homes over the next five years. The JV will use construction systems from Barcelona Housing Systems and access China National Building Material Company's (CNBM) industrial strength, financial support and leverage for additional investment. Under the agreement, the JV will build up to six factories at locations across the UK, which could ultimately produce up to 25,000 homes per year. The first scheme, in Liverpool, is expected to receive planning permission in January 2017.

Essential Living
- Dec 2016 – Essential Living secured a £60m loan from RBS and HSBC to fund a 249-home development at Creekside Wharf in Greenwich, south London, that the company claims will be the UK's first modular build-to-rent (BTR) scheme. At 23 storeys, the scheme will be one of the tallest buildings to be developed using off-site construction methods. The development is also unusual in that it is designed exclusively for families. A quarter of the flats will be provided at discount market rent (DMR), from 55% of market rent.

- Elements' 200,000-sq-ft factory relies on workers of all trades to assemble up to 700 homes each year. At Creekside, 632 modules will be stacked one on top of another, plugged into a concrete core, with 20 arriving a week. Each apartment is made up of two or three modules, with the façade covered onsite.
Previous Lack of Investment

- A major stumbling block for modular in the past was the lack of investment in "production-style" housing, which requires significant upfront costs to set up warehouses and machinery, as well as heavy demand for its output in order to make the proposal economically viable.
- In addition to this, it was known that houses for sale could only be sold at a certain speed and there was little reason to construct houses in seven days only to have them sitting there waiting to be sold.

Paul Smee, director general of the Council of Mortgage Lenders, says:

- The diversity of offsite construction techniques presents particular challenges for lenders. They might be encouraged to provide greater support if there were more evidence on how custom-built properties hold their value over time and whether there are any long-term effects on the ability to sell a property.
- If lenders remain cautious for now, it is because innovative methods of construction have a chequered history. This legacy affects the willingness to lend on construction methods that are either unfamiliar or appear to embody the problems of the past. Lenders providing funding for the social rented sector have similar concerns.
- While firms clearly need to lend on properties that are durable and provide security for a long-term loan, they are also looking for other qualities when it comes to custom-built homes. They want the cost of maintaining the property to be broadly comparable with traditional methods of construction.

PRS Sector Opens Door for Modular

- Off-site construction works best with the burgeoning private rental sector, funded by institutional investors. This is because the modules are made on a large scale, designs can be repeated and, crucially, the six-month advantage they have over a traditionally built block, meaning rental income can come in sooner.
- "Once we have designed a product, we can repeat it, becoming more cost effective as we go," says Simon Underwood, chief executive of Elements.
- RBS announced plans to focus on the PRS sector at the start of 2016, earmarking £1bn to provide development finance for UK private rented sector (PRS) schemes.
- On its involvement in the Essential Living project at Creekside Wharf, Chiara Zuccon, head of PRS at RBS said "We believe Creekside Wharf, with its provision of affordable housing and its innovative use of modular construction, will be another standout scheme."

Kickstarted by Government Assistance

- If the build-to-rent sector receives the government funding it so desperately seeks, modular construction is likely to come into its own.
- The government’s £3bn Home Building Fund, launched in 2016, will direct some of its funding to modular housing, while more initiatives in its support are expected in the housing white paper, due in early 2017.
Issues to Consider

The main issues with modular are:

- **Significant insolvency risk** - a substantial proportion of a project’s turnover rests with one sub-contractor. This needs to be addressed by a package of bonds and/or parent company guarantees.

- **Bespoke design can increase risk and cost** - if there is default, there will need to be substantial redesign, leading to abortive cost, additional costs on site and delay.

- **Off-site fabrication and long lead in** - there is the potential for payment prior to goods being brought to site. There may need to be advanced payment bonds and certainly, vesting certificates.

- **Potential that suppliers are not UK based**. If so, there will be issues around shipping risk, marine cargo insurance and apportionment of the risk of delay arising from shipping or marine casualty. Query if force majeure applies to all circumstances and if weather conditions only apply in the vicinity of the site.

- **Bargaining position of the modular supplier**. They are in a strong position and on significant schemes will require a

Buy Modules or Make them Yourself?

The types of issues that need consideration are as follows:

- If a housebuilder is manufacturing its own modular units then the risk of design and construction lies with it, it has no recourse to third parties in the supply chain for those units (beyond what it can secure in the way of product warranties from suppliers of good included in the module).

- If a housebuilder is buying the modules from a third party manufacturer (or is in some way joint venturing with such a party) then:
  - a very large part of the value of development may lie in that one contract (quite a different model from the multiple lower value trade contracts one usually sees);
  - the purchase contract/joint venture agreement must provide suitable protection to the housebuilder if there are any subsequent problems with the module eg skill and care/fitness for purpose, dealing with defects liability, defects rectification and financial security;
  - what are the design and construction interfaces if the manufacturer is not delivering or installing or is installing only in part eg where
Using a Design & Build procurement route

If a developer were to be seeking a design and build procurement route employing a main contractor to take full responsibility for the development (assuming that the D&B main contractor is buying in the modular units), then:

- the main contractor may be nervous and less willing to accept risk when, as is likely, it has not been the party responsible for choosing the module supplier
- will the main contractor accept responsibility for a product that it may have little or no experience in?
- can the main contractor get comfortable on sub-contract terms being 'back to back' with the main contract with which it is to comply? The main building contract may be very different in terms and substance from a manufacturing contract. Issues such as design responsibility and pricing and payment timings will need to be resolved at least.

There are some more general questions that need to be considered and these are likely to arise notwithstanding the construction procurement structures, including:

- Third parties (e.g., purchasers, tenant and funders) in property deals usually seek collateral warranties from the construction supply chain as a protection against the default or insolvency of developers or contractors. Individual house purchasers may have the benefit of appropriate house warranty schemes. What would a purchaser of a housing development or a lender to a housebuilder or developer be able to achieve in the way of warranty protection from the manufacturer of the modules.
- If manufacturers are to be paid in advance of the realisation of value and title to goods being on site then parties need to think about payment and payment security, e.g., insurance, off-site materials agreements, vesting certificates, advance payment bonds and escrow accounts might all be relevant considerations. If the manufacturer is abroad then the issues are more acute.
- Developers need to be clear on design interfaces. Are manufacturers 'designers' or are they just building to specifications created by others. Who is responsible for the specification? Who is responsible for 'on site design, the overall design of a scheme and its infrastructure and can affect issues such as who is responsible for matters such as ground risk.
Further Reading

**Building Societies Association**
- Nov 2016 - a report published by the Building Societies Association (BSA) titled *Laying the Foundations for Modern Methods of Construction* and launched by the housing minister, Gavin Barwell, makes ten recommendations aimed at encouraging modular housing.
- In the report's foreword, Richard Bacon, the chairman of the all-party parliamentary group on self-build, custom and community housebuilding, place-making, writes: "The introduction of off-site construction using the latest technology will make a big difference. This area has seen huge changes in recent years. Bespoke houses, which cost almost nothing to heat and that are made-to-measure for each customer, configured on a laptop and then delivered within weeks, are a reality now, but not yet at scale."

**The Offsite Hub**
- **Reports**
  - The Offsite Hub, which aims to ‘connect the UK offsite industry’, has links to the above reports and a number of others here: [http://www.offsitehub.co.uk/info-centre/industry-reports/housing-reports](http://www.offsitehub.co.uk/info-centre/industry-reports/housing-reports)

**NHBC Foundation**
- A June 2016 National House Building Council report (NF70) found that the proportion of homes built with an element of offsite construction had actually fallen from 24% in 2008 to 16% last year.
- Although these figures do not take into account 2016’s pick-up in activity, they do show how far modular has to go before...
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