BIM IN DESIGN FOR MANUFACTURING AND ASSEMBLY: BRIDGING THE GAP IN AECO INDUSTRY 4.0

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Abstract

The construction industry is changing, the lack of man labour is a sign of the changes that are affecting the world. Since the financial crisis of 2008, the construction suffers and eagers to find solutions to face the new demand for housing and the lack of response to the current market cap. The shift for off-site construction is being talked recently with new development in technology with Building Information Modelling (BIM) leading this new transition. Design for Manufacturing and Assembly (D is the idea in this process, enhancing the design and production of the building parts in-house to be later assemble and transported to the site, providing a viable solution to the challenge presented.

This dissertation result from a collaboration with Grupo Casais, a Portuguese construction company based in the city of Braga. The aim was to develop sustainable prefabrication processes, to be applied in current and future projects. Namely, the integration of BIM tools for the design and manufacturing of partitions walls system with a high degree of combinatorial application. The goal of the process contemplates the possibility of maximizing the repetition of prefabricated elements to be used and systematize their assembly on site. Therefore, by following the principles of DfMA to incorporate the maximization of resources and time, without compromising stakeholders and benefiting from the advantages of offsite construction.

The solution developed uses Visual Programming to generate a process to divide and sort rooms by their typology, to later export as data. Additionally, through the research it used parameters with the aim of helping in grouping and sorting (within specific constrains) the building parts. This method allows to systematize the knowledge needed to define a computational tool for the manufacturing optimization of the rooms of a given project. With this goal in mind, the research

was focused on the development of computational models that maximize the output of all the information.

This research aims to bridge the gap of prefabrication between architecture and engineer by applying DfMA trough BIM tools. The desirable outcome can be applied to a project that was not prepared to be prefabricated, hence making it a reliable solution to make the transition. With the systematic definition of a set of computational models in a BIM Application Programming Interface (API), the aim was to coordinate and cooperate all the information available inside the model to optimize and generate information that can further help in the prefabrication and planning of building components.

Dissertation:
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Presentation video:
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