

## Smart 3D modelling for buildings

**Building information modelling (BIM) has disrupted the construction industry. The digital technology represents and processes all the characteristics of a building in its whole life-cycle, allowing architects, engineers and construction professionals to design and manage it in a more efficient way**



It is one of the most famous museums in the world, with more than one million visitors every year. **If you happen to visit Bilbao, Spain, you can't miss the Guggenheim.** This architectural masterpiece, designed by Frank Gehry in the ninety's, was **a pioneering piece of construction that tested the building information modelling (BIM) method.** Today this technology is becoming an indispensable tool in engineering and architecture offices.

**The main advance behind BIM is the jump from 2D drawings of building plans to 3D modelling.** However, it goes much further than just enhanced digital models, it provides a realistic representation of a building project that can also incorporate and annotate detailed information regarding **every aspect of the project: colour, cost, size, material and even time.** In this way all of the various expertise involved in every step of a project can accurately envision the physical and functional characteristics of a building.

"BIM has been a huge help to our industry," says [Erleen Hatfield](#), an architect and engineer with over 25 years of experience in the industry. She has witnessed the transition from paper and pencil to 2D CAD drawings and now the 3D models of BIM. "The real value of going to the 3D process is that the models are full of information. Not only is it a faster and more coordinated process, it gives architects the ability to be more ambitious and create buildings that are **pushing further in terms of geometry, performance and coordination,**" she says.

By allowing the architects, engineers and contractors to all contribute to, and adjust the model, as well as monitor the specs involved in any particular detail, the process is streamlined, freeing up everyone's time to do more creative tasks, such as improving the sustainability or functionality of a design.

**However, such drastic changes to an industry usually come with learning curves and some resistance.**

Jan-Friedrich Köhle is an engineer and one of several industry experts at the [5D Institut](#) in Germany which provides training and consulting services regarding BIM. He has seen firsthand some of the challenges in adopting new technology and workflows. "We are changing a lot of traditional working structures," Köhle says, admitting that it can be difficult for people to not feel threatened. For example, when BIM models automate processes like cost calculations that were once the job of a dedicated employee, "it's difficult to teach people that they are still necessary and that BIM is only a tool for them which can optimise their boring work." Meaning that with BIM they have time to dive into and solve the real problems facing the project.

Along with changing old habits, with a technology that brings different fields together, there will always be issues with getting everyone on the same page and developing standards. The level of detail and information required for a BIM model for example is not universal. Trying to develop standards around this and other aspects like software packages and tools are some of the current challenges facing the expansion of BIM to every corner of the construction industry.

**Apart from new building design, the technology facilitates another area of construction, the updating of existing buildings.** Using a BIM tool building upgrades can be made readily available and easy to implement for virtually any customer.

"Since BIM contains all the information about the building, it can be used by different actors and advisors to evaluate different aspects," explains [Isaac Guedi Capeluto](#), associate professor in the Faculty of Architecture and Town Planning at the Israel Institute of Technology.

Capeluto is also part of the European project [BRESAER](#), which is developing adaptable envelope systems that are retrofitted to buildings, increasing their sustainability and the indoor environmental quality. The group developed their own BIM based tool which, according to Capeluto, "allows potential users to easily test and evaluate different designs to a specific problem, without worrying about technological modules' constraints."

Moreover, "The envelope system developed by the EU project differentiates from similar concepts by being **[adaptable to different climate zones](#) through a variable choice of highly efficient energy technologies and intelligent controls,**" says Capeluto. And **BIM is central to this feature:** "To suit different situations, the modules can vary in size and position according to needs."

This adaptability allows any building to get an upgraded roof or façade which, developers say, reduces the total primary energy consumption by 60%. The envelope has integrated solar and thermal panels, as well as reactive windows with insulated solar blinds that adjust to the sun's position in the sky. All of these features are incorporated into energy management system, that measures and controls energy consumption.

By Bradley van Paridon