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From chaos to construction

Building design comprises both materials and professional expertise. New software promises to unify and revolutionise the process. By **Bruce Andrews**

IF A PIPE SPRANG A LEAK deep in the bowels of the Sydney Opera House, it could soon be possible for the facilities manager to locate the problem and order a replacement without leaving the computer.

One day, owners will be able to see every detail of their buildings and know what every door, wall, duct, pipe or window is made of, and their dimensions, without having to be on site. Not only will they see the building as a three-dimensional model on their computer screen, they will be able to calculate instantly how much energy was expended to build and operate it, to predict how pedestrians will move within the building, and determine whether safety requirements would be breached if a wall or door were moved.

Software packages for designing in three dimensions have been available for about two decades. But soon there will be computer programs that can display models with data attached to every feature of a building's design – data that can be passed seamlessly from the architects to the engineers, and on to the quantity surveyors, builders and contractors, and eventually to the building's facilities managers. This approach is known as building information modelling – BIM.

That day is perhaps five or 10 years away, say most engineering and architectural experts. "The Holy Grail is that there is one piece of software … [and that] all the designers of the different bits of a piece of a building are using that software," the chairman of Arup's global business buildings division, Tristram Carfrae, says.

Unfortunately, information often gets lost or misconstrued when the BIM plans are passed from one software package to another. Among the engineering and architecture professions, this is referred to as "a lack of interoperability", and it is the biggest roadblock to developing a single piece of software.

Architects and engineers tend to use different software, which can cause interoperability issues. When the designs are transferred, beams can sometimes disappear or a roof turn upside down. But some of the biggest problems arise when engineers use highly specialised software to analyse a BIM design, Carfrae says. One of BIM's best features is that the information embedded in a design can be analysed to predict a building's lighting, acoustics, safety, crowd and air movement and many other aspects. But information is frequently lost in translation between the design programs and the analytical programs.

Efforts are under way around the world to overcome these issues and move from designing in two dimensions to three dimensions and BIM. "It has been a web of different data and great confusion over the design of the building," the chief operating officer of the Cooperative Research Centre for Construction Innovation, Peter Scuderi, says. "Whereas what we are moving towards … is a common set of data which is manipulated by the various disciplines and added to and then shared."

Headquartered at the Queensland University of Technology, CRC promotes a technique for achieving interoperability by using a standard file format for designs called Industry Foundation Classes. A design is translated from one software package into an IFC file and then into another. The CRC is developing analytical tools that use the IFC standard.

To show that BIM can be achieved with this method, the CRC and firms such as Arup and participated in creating a partial BIM of the Sydney Opera House this year using the IFC standard for the iconic building's facilities managers.

Scuderi says that due to resistance from the professions, the IFC standard has taken about 10 years to find acceptance. "It has taken a long time to get any traction because if you are trying to change the way that industry works, they will say, 'We are not going to change because it will cost us money'."

A wide variety of IFC translators have come on to the market with a rush during the past six months in anticipation of the United States government's general services agency, the world's largest buildings owner, ruling that all sketch designs of government buildings must be submitted in IFC format. Scuderi says the Queensland government's project services division has also expressed interest in using the IFC format.

Carfrae says an alternative approach to IFC and other standard formats is for the clients to pay for the architects, engineers and builders to use the same brand of BIM software. In Hong Kong, property developer Swire adopted this approach last year when it commissioned a software vendor, Gehry Technologies, to organise the BIM for the construction of a 70-storey office tower. Swire hopes that using BIM for the project will save 10 per cent in costs and months in construction time.

Other engineering disciplines may have to wait longer to use the BIM approach. The group manager of design delivery at engineering firm Parsons Brinckerhoff, Rick Everett, says parts of the BIM approach have only begun to be used on big infrastructure projects. "In the infrastructure sector, that integration of all those different types of software hasn't occurred yet. But I think it will come next. It will follow the BIM principle and will get there eventually." ●

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GLENN HUNT