

# Offsite construction and standard design: is this the answer to the housing crisis?

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# CCHPR

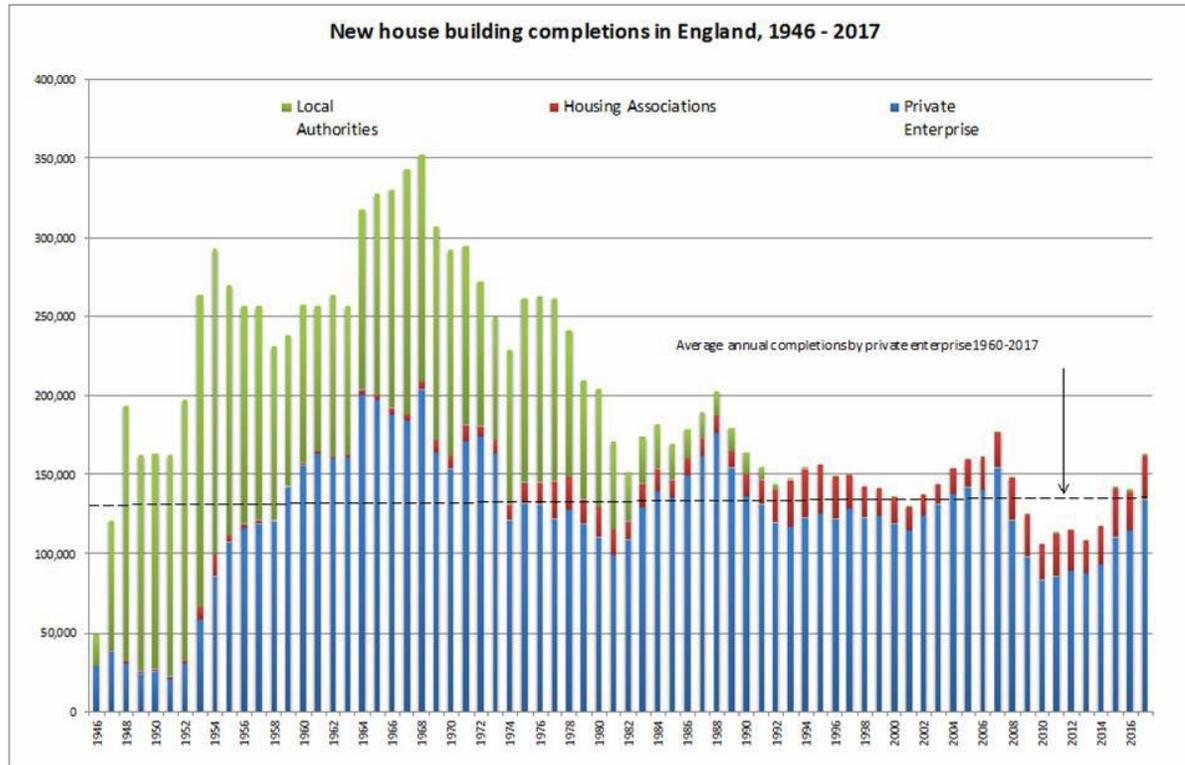
- The Cambridge Centre for Housing and Planning Research  
University of Cambridge Department of Land Economy
- Centre for Digital Built Britain - partnership between the  
Department of Business, Energy & Industrial Strategy and the  
University of Cambridge
- Construction Innovation Hub
- Deliver a smart digital economy for infrastructure and  
construction for the future and transform the UK construction  
industry's approach to the way we plan, build, maintain and use  
our social and economic infrastructure

## Housing in a DBB

- Housing sits at the heart of many wider social issues, and it will sit at the heart of the development of a Digital Built Britain (DBB)
- Delivering DBB is not simply about technological solutions to make supply and maintenance more efficient, although this is important
- Also about understanding how those solutions and efficiency gains interact with wider social policy issues to address UK housing inequalities

# UK housing crisis – supply?

- Lack of supply
- Few house builders
- Lack of innovation



## Industry challenges

- Farmer's 2016 review of the UK construction labour model was dramatically titled Modernise or Die: Time to decide the industry's future
- Low productivity
- Not embracing the potential of technology
- Problems of future workforce capacity, ageing workforce, low level of new entrants, deep and recurring recessions
- Lack of collaboration and improvement culture, which prevents organisations from scaling up, sharing risks and creating more business plan certainty
- Lack of R&D and investment in innovation

## Off-site housing construction

- Digitisation and off-site manufacturing might offer solutions
- House of Lords report concluded that emerging digital technologies have the potential to transform off-site into a more viable alternative to on-site construction (2018)
- Government presumption in favour of off-site manufacturing
- Includes:
  - Volumetric construction - three-dimensional units which are fully fitted out off-site;
  - Pods - used in conjunction with another construction method e.g. bathroom or kitchen pods;
  - Panelised systems - panels with timber or light steel framing, structural insulated panels or cross-laminated timber;
  - Sub-assemblies and components - larger components incorporated into new homes, including roof and floor cassettes, prefabricated chimneys, porches and dormers, and I-beams.

## Potential benefits?

- To build at scale, at speed, sustainable, future-proofed
- Faster build programme
- Fewer defects, higher quality
- Easier to ensure buildings meet quality assurance standards
- Address the skills shortage
- Fewer labourers and increased productivity
- Cost advantages from economies of scale
- Improved health and safety
- Reduced disruption to the local community
- Improved sustainability
- Creating more regional jobs away from large conurbations

## Evidence of benefits?

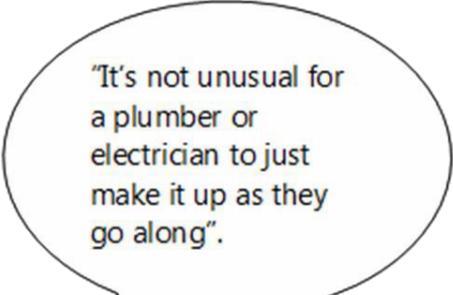
- National Audit Office (2005) suggested that using modern methods of construction should make it possible to build up to four times as many homes with the same on-site labour, and that on-site construction time can be reduced by over a half
- New entrants into the market – but early days
- Data on impact and evidence of benefits is limited
- Failure to capture learning from successful innovations

## Constraints

- Public attitudes
- Cost is a barrier to uptake - risk
- Build cost is only proportion of costs
- Current house builder business models
- Confidence innovation will be commercially rewarding
- Nature of construction procurement restricts collaboration between client and supply chain
- Land supply, the planning system, NIMBY-ism
- Reduce incentives to invest in innovation



"House building is fundamentally still a cottage industry"



"It's not unusual for a plumber or electrician to just make it up as they go along".



"The technology is there, but it is the investment of time that is the problem."

## UK housing crisis – management and maintenance?

- Expansion PRS, only 24% of the stock was built after 1980
- Age disparities affect quality, security and energy efficiency
- Raises management and maintenance issues
- Third of PRS homes considered non-decent (DCLG, 2017)
- Impact on safety
- Across the UK, 470 buildings are using the aluminium cladding responsible for the Grenfell fire
- Impacts health and well-being: 15 million people in the UK live in poor housing
- Cost : poor housing conditions are the source of 70% of NHS costs (NHBC, 2018)

## Challenges in governance and maintenance

- Lack of regulation
- Lack of incentives
- Lack of means and technology
- Lack of data

## OSM and asset management

- Benefits of offsite and standardised components for asset management industry?
- Impact on long term management and maintenance?
- Digitally enabled OSM, BIM, DFM
- Building Information Modelling (BIM) - throughout the building life-cycle, from construction to facilities management
- 3D model-based process - tools to more efficiently plan, design, construct and manage buildings and infrastructure, to:
  - automatically generate inspection plans
  - digital life-cycle scenarios
  - share better-informed data with different stakeholders involved in order to reduce costs and risks
  - transform management capabilities
  - reduce costs involved in managing the asset

## Benefits?

- “Golden thread of building information” (Hackitt review, 2018)
- All safety-related information is gathered throughout the building life cycle
- Address the fragmentation of stakeholder’s activities and responsibilities, as well as the burden of excessive documentation
- Might help to save 5% in the construction cost (Hackitt review)
- Reduce repair and maintenance costs

# Challenges

- Evidence and quantification of benefits?
- Challenge of retrofit and existing stock
- Research on “human barriers”
- Issues of data ethics, privacy and security of access
- Governance challenges and attribution of responsibility

## Current research

- Housing stock represents 80% of the total built floor space in England
- By value, housing represents 35% of all new construction work, and 53% of all repair and maintenance work
- NHBC pays out £85m pa to rectify defects in new build homes
- There is therefore significant value that could be realised if digital uptake was improved
- Research on the socio-economic inhibitors to the take up of digital innovation in construction
- Construction Innovation Hub

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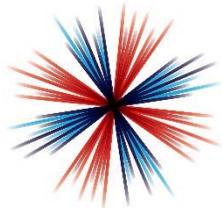


This research forms part of Centre for Digital Built Britain's work within the Construction Innovation Hub. The funding was provided through the Government's modern industrial strategy by Innovate UK, part of UK Research and Innovation.



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