

Innovation in Construction – Exploring Barriers to Uptake of Offsite Manufacturing in the UK Housebuilding Sector.

By Thomas Lord

The UK's growing housing supply problem is an issue regularly retold in articles and reports across the development and planning sectors. This is coupled with a series of critical claims revolving around a history of inefficiency, rising costs and labour shortages. The construction industry is therefore under increasing pressure to address the long-term undersupply of housing and to engage with inventive approaches which will mitigate the constraints to delivery. The drive "*to produce more, better quality homes in less time*"ⁱ involves applying 'Modern Methods of Construction' (MMC), including Offsite Manufacture (OSM).

Such methods have been advocated in every major review of the industry over the last quarter of a century, including Latham (1994), Egan (1998) and Farmer (2016) to name but a few. Assessments of the UK market have shown that there is significant interest in these approaches, with 61% of housebuilders believed to be investing in some form of MMCⁱⁱ. Other studies have suggested that up to 98% of organisations used or considered using MMC between 2013 and 2016ⁱⁱⁱ. The advantages of greater deliverability, quality and sustainability provided by MMC, have created a belief that construction is on the verge of a radical transformation. Such methods are seen to offer greater control over build costs, reduced waste levels, improved efficiency, greater health and safety, minimised disruption to the surrounding area and help address shortages of labour. Ultimately, proponents see MMC, particularly OSM, as "*the panacea to the ills of the construction industry*"^{iv}.

However, the overall contribution of OSM to the delivery of housing has been relatively low, resulting from a series of barriers which have prevented committed engagement. Disappointingly, the mainstream adoption of OSM seen in Scandinavia, Japan and other nations, has not been replicated in the UK and traditional methods predominate.

The focus of this research was therefore to understand the issues which inhibit application of OSM in housebuilding and have thus thwarted widespread uptake. The study built upon existing research and engaged with active stakeholders in the construction and development sectors to investigate these inhibiting factors. Three broad categories were identified – 'People Barriers', 'Process Barriers' and a 'Cost-Supply Conundrum'. These categories are influenced by a multitude of technical, financial, societal and political issues which serve to control uptake.

What people don't know... might actually help them!

A series of 'People Barriers', associated with historical and societal preconceptions have sought to harbour interest in OSM. Particularly, the influence of poor-quality post-war prefabrication combined with traditional societal preferences for 'bricks-and-mortar' houses together with concerns about longevity, have prejudiced attitudes towards OSM in the minds of both public and industry stakeholders. A distinct lack of adequate knowledge of the processes and benefits of OSM runs through industry and decision-making, preventing accurate interpretation of the relative advantages compared to traditional methods. The slow diffusion of knowledge is perpetuated by a historical reluctance to adopt innovative construction methods within housebuilding, particularly those which alter traditional delivery methods. These issues run across the categorisation of barriers, influencing decision-making and implementation.

"We need to see it to believe it!"

For potential adopters of OSM, uncertainty is based upon a complex balance between the level of investment an organisation is willing to contribute, the evidence of an adequate pipeline to quantify such a commitment and the ultimate cost of an individual housing-unit. Setting up OSM capabilities, including building and operating a factory, entails levels of investment which are significantly higher than those needed for traditional on-site construction. The overall initial capital cost is thus seen as a barrier to OSM due to the scale of capital expenditure risk. Securing certainty of project pipeline to generate 'a return' is critical, underlining the need for large-scale project programmes to balance investment cost and secure profitability.

Without committed investment into developing offsite capabilities the capacity of the OSM supply chain is constrained. Similarly, without increased volume the individual unit-costs are uncompetitive compared to traditional methods and are thus unattractive to developers and homebuyers. This 'Cost-Supply Conundrum' involves a requirement for adequate volume based on demand for OSM from the housebuilding market, which in turn is influenced by the 'People Barriers' noted above. Without this demand, OSM is unable to engage economies of scale and therefore individual unit-costs remain considerably higher than those of traditional methods. In this scenario, housebuilders are dissuaded from investment as their existing delivery model is able to produce houses at a cheaper cost and without requirements for vast investment in innovation.

It's not what you do, it's the way that you do it!

The third category of barriers includes a number of 'Process Barriers', involving technical and political issues which thwart greater uptake. Effective implementation of OSM is achieved through the integration of planning, design, manufacturing and assembly, alongside the coordination of

various project stakeholders, such as clients, architects and contractors. Failure to adequately consider OSM in the design-phase of projects thwarts realisation of its benefits to housing delivery. This is often the result of a lack of awareness or experience of OSM solutions. The fragmentation of the construction industry, involving multiple tiers of contractors – each with their own supply chain and each trying to secure a profit – requires action to introduce greater collaboration between stakeholders. Secondary (i.e. Tier 2 or 3) contractors are often not directly connected to the client or other project-players and therefore don't engage in collaborative discussion. Similarly, the relationships between project-players are often temporary, preventing development of effective 'knowledge share' or continuous learning. Such fragmentation prevents industry-players from capturing and sharing knowledge, thus limiting learning and diffusion of innovative solutions. Various mechanisms such as Building Information Modelling have been introduced to enable this integration, recognising the inefficiencies triggered by the fragmentation of the construction industry, yet the level of OSM in housebuilding continues to remain low. Therefore, education and awareness-building of the flexibilities provided alongside the standardisation aspects of OSM are required to stimulate uptake.

Similarly, the influence of the planning system on facilitating development involving both traditional or modern methods is a significant consideration. The overtly conservative nature of the UK planning regime arguably facilitates 'NIMBYist' behaviour and enforces strict controls on development which rely upon local political decision-making. This system of 'development control' reinforces the interpretation of construction projects as unique occurrences which require specific permission from the local planning authority, based on legally-binding definitions. This contrasts the 'rule-based' systems of continental Europe and the United States, based upon area-specific plans outlining key parameters which if met effectively secure development consent. In the UK system, the absence of standardised decision-making and reliance on local preferences increasingly challenges the delivery of housing, particularly where there is significant resistance from local communities. Similarly, the ultimate decision-making power is reserved for local politicians who are not necessarily professionally trained planners or technically-proficient in the development sector. Instead local Councillors are committed to maintaining the political support of their communities. Added to this, the slow nature of the planning system has arguably negated the speed benefits offered by OSM.

These 'planning peculiarities' are significant inhibitors to the application of OSM for housebuilding and to development more generally. Enhancing the flexibility of development permission and supporting the delivery of housing are key challenges for the UK planning system. The need for enhancing knowledge and ensuring the use of suitable planning conditions which don't restrict application of OSM, are also crucial areas of action. Similarly, by recognising that OSM streamlines

design processes, provides greater time-scale/cost certainty and mitigates the disruption of traditional building, local planning authorities (LPAs) have an opportunity to increase certainty of housing delivery. Minimising such issues could enable LPAs to overcome the increasing resource constraints placed upon them by central government.

A plan for the future?

Alongside numerous 'Modern Methods of Construction', it is evident that OSM has the potential to contribute significantly to tackling the UK's housing crisis and to rapidly improve industry practices. The issues discussed above have been regularly documented by previous research and it is evident from the work of this study that they continue to stall uptake. It is the combination of these obstructions which prevents greater adoption. This 'cocktail' of barriers has perpetuated resistance to widespread investment and without a committed response will continue to delay the application of OSM in housebuilding.

Therefore, whilst it is important to understand what the barriers are, it is also vital to develop opportunities to overcome them. Collaborative action between the industry and government, involving greater diffusion of knowledge and meaningful policy incentives, will enable housebuilders to actively develop OSM capabilities. Promoting enthusiasm will be key and whilst change will not happen overnight, action to drive interest must involve a range of committed stakeholders. It is not enough to wait for the large housebuilding organisations to invest in OSM and it is therefore vital to support the growing UK supply chain to develop its capabilities. This will include a push for greater knowledge sharing, education and training in OSM, advertising the benefits case to a wider market, including Local Authorities and homebuyers. Government lobbying and the influence of industry organisations such as Buildoffsite, could have a significant role to play in facilitating the diffusion of knowledge. 'Catalytic events' such as conferences and symposiums may provide opportunities to bring together actors from across the housebuilding sector to engage in collaboration. Similarly, endorsement could be gained through case-study examples, which can openly demonstrate the benefits of OSM.

Whilst in its infancy on the commercial stage, OSM is currently developing a solid and robust platform across the UK. Change is not expected to happen overnight and innovation will continue to diffuse across the industry – indeed it took almost 20 years for the mobile phone to develop into what today is seen as an 'essential' piece of technology. As awareness of its benefits grows, OSM will continue to develop and housebuilders will be motivated to engage. The barriers identified above can be addressed by committed action, enhanced knowledge and supportive policy incentives.

This article provides a summary of a dissertation submitted to the University of Liverpool in partial fulfilment of the requirements for the degree of Master of Civic Design, Town and Regional Planning. The dissertation forms part of a wider research project, funded by the University of Liverpool Industrial Strategy Challenge Fund, aiming to explore perceptions of Offsite Manufacturing for Housebuilding in the UK, identifying perceived barriers to its use in order to understand current low-level uptake. A strategic partnership has been established between One Public Estate and the University of Liverpool to conduct this research, cumulating in a forthcoming academic journal paper.

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ⁱ NAO (2005) *Using modern methods of construction to build homes more quickly and efficiently*, London: National Audit Office.

ⁱⁱ Lloyds Bank. (2018) *Housebuilding Report 2018*. London: Lloyds Bank.

ⁱⁱⁱ NHBC Foundation. (2016). *Modern Methods of Construction – Views from the Industry*. Amersham, UK: National House Building Council Foundation.

^{iv} Blismas, N. G., Pendlebury, M., Gibb, A. and Pasquire, C. (2005) 'Constraints to the Use of Off-site Production on Construction Projects', *Architectural Engineering and Design Management*, 1(3), pp. 153-162.