Editorial

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Off-site construction and design for manufacture has come increasingly to the fore in the national conversation concerning desired improvements in construction sector productivity, quality and safety. Last November HM Treasury published a policy paper that said with reference to infrastructure delivery ‘...the Department for Transport, the Department of Health, the Department for Education, the Ministry of Justice, and the Ministry of Defence will adopt a presumption in favour of offsite construction by 2019 across suitable capital programmes, where it represents best value for money’ (HM Treasury, 2017: section 5.21). Further to which the House of Lords select committee on science and technology issued a call for evidence concerning off-site manufacture for construction in late 2017, with written and oral evidence being received in late spring 2018. The select committee was interested to learn of the potential benefits of off-site manufacture in construction, obstacles to wider adoption, potential contribution to sector productivity and sustainability, and the role of public procurement (House of Lords, 2017).

The select committee received oral evidence over the course of several sittings during April, May and June 2018. Having listened to what turned out to be 8 h of engaging evidence from leading industry figures (8 May, 15 May, 5 June), summarised in Table 1 are the key obstacles and opportunities concerning off-site manufacture in construction contemplated by those giving oral evidence (House of Lords, 2018).

What is apparent is that off-site manufacture requires investment in production facilities, and investment is unlikely to come from private sources on a scale necessary to unseat established in situ methods while the construction market remains so resolutely cyclical. Nor perhaps is the degree of standardisation required to drive down costs going to be realised unless common specifications can be agreed for core components for use across multiple types of asset and multiple clients, which would require designers to design to utilise standard components first and only revert to custom manufacture or in situ fabrication as an exception. That degree of collaboration and coordination sounds optimistic, but I would like to think that building information modelling in its object orientated design form would facilitate consistency in component and pre-assembly packaging sufficient to allow for a clearinghouse to match pooled project demand to pooled manufacturing capacity, a digital national parts bin if you will.

So what is off-site construction and design for manufacture? I think that’s a question best answered by the five papers we have for you in this themed edition, as the answer, for now at least, appears to be fluid and dependent on which construction sector you are referring to.

We start with a briefing paper by Tresidder and White (2018), which describes the application of off-site at a large wastewater treatment works project. It describes off-site construction as a conscious procurement decision, driven in part by time and space constraints, and enabled through early engagement with the supply chain to optimise design for off-site manufacture and ease of on-site assembly. Collateral benefits of reduced working at height, reduced vehicle movements, reduced complexity of on-site works and reduction of programme exposure to weather events are also discussed.

Our first full paper comes in the form of a client’s perspective of design for manufacture and assembly (DFMA) in the UK water industry (Trinder *et al.*, 2018). This paper describes how the client has gone about implementing DFMA across its investment programme. The paper offers insight for clients in all sectors contemplating a move to off-site construction and design for manufacture. These include, embedment of a new delivery culture from executive sponsor outwards through the supply chain, the development of a knowledge centre as well as a product taxonomy to aid understanding, communication and standardisation. The paper concludes with a lament on the risk-averse culture in construction and the challenge faced by those wanting to adopt off-site practices.

The second paper is a piece of practitioner research in which Trinder (2018) utilises desktop case studies and interviews to capture past project performance and contemporary understanding of DFMA in a UK water company and its tier 1 contractors and consultants. The literature review equips the reader with an appreciation of the evolution of DFMA, and to some extent an appreciation of the lack of uniform view concerning what DFMA is or is not. To address this latter point Trinder offers a definition for DFMA in terms of its distinctive characteristics, namely, pre-assembly and standardisation. Standardisation here is viewed from the perspective of the manufacturer rather than the client, with product specifications unique to each client being seen as sub-optimal compared to one size fits all. Pre-assembly and production strategies are developed into a scoring system for use at tender stage to determine if the project is characterised as DFMA or traditional construction. The paper concludes with an examination of the themes emerging from interview data associated with risk and uncertainty and proposes assessment tools for managing these during the asset life cycle.

We move from the water industry to high-rise residential for our third paper. Banks *et al.* (2018) provide us with a case study describing the utilisation of DFMA across all disciplines to deliver a 40-storey building on a space-constrained site. The case study describes a design and pre-assembly strategy that exploited the off-site capacity of the contributing organisations to minimise

Table 1. Off-site manufacture in construction – obstacles and opportunities

Obstacles	Opportunities
Industry fragmentation	Reduction in man-hours embodied in the asset
Specialisms/silo mentality	Different blend of skills required at factory and site, relieving the shortage of traditionally skilled trades
Lack of pipeline not conducive to investment in factory capacity	Safety, welfare, environmental gains from factory environment
Risk allocation	Conditions for innovation in design, manufacture and assembly
Cash flow – factory approach brings costs forward	
Procurement practices	
Lack of common understanding as to what is or is not off-site manufacturing	

the duration and complexity of on-site assembly and final commissioning activities. Just-in-time delivery was facilitated by integration of component tracking with the digital model, coordinating the installation sequence with the delivery sequence and dynamic traffic information.

For our final paper we have a researcher paper on enhancing off-site manufacturing through early contractor involvement (ECI) in New Zealand (Finnie *et al.*, 2018). This paper underlines the role of the procurement strategy and that offsite manufacture branches from traditional construction at an early stage in the project life cycle if the client is to benefit to the fullest extent from a decision to utilise off-site. Following a review of existing standard forms of contract Finnie *et al.* (2018) propose a two-stage ECI procurement approach which involves contractors and subcontractors being engaged once the concept design has been developed. Factors that the novel first-stage contract governing ECI must address are discussed, including intellectual property, buildability and payment.

As you read this edition I hope that you will reflect on what a widespread ‘presumption in favour of off-site’ would mean for you and your organisation. Are you sufficiently informed about off-site construction and design for manufacture to give clients the most suitable advice concerning procurement, design and construction options and routes to best value? How do you plan to keep your knowledge current?

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