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# Proptech provider pilots new approach to better building performance

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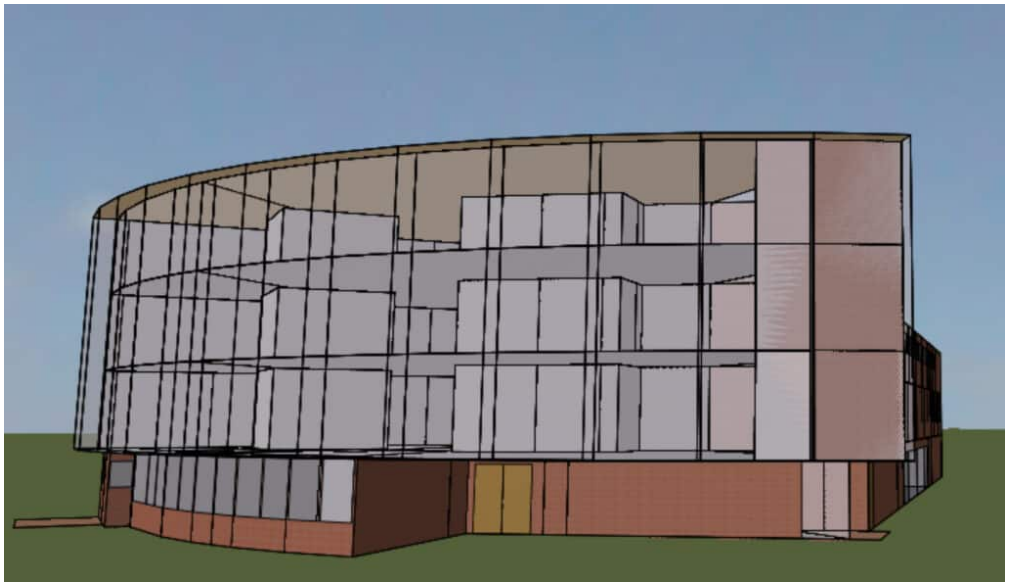

Glasgow-based proptech firm IES has created digital twin versions of three buildings at the University of Glasgow as part of a pilot project assessing how compliance models can be used to improve building performance.

Funded by Innovate UK and called eDigit2Life, the project saw the creation of digital twins for the James McCune Smith Learning Hub (JMS) built in 2021, and the Advanced Research Centre (ARC) completed in 2022. A digital twin was also created of the university's 55-year-old library.

Compliance models are created at the design stage to assess aspects such as energy performance and environmental rating. However, they cannot reliably predict real world building performance in a useful way. The project used compliance models for three buildings at different stages of their lifecycle and created calibrated models and, from those, detailed digital twins.

Digital twins intend to enable accurate predictions of a building's operational performance while repurposing existing models for further use.

The pilot project and insights from the campus building models will be used to drive recommendations for better performance management.

Chief operating officer Ruth Kerrigan said: "Many valuable insights have been derived from this project which we hope will help to improve the way that building performance is measured and demonstrate the role that digital twins can play in facilitating this change.

"Better measurement and verification for building performance is desperately needed if we are to

decarbonise the built environment. Operational efficiency and performance metrics need to be considered at the earliest possible stage in a building's lifecycle to prevent the need for costly interventions and reduce the performance gap between design and operation.

"Currently, calibrated models created during the design stage are not used in any further stages of the building's development, and just aim to facilitate the meeting of minimum performance standards. This results in inaccurate performance predictions and will not provide the sustainable outcomes that building owners want and need.

"Performance digital twins provide invaluable, accurate insights into a building's performance and can be used, as demonstrated in the project, to help building owners achieve better energy efficiency, reduce carbon emissions and future-proof their buildings."

Creating the performance digital twins

For the JMS and ARC buildings, a building information model (BIM) was created. These were then converted to energy models by the engineers using dynamic simulation modelling software. The models ensure that the buildings will comply with the relevant industry standards for energy performance.

The compliance models were then updated to include information on each building's energy-usage patterns, as well as unregulated loads that had not been considered originally. Occupancy profiles based on building use were also added and small power electrical equipment loads were investigated.

Date collected from the building management system (BMS) and design profiles, such as equipment efficiencies and lighting loads, were then added to the models. The resulting models were calibrated to create building-performance digital twins.

For the library, a geometry model was created based on an existing BIM and an energy audit was carried out to create a thermal template of the model. This gathered information on the energy heat and flows, as well as the schedule for heating controls, domestic hot water consumption and heating set-points and set-back temperatures.

A calibrated model was then created using information from the energy audit. Using the resulting building-performance digital twin, three scenarios were tested for improved performance. These were: adjusting start/stop times and closing upper floors during low-occupancy periods, a basic electrical retrofit and HVAC equipment upgrades.

The digital twin predicted reductions of 15% on energy and carbon emissions, with 9% reductions for the electrical retrofit and 23% for the HVAC upgrades. The University of Glasgow is hoping to begin the first scenario and consider the other two options alongside a range of other campus-wide energy-saving initiatives.

As a result of the project, recommendations have been made to RIBA to facilitate performance digital twin adoption, with the aim of improving building performance and helping to decarbonise the built environment. Recommendations have also been outlined for governments and standard bodies to support the use of digital twins across the whole building lifecycle.