



NEW PERSPECTIVES

THE COMBINATION OF BUILDING INFORMATION MODELLING AND VIRTUAL REALITY HAS THE POTENTIAL TO TRANSFORM ARCHITECTURE, PLANNING AND CONSTRUCTION AROUND THE WORLD, SAYS NIGEL ALEXANDER

Building information modelling (BIM) is the process of generating and managing digital representations of the physical and functional characteristics of places. Originally created to help improve the way we design and construct buildings and infrastructure, it enables everyone involved to understand a building or space using accurate digital modelling that draws on a range of data assembled before, during and after construction.

While the concept has been around since the 1970s, take-up has been inconsistent across the globe. The Nordic countries have shown the most advancement in the use of BIM, where it has been in use for the past 10 years. In Finland, for example, almost every building has some BIM elements attached.

In Europe, progress is varied. Spain and Italy are only at the beginning of introducing BIM requirements. By contrast, in the UK, it is already a legal requirement to use BIM in all centrally procured public sector projects and France is expected to introduce a similar public-sector requirement this year. Germany has a 2020 target for BIM-use across all construction projects.

There's also increased take-up in the Middle East thanks to the UAE making the use of BIM a legal requirement for all large and public sector projects. There is also significant adoption in Korea and Australasia, although we're only now starting to see a rise in the use of BIM in China

and Singapore. In the US, BIM is only now growing and its impact is starting to increase.

Despite its ability to benefit the construction industry, BIM is not seen by everyone as a positive. Many in Europe view it as more regulatory red tape and in a move to counter this, substantial effort has been made to educate the industry about BIM's value, including EU-funded initiatives to promote BIM in public sector procurements.

However, the reality is that it could become a major asset in building and infrastructure construction, with virtual reality (VR) offering a powerful route to unlock that power across the board. One of the key things that VR brings is the ability to better visualise and display exactly what buildings and environments will look like. We've had this before with 3D modelling, but by combining VR with BIM, the visualisations become immersive, interactive and completely accurate. This gives us the opportunity to move away from traditional modelling, towards something that is more user-friendly and accessible.

VR models enable you to explore entire environments and buildings in much greater detail and with increased flexibility. They allow you to move into a space that doesn't yet exist and to interact with that space in ways that no other modelling technique will let you. Indeed, how you interact with a VR space is where the major advances in technology will occur in the next few years.

This is where we begin to see the power of VR and BIM to drive benefits in everything from building construction to space-planning. The accuracy of the modelling thanks to BIM can become a game-changer for space-planning and flow-management, as you can move around VR environments freely and understand in detail how they fit together and how a space really works – even though it may not be built for another two years, say. This means issues can be spotted and ironed out early in the process, which removes the need for expensive reworking and redesigning. For construction, this has a huge impact not only on reworking costs but also in potential wastage.

Beyond buildings

There is also significant application outside solely construction-based projects, expanding into landscape and larger environmental area planning. While 3D modelling for entire cities and areas due for development is starting to become more prevalent, fully immersive and interactive VR environments bring a far greater ability for everyone to be aware of the geospatial impact of any construction.

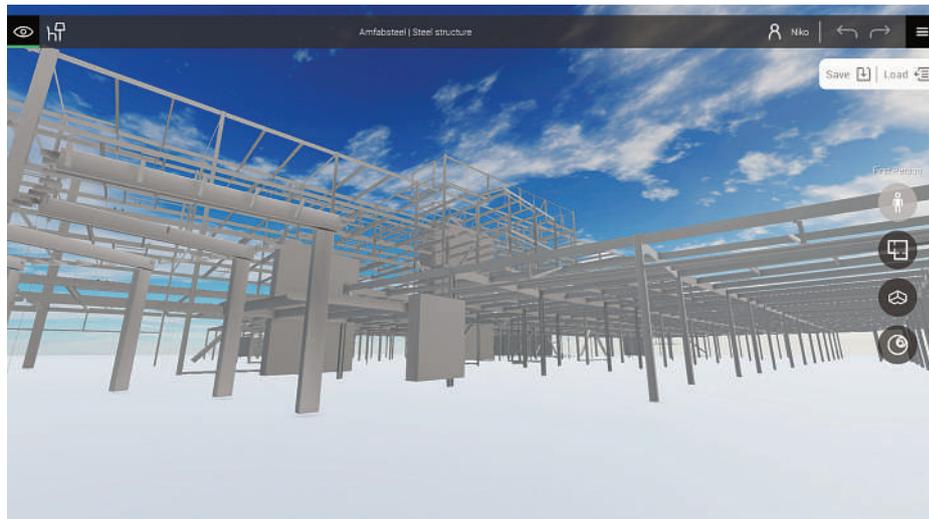
If we take the placement of a wind farm as an example, the integration of BIM and VR can allow you to position views from specific co-ordinates and accurately display how the individual turbines will look and affect their surrounding environment. Integrating other data – such as, for example, the position of the sun based on the coordinates of the location – you can track in real-time how the structure will affect the landscape throughout the year, without having to resort to generating new and expensive 3D graphics. While there have been no test cases yet, the level of accuracy provided by BIM and VR might allow you to meet legal requirements for positioning of views.

Being able to clearly visualise the scale of any construction relative to what is around it, means that even non-technical stakeholders can understand the effect of any structure on its local environment. Looking at something like the building of a dam, a single narrative 3D image will not allow the average layman to explore the impact of losing a valley in anywhere near the detail of a VR environment, whereas BIM and VR can.

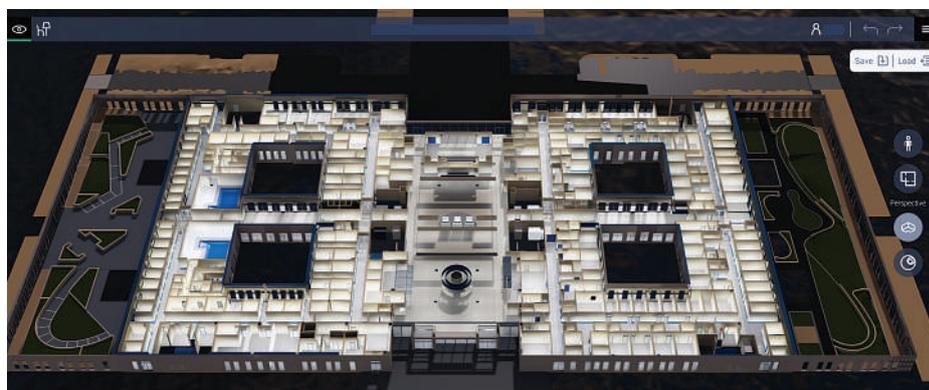
We tend to think of the impact of construction purely in terms of the negative, but we should be looking at what the positives are as well. Modelling a brownfield site and then placing new infrastructure in it has a very positive impact. VR allows us to represent that environment in a way that's much easier to understand.

Bringing developments to life

There are several techniques being used to bring planned development to life, from physical landscape modelling to 3D imagery. As an extension of 3D modelling, we're seeing



BIM and VR could become a major asset for building and infrastructure construction



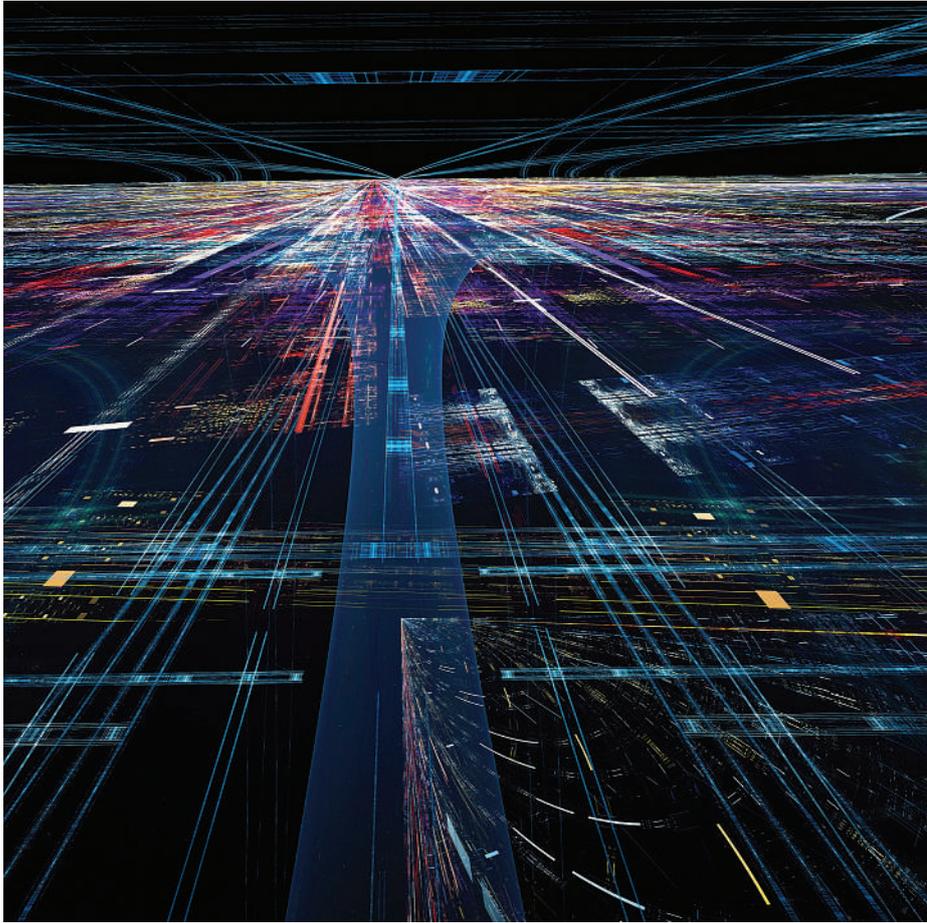
VR enables you to better visualise and display exactly what buildings and environments will look like



VR brings a flexibility not seen in other modelling methods



Advances being made in VR technology will make the process of remodelling and rebuilding easier



The integration of BIM and VR can allow you to position views from specific co-ordinates and accurately display how it will look



A building 'constructed' using BIM and virtual reality, and the resulting building in real-life

some companies creating hi-resolution building models from stereo imagery. A typical example of this might be where they have a satellite picture of an area that then has a 3D model built on top of it. Bringing these models together can produce many benefits, such as understanding traffic flow, urban planning and even flood mitigation.

Using the open interoperable format IFC, BIM data can be used on VR platforms such as Tridify, ensuring that the landscape or the structure and envelope of a building are accurate and enabling a true portrayal for the VR interactive environment. A key task is optimising and transforming the BIM data to enable it to be rendered on the VR platforms.

VR should be available on ordinary devices such as tablets or smartphones without requiring dedicated high-specification workstations that manipulate the CAD files. However, access to the underlying BIM data that provides detailed specifications may still be maintained through API access.

This whole process is resource-intensive and incredibly expensive, as well as requiring high degrees of expertise to create. Of course, on top of that, it's only as good as the data you're putting into it. There is also the issue that as soon as you make any modifications, you hit a new problem – the model becomes redundant and it is an expensive process to recreate. However, the advances being made in VR technology will make the process of remodelling and rebuilding easier.

The impact of new VR technology

There are big changes afoot in how VR models can be created and displayed. The VR companies currently creating building models are doing so on a project-basis and this can be very labour-intensive. They're also building environments on huge VR computers and these must be viewed on those computers with VR headsets, so the whole end-user experience becomes very static and limited.

By combining cloud-based technology with VR and BIM, the creation of these models will become automated. A move away from project-based VR creations to a SaaS-based approach will produce big savings in both time and money. And in a sector where projects need to be completed as quickly as possible, these factors can prove critical.

This same technology also enables these models to be modified and adapted easily, such as increasing corridor width, moving access points, adding furniture, moving lighting, colouring walls and changing flooring. But probably more importantly, these VR experiences can be viewed on any platform, including mobile devices such as smartphones and tablets.

However, this vision of how VR can change the industry is not without its challenges. This is a heavily disruptive technology that challenges areas in the architecture and construction industries across the board. The reality is that combining BIM with an automated and scalable VR platform can allow you to create plans and models faster, smarter and with higher quality. Above all, the combination of BIM and VR is a real enabler for change in the sector.

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