UNIVERSITY OF CAMBRIDGE
Department of Engineering

CONSTRUCTION ENGINEERING MASTERS DISSERTATION ABSTRACT

Evolving the Design Process in the House Building Industry using Design for Manufacture and Assembly

In response to the housing crisis, the United Kingdom government has set a target of creating 300,000 new homes in 2020. Design for Manufacture and Assembly (DfMA) could be a cost-effective approach to achieve this goal. Furthermore, DfMA has proven to improve productivity, quality, and efficiencies in manufacturing industries beyond construction. DfMA has not, however, been embraced by the construction industry. A significant contributor to this is a perceived constraint in design among architects. Currently, architects use the Royal Institute of British Architects (RIBA) Plan of Work (PoW) design process. Even when attempting to adopt the RIBA's DfMA overlay, architects design factory- made housing within the same process as they would a traditionally constructed house.

The purpose of this research was to identify potential improvements to the design process of manufacturing houses with DfMA. Design approaches from industries that have successfully employed DfMA were identified. These approaches were then assessed through semi-structured interviews with participants who work in house construction to assess the feasibility of transferring these methods to house construction. The methods assessed were concurrent engineering, knowledge feedback loop, increased concept stage, customisation/standardisation and TRIZ & axiomatic.

The overwhelming theme from the results was that to successfully employ DfMA in house construction, the most important change to implement is to restructure the whole relationship between design and manufacture with either the developer owning the factory or working in close partnership with a manufacturer. An alternative to this approach is to restructure the procurement process as this was seen as a significant barrier to implementing DfMA. In the absence of these more dramatic changes, increasing the concept stage and developing customisation could enhance the use of DfMA in the existing framework. Recommendations were made on potential changes to the design process considering the findings of this study.

Neil Hayward

July 2021