

THE VIRTUES OF VISUALISATION

Jonathan Hunter, COO Elecosoft, considers the growing benefits of visualisation technologies and connected data for construction and building engineering professionals



Building Engineers have a uniquely broad engagement throughout the construction value chain. Their expertise is needed from design and build, through commissioning and into operation. It is critical from confirming feasibility of a building concept, through to potential maintenance challenges; analysing and designing solutions to meet those challenges and client demands.

Project visualisation is key to the ability of most specialists, at some point. 3D visualisation in design is already mature, while the task of bringing and keeping projects alive in multi-dimensions throughout the value process remains in fast-moving development.

Today's view

The most prevalent visualisation tools in use are 3D technologies, and those which add value to 3D. 4D planning has evolved in response to the BIM imperative. The BIM module of our Powerproject software enables sophisticated 4D visualisation; 3D illustrations along the fourth dimension of the planning timeline. In the past making proposals or decisions about any future state of a structure relied upon mental visualisation and synthesis, or projection drawings that could only be theoretical. Today's engineering decisions can be rolled forwards, backwards, and assessed throughout the impact timeline.

This enables planners, contractors, and engineers, to visualise the future and conduct 'what if' analyses brought to life in 3D. It not only provides a crystal ball to see the future but reduces the risks of decisions. It also enables value engineering in a way which was previously impossible, helping them extrapolate and illustrate creative engineering solutions to problems in ways every stakeholder can understand.

The benefit is further compounded with 5D solutions, which align 4D plans with cost estimation. In our case, that is achieved via the Bidcon cost management application. Both 4D and 5D help teams to ensure optimally efficient programme plans, something that is close to the heart of every engineering contractor.

For specialist system engineers, 3D modelling technologies have led to numerous useful visualisation systems. For example, our Staircon application enables design, specification and 3D visualisation of staircases, backed up by rules and a database to aid decisions about material, dimensions, headroom and more. Our Framing solution gives similar capabilities to timber engineering specialists, to develop and specify frames for walls and floor cassettes in 3D. The value is then extended, as the data generated drives precision CNC manufacturing.

Visual simulations are helping forward-thinking building engineers to design and perfect many types of mechanical and electrical systems ranging from lighting, to HVAC, to waste management and environmental control, connecting digital information about buildings and their systems in ways that enable data-driven decision-making, predictive action, risk modelling, and more.

Tomorrow's vision

The landscape of opportunity that is being opened up by digital visualisation is only coming into focus. All building engineers should be monitoring development closely, because visualisation needs are driving some of the direction of digital construction and engineering technologies.

A cluster of emerging technologies could transform how we can see and gather information, such as:

- **DRONETECH** – Drone applications are evolving fast. Now we can have eyes in the sky for mapping, survey and site analysis, new ways to monitor site safety, or inspect previously inaccessible spaces within structures or system components such as pipes. It is easy to imagine how drones could aid engineers in the process of continual learning that feeds design iterations, as well as helping operators to manage installations after completion
- **SENSORS** – The groundswell of excitement is building about the Internet of Things and its potential to enable data-driven decisions and services. Sensor-connected buildings, smart Building Management Systems, and connected assets to aid FM and maintenance, are all exciting. Remote sensing and data-gathering may enable things such as visualisation of building, estate or urban energy to transform better energy planning
- **IMMERSIVE TECH** – Excitement is accelerating around virtual reality (VR), augmented reality (AR) and mixed reality (MR) technologies in construction. This year's Digital Construction Week will feature a track dedicated to visualisation for projects, people and processes. For building engineers these new realities offer a tantalising new vision of system inspection and oversight, the ability to create 360-degree views, and photorealistic fly-throughs of complex systems that are otherwise impossible to explain. The idea of blending the real and virtual worlds through augmented reality can stimulate the imagination.

Convergence of opportunity

Such technologies may have caught the imagination most because they promise a little fun, along with value. Consumer technology can drive innovative business usage: the Oculus Rift, launched as an entertainment visor, was grasped by early adopters as a viewer for 3D building designs. Some of the smaller digital devices that can enable exploration in immersive reality are accessible at consumer 'gadget' price levels, such as lower end 360-degree cameras, and some drones. These can potentially be used as input devices in conjunction

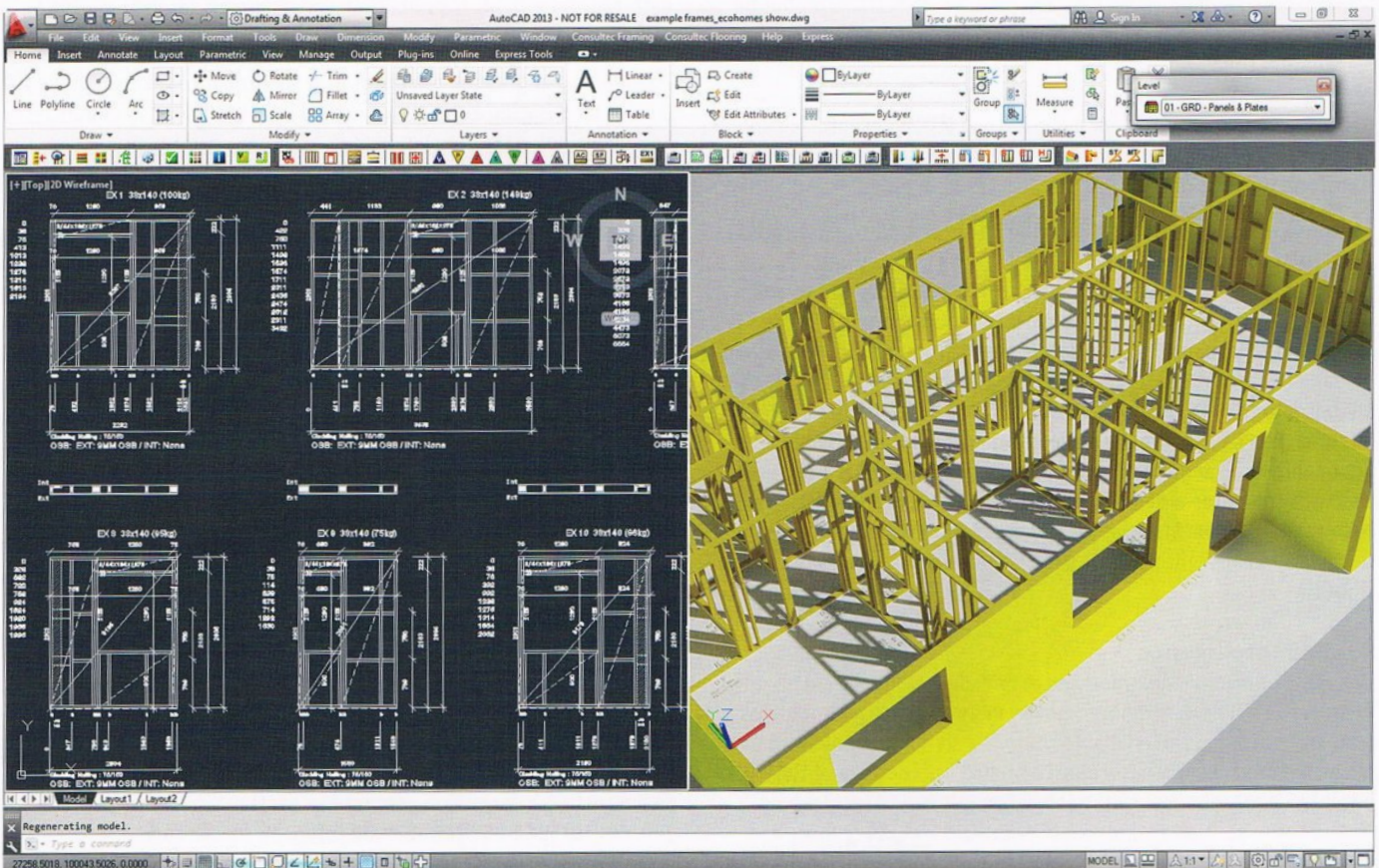
with some existing design software, generating data in the form of images and information.

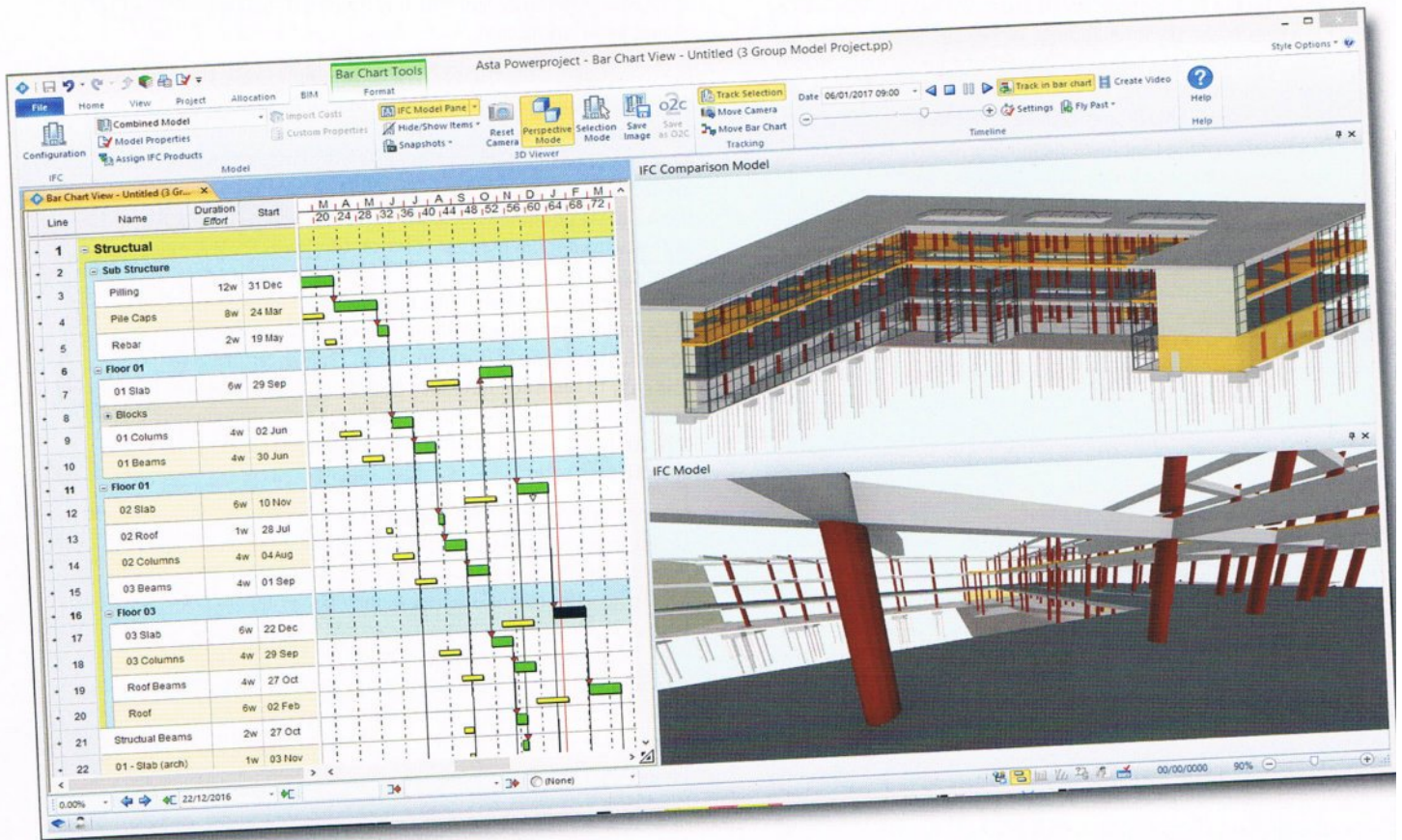
The convergence of visualisation technologies with the needs of designers, builders and engineers is close to Elecosoft's heart. Within our portfolio also sits Arcon Evo, a neat solution to generate 3D visualisations from 2D floorplans, a powerful tool for architects and developers early in the process, long before the build stage commences. We also provide designers with a sophisticated room planner solution that uses visualisation: Interiormarket is used by German home and garden retailer Obi to showcase stylish home furnishing and finishes, as part of its multi-channel marketing. Behind it sits a tremendously powerful database of flooring, finishing and furniture data. It is easy to envisage how such technology could empower housebuilders and developers to deliver new customer service tools to home buyers or office purchasers, energising marketing and off-plan sales.

This approach is used with our stair design solution, which enables buyers to participate in creating their staircase vision in 3D. Paul Elkin of Excel Stairs says that the software plays an essential role in helping make clients' dreams come true, with the software not only supporting delivery but also engagement with the client, throughout the sales process. He explained: 'With the aid of Staircon, we'll make an outline presentation to catch initial interest. Then the client may come in or go online to interact with the design process. We allow them to make changes, and they can see a visualisation of what we're proposing. Staircon enables them to get involved in their project and shows them a model that is truly realistic.'

Data directions

The collection and use of 3D data in various initial configurations is certainly powerful. Yet, it is only the start. Once you start to build data, there's yet more potential.





Data will form the foundation for the future digital built environment. Not just at design stage, or in the build, but in the long-term life-cycle of every new building, smart city, and piece of infrastructure. Digital Built Britain, the vision outlined by the Government in 2015, was an early part of the BIM and digital transformation journey outlined for the construction and engineering sector, but it had the development of new open data standards at its heart, and vision of capturing and generating 'the data to create a digital and smart city economy to transform the lives of all'.

For those who design, install, manage and maintain sophisticated M&E, HVAC and other specialist systems, data coupled with visualisation technologies can help them locate, understand and target problems with assets, equipment and components throughout operational lifespans. Linking data streams from sensors with asset management solutions, such as IconSystem from our portfolio, could enable data to be aggregated in new ways to build newly detailed pictures. People can already make information not just visible but actionable by a range of different functions who need it. Connecting this with computer-aided management maintenance (CAMM) systems such as Pirana from Elecosoft would enable them to align the right resources to the right problem in the right place, as well as at the right time.

Adding intelligence

The value of machine learning and artificial intelligence (AI) is only now being explored. Although spoken of as separate technologies, machine learning is an enabler of AI in that it enables software to become more autonomously able to predict outcomes over time. The potential is enormous for the automation of issue identification, before these become visible to mere humans – whether these are health and safety, quality or materials issues. Machine learning can

be considered another 'visualisation' technology, in that it enables us to see things earlier in the timeline. In contrast, AI can spot patterns and provide insights from very complex, large or multiple sets of information that individuals simply cannot grasp unaided.

For building engineers, operators and maintenance teams, adding AI to the visualisation and data mix could help them spot emergencies and needs not after they happen, but before, enabling predictive maintenance by creating actionable links between the digital and real worlds. AI will allow us to see things that we would never have known about.

The potential of digital technologies and data is staggering. Some people worry that they will devalue human expertise – although we disagree. We believe that it can enhance and add value to the irreplaceable insight from a career's worth of experience in the practicalities and system design realities that professional building engineers gather as their stock-in-trade. They can already see the future of projects in 4D but are now entering an era where their reaction times and ability to anticipate where to apply expertise is enhanced. This does not reduce the value of real-world experience and practical knowledge and, indeed, will be useless in practical terms without it.

All building engineers should be keeping their eyes open (pun fully intended) on the exploding opportunities that construction visualisation technologies and digital data may offer. It's time for building engineers to visualise their future.

● For further information contact Elecosoft.
Tel: +44 (0)1844 261 700. E-mail: info@elecosoft.com
Web: www.elecosoft.com Twitter: www.twitter.com/astapmssoftware