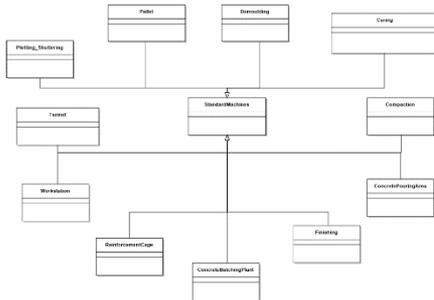


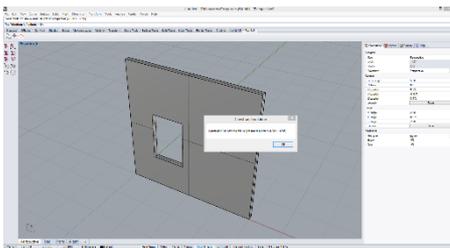
**Level | PGR**



**Façade panel produced in Explore Industrial Park, the new Laing O'Rourke manufacturing facility**



**Domain ontology (in a UML notation) of the façade-related production machines**



**Testing of the automatic tool**

**Integrated Early-Stage Design and Manufacture of Façades**

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**Overview** | The growing housing demand in the UK market, along with the need for increased efficiency in the delivery process of buildings, require innovative solutions to deliver high performance, customised and affordable buildings. Prefabrication is increasingly spreading as a potential solution to achieve higher quality standards and shorter delivery times, although careful planning is required in advance: this aspect sharply contrasts with the way buildings are traditionally designed, with supply chain changing on a project-by-project basis and design teams following a linear approach with increased levels of complexity.

In this context, building façades play a fundamental role: they have to concurrently provide a different number of performances while respecting constraints in terms of cost, manufacturability, standard compliance and aesthetic appearance. For these reasons, façade design is one of the most interdisciplinary engineering disciplines: every actor involved along the design and manufacturing process has to work collaboratively to deliver a complex product.

**Outcomes and Impact** | The aim of this research work is to provide a digital, knowledge-based tool to support the design process of specific façade systems, based on manufacturing capabilities of the system supplier / façade builder. The tool will be used by architects and façade consultants during the early stages of the decision making process. It will also introduce new opportunities for a more conscious, well-constrained, multi-objective optimisation and it will reconsider the current paradigm in the construction industry, in which "each design is a prototype". The research will impact façade design in terms of reduction of errors, lead times while increasing design variability; it will also develop a human readable knowledge repository for knowledge reuse in future projects.

**Work Involved** | The project will focus on the following stages:

- Analysis of current state-of-the-art in design and manufacture in the building sector and other industries such as aerospace, automotive and shipbuilding
- Identification of applicable cases along the design process and collection of relevant knowledge from domain experts
- Development of the digital tool and knowledge-based repository

**Sponsors & Partners** | Laing O'Rourke, EPSRC