Constructive praise!
We round up the winners of the Construction Computing Awards

Going Underground
CAE and FEA for the Bond Street Station upgrade

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Top Priority
Viewpoint's Information Management solution reviewed

Go with the Flow
Pedestrian analysis for architects

Building it twice
Why HS2 will push BIM to the limit
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For a project as complex as HS2, with its political, environmental and public issues being of paramount importance, it is imperative to build a virtual model to test every aspect before the final designs are established.
COMMENT

On the right track?

by David Chadwick

I you are a frequent traveller on the Underground and have to go through Bond Street you will have noted that the station is currently closed, exuding an air of complete abandonment and lack of activity. It’s all a front though, and you will be astonished at the scale and complexity of the work going on behind the boarded up platforms - as you will see in the Dassault Systèmes article in this issue. In face we have two other railway related articles in this edition, dealing with the political hot potato of HS2 and the mass pedestrian analysis of visitors to major railway stations respectively.

The article on HS2 follows a brilliant presentation on the scope and rationale of the project by Professor Andrew McNaughton, the Technical Director of HS2, given at Bentley’s Infrastructure Conference last November. The cost is colossal, the disruption to people’s lives - the ones who live on the proposed route - will be unbearable, yet the unthinkable has to be considered.

The density of housing in this country has reached such a level that any long term improvements to road or rail networks are going to disadvantage some members of the community. Not to do so, however, blights future generations, who will be faced with exactly the same problems but at far higher cost, and with disruption to even more deeply established and committed populations.

As Professor McNaughton says, there are legions of protesters, representing every bit of human, flora and fauna interest, who are articulate, organised and adept at attracting the attentions of the media. HS2 advocates, representing the ‘establishment’ line, have a hard struggle putting across their views in an environment that currently favours the protesters.

The phenomenon is not just the preserve of HS2, but rears its head against many large scale infrastructure projects; Heathrow expansion, power stations (both nuclear and coal-fired), bypasses and so on.

I must admit I was not fully convinced by HS2 till I saw the presentation. Does it all really boil down to the presentation skills of the proposers of the project?

Part of the proposal relates to the rapid movement of passengers through the network, with trains arriving and departing in very rapid progression, disgorging and picking up passengers at an unbelievable rate for anyone - certainly for anyone who has had to travel back home from Paddington between 4 and 7pm on a weekday evening!

The HS2 revolution, aimed at meeting the needs of passengers before anything else, envisages a complete modernisation of booking and seat allocations using all of the most up to date social networking tools, guaranteeing passengers a seat when they need one and directing them precisely to the point of embarkation.

Such a feat cannot be achieved without an analysis of expected passenger flows within the main rail terminals and the surrounding areas, using solutions like MassMotion from Oasys, also the subject of an article in this issue. Actually, the figures quoted for passenger numbers and the frequency of trains are an order of magnitude above current passenger levels - HS2 obviously expects the service to be popular.

And some more rail facts! Apparently the early days of travel by steam railways were a factor in the development of Impressionism, allowing artists to get out more and explore the countryside, taking their easels and paints with them. It provided them with an extra stimulus from nature, allowing them to create rapid ‘impressions’ of what they had seen before they caught the last train back, according to Philip Hook, a Senior International Specialist at Sothebys.

With railways having such a cultural impact at the beginning of the twentieth century, who is to say that the arrival of HS2 will not prove equally propitious?
By January 2016, everyone working in the UK construction sector needs to understand the potential of Building Information Modelling (BIM) and how they can use it to produce better quality buildings and landscapes more efficiently. For 25+ years, Nemetschek Vectorworks Inc has been a global leader in design technologies providing elegant architectural, landscape and lighting design software that offers Building Information Modelling capabilities in a flexible, hybrid-design environment. Act now and contact us to make sure you are ready for BIM.

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INTEGRITY SOFTWARE JOINS JDM GROUP

Integrity Software is joining the JDM Technology Group. JDM, the parent company of RedSky IT, is a worldwide provider of Software solely to the Construction Industry, with nearly 5,000 customers on 6 continents and employing almost 300 staff.

Integrity Software Systems Ltd. will be run as a separate company with dedicated resources, delivering their construction software solutions to their 800 plus clients in the United Kingdom and Ireland. The acquisition of Integrity Software Systems significantly bolsters JDM Technology Group’s global position. JDM’s portfolio of software solutions cover the following sectors:

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- Civils/Rail
- Housebuilders
- Specialist Subcontractors
- Electrical/Mechanical
- Service Management
- Utilities
- Architects, Engineers, Consultants
- Builders Merchants

JDM grows by acquiring Construction Software providers, it then continues to support and enhance the lead products of those businesses, whilst also bringing to those Customers technologies that will complement the current software, through its set of web based and mobile tools.

www.redskyit.com

A CUNNING PLAN FOR BUILDING SURVEYORS

3D Laser Mapping has launched a powerful solution that, the company says, will revolutionise the production of highly accurate building floor plans. Combining the easy to use ZEB1 handheld laser mapping system with intuitive point cloud processing software, the end to end solution will allow users to scan and produce detailed floor plans in a matter of minutes.

The combination of scanner and software is set to transform building surveys, delivering both operational and financial savings for survey companies and end clients. The announcement follows an agreement between UK based 3D Laser Mapping, worldwide distributors of the ZEB1 handheld mapper, and PointCab, a German software company specialising in the processing of laser scanned data.

“The combination of ZEB1 and PointCab creates a truly powerful solution for building surveyors,” commented Charlie Whymann, Global Sales and Marketing Manager, 3D Laser Mapping. “Both are easy to use with little or no training, both are fast and effective and both are well supported. Trials of the combined solution have shown that a multi room facility can be scanned, the point cloud data processed and a vector model produced, all in less than twenty minutes.”

www.3dlasermapping.com

BENTLEY ACQUIRES UK-BASED C3GLOBAL

Bentley Systems has acquired C3global, a U.K.-based provider of web-based Amulet software for operational analytics. Bentley’s AssetWise platform is now extended, through AssetWise Amulet, for asset performance modeling. Commenting on the acquisition, Paula Hollywood, senior analyst, ARC Advisory Group, said, “Advanced analytics helps break down the barriers between operational technology and information technology, facilitating more effective decision making. Our research shows that the use of advanced analytics can reduce costs, increase efficiency, and drive higher performance. The acquisition of C3global by Bentley Systems is a leading indicator of industrial-scale progress being made to help organisations optimise asset performance and achieve business goals.”

www.bentley.com/AssetWiseAmulet

TAKENAKA ADOPTS GRAPHISOFT BIMX DOCS

A large-scale purchase agreement has been finalised between Graphisoft and Takenaka Corporation, one of Japan’s largest AEC firms, that will equip thousands of Takenaka field technicians with Graphisoft BIMx Docs.

Takenaka Corporation will adopt BIMx to make the BIM project presentation app available to thousands of field technicians, further ensuring on-site construction quality and management efficiency. Development of “Takenaka Smart Work” will improve productivity and communications by revolutionising workflows through the use of iPads and mobile devices. As a result of this agreement, Takenaka will be authorised to install and use Graphisoft BIMx Docs on all Takenaka-owned tablet computers in Japan. With this agreement, Takenaka Corporation hopes to further develop the use of BIM in the field of design and construction.

“We adopted BIMx Docs as a tool to facilitate communication with models, as well as for reviewing models in conjunction with drawing smoothly in a mobile environment. We would like to promote the transformation of our work style by spreading the use of BIM models in various scenarios,” said Kozo Nose, Senior Manager of ICT, Design Planning, Design Department, Takenaka Corporation.

“Takenaka’s decision indicates that BIMx is on the way to becoming the mobile software of choice for the construction industry in Japan. We share a common vision: bringing BIM data to construction sites,” said Bence Kovacs, Vice President of Asia, Graphisoft.

www.graphisoft.com

TAKE A LOOK AT WHAT WE’VE DONE

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www.bentley.com/AssetWiseAmulet

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NEW REVU FOR 2015 FROM BLUEBEAM

Bluebeam Software has released Bluebeam Revu 2015, which introduces new features to enable project teams to keep complex document sets organised and up to date, ensuring all team members are on the same page. "To meet the demands of complex projects and condensed timelines, project teams need technology to simplify communication between project stakeholders and remove workflow redundancies," says Richard Lee, Bluebeam Software President and CEO. "Revu 2015 presents and polishes features that make marking up and managing document sets easier with greater markup tool functionality and batch automation, as well as more flexibility with how project information is shared."

One of Bluebeam’s most highly anticipated markup features is now available in Revu 2015. Sketch Tools allow users to quickly create new shapes to exacting measurements based on a PDF’s calibrated scale. The tools give users real-time length and angle feedback as they sketch details with their mouse or enter dimensions using their keyboard.

Also added in the new release is the Dynamic Tool Set Scaler, which enables markups to automatically resize precisely and proportionately when used on documents of different scales. Grouped markups in a drawing can also resize proportionately, regardless of scale setting.

Using Revu’s Camera tool, Capture 2.0 now allows users to embed videos into markups. Users can scroll through images and play back videos directly from each markup’s Capture viewer. Markups containing Capture media can be tracked and viewed in Revu’s Markups list and exported as a PDF Summary.

www.revu2015.com

DETAILLED COMPONENTS FOR SKETCHUP

With the release of SketchUp 2015, SketchUp has greatly expanded and improved its standard component collections, with more than 2,600 individual detailed pieces of new SketchUp-authored content now available on 3D Warehouse.

Similar to their predecessors, the updated and improved components are generic in nature and have been uploaded alongside their simplified counterparts. The new detailed components are typically more "geometry heavy" (have a higher polygon count) and can be accessed by browsing the 3D Warehouse Detailed Collections via SketchUp’s 3D Warehouse window or a web browser.

In addition to visual improvements, the components also include useful information such as IFC attributes, which can be exported to solutions such as Tekla BIMsight or Trimble Connect.

https://3dwarehouse.sketchup.com

A VISIONARY ADVANCE IN VIRTUAL REALITY

Virtalis is now shipping the first new version of its Visionary Render software since it was launched last year. Visionary Render allows users to access and experience a real-time, interactive and immersive Virtual Reality (VR) environment created from huge 3D datasets. Users can work alone, in small groups, or collaborate with distant colleagues in a common virtual environment to perform detailed design reviews, rehearse in-depth training tasks, validate maintenance procedures or verify assembly and manufacturing processes.

Technical Director, Andrew Connell, said: "I am exceptionally proud of what the Virtalis R&D Team have managed to pack into Version 1.1. From floating licences to capped sectioning, Version 1.1 represents an enormous advance in 3D rendering technology.”

Key features in the new version include new controls for scene management, deferred render, infinite streaming terrain and Logarithmic Z support.

www.virtalis.com

NO NEED TO WASTE TIME IN THE OFFICE

A new in-cab waste management system from Yotta is set to transform the delivery of refuse collection services. Mayrise In-Cab uses a vehicle mounted mini-PC to integrate with the Mayrise Waste back office system, giving frontline staff access to the latest service and reference information.

Utilising GPS, mobile and WiFi technology the Yotta solution further supports crews in the field with real time messaging, reporting and event logging. The integrated mobile and back office system also allows office based staff to monitor the progress of crews in the field with their location and logged events displayed in real time against a map backdrop. This latest addition to the Mayrise Waste product portfolio has been designed to help increase operational efficiencies, improve customer service and reduce unnecessary paperwork and administration.

www.yotta.co.uk
MassMotion Flow
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It’s pretty obvious the way things are moving. The whole world appears to be going mobile, wanting instant access to friends, colleagues, information, and entertainment on a multitude of platforms. Phones, tablets and laptops enable people to be constantly in touch with their work colleagues, enabling information to be shared more widely and instantaneously, decisions made sooner, and work processes to be made more efficiently.

The construction industry is shaking off its image as a hidebound, somewhat reactionary group of people, reluctant to take on new technologies until they are tried and tested. Now, as some of the older members move upstairs or retire and the more dynamic workforce get to grips with the advantages of having construction information at their fingertips, the ability to interface directly with the building model and collaborators and make critical decisions in the field is becoming apparent.

Software developers have to reflect current trends as well, especially those concerned with supplying information management and control systems, and particularly those in the construction industry, where managers and their workforces are spread over a multitude of construction sites. Hence the decision by Viewpoint (the new owners of 4Projects) to acquire another UK company, MCS, to enhance its mobile capabilities.

Priority1 from MCS becomes part of the Information Management Solutions line-up at Viewpoint, as the company evaluates mobile computing issues and opportunities.

Priority1 is a cloud-based task management, forms and process control system, which allows any paper-based operation to be quickly reengineered for use on a tablet or other mobile system via the web. Site-based personnel are able to gather information in real-time, make decisions, assign tasks, communicate with other team members and, subsequently, when inspections have been carried out and all tasks completed, to update the project model. Managers can keep an eye on ongoing operations and check on the performance of their teams across the entire project, allocating additional resources where necessary and generally improving the quality and safety of the working environment.

Priority1 has been designed to be as intuitive as possible. Schedules of activity outline work locations and activities. Once on-site, 2D plans are downloaded, together with associated forms and checklists, pinpointing items to be inspected categorised by type and status. Details of defects, H&S violations or any other notifiable conditions are appended to the inspection report, which is then used to update the project model or sent as ‘action required’ emails to the relevant subcontractor, attaching photos and drawings to the textual annotations to
highlight issues wherever necessary. The workflow can be configured to suit any on-site working process, and can include snagging, variations, incomplete works, clean-up notices, NCRs and other housekeeping activities. Additional forms can be devised easily and quickly, adding fields that need to be filled out on-site, for example if further sub-contractors need to be brought in and issued with a form contributor request.

Customising tasks to increase workflow involves using the Process Control features for constructing activities and checklists for repetitive inspection processes. These control the rules that dictate the types of forms to be used and when, which require signatures, or which will probably need photos to accompany them. Process Control reports, usually in Excel format with colour coded matrixes, keep site managers up to date with progress, with predefined formats that include ITPs, Progress Activity, Quality Check-sheets or Commissioning Checks.

As there are a seemingly infinite variety of paper-based forms, Priority1 offers a similar variety of electronic forms for use on tablets or the web, covering health & safety, accident reports, permits to work, site diaries and any other construction related activity. Quite apart from the real-time recording, distribution and access to information, there is the incalculable benefit of cutting out back office paperwork - the onerous task of transferring paper-based reports to computer-based spreadsheets in the office. Updating in Priority1 is instantaneous, and it also eliminates any inaccuracies that might have previously crept in because the staff in the office couldn’t read your handwriting! Tasks are accurately located, critical data is checked for errors when inputted, photos and drawings are used to identify problems, and the right people informed of progress or otherwise. The end result is a more efficient information workflow that helps contractors stick to budgets and timescales.

**MOBILE COMPUTING ISSUES**

Viewpoint has put out a White Paper that looks at the mobile computing phenomenon. It covers the phenomenal success of Apple’s iPads and iPhones, the growth of Android as a valid alternative, and the hard fought inclusion of Microsoft’s Windows 8 devices in the final line-up of platforms supported by Priority1. The latter, used on touchscreen devices and Windows tablets, fits in easily with Microsoft-based back office applications, potentially making them more appealing to site managers used to working in a Windows environment. It also makes it easier for Windows-based developers to create standalone applications, or for standalone applications to be modified for mobile devices.

This is particularly relevant in the construction industry, where far-flung, condensed building or underground sites are often out of range of broadband networks. Priority1 enables tasks and the data models associated with them to be downloaded prior to being used on-site, and subsequently uploaded once the user comes within range of a transmitter. This is always something worth keeping in mind when selecting mobile-based services - whatever the application.

The other issue explored in the White Paper is ‘what do you do with the data once you have it?’ Point solutions merely send an email notification of a defect to the person required to fix it. Current technology allows us to go so much further though, capturing the information as part of the document covering the design and construction records of the entire build asset - creating a whole lifecycle approach to the information.

The integration and interoperability of data is growing apace. Recording and alerting someone to a defect is fine, but being able to integrate the information with similar instances throughout a project assists greatly in ERP (Enterprise Resource Planning) shifting resources to analyse and resolve recurring problems, ECM (Enterprise Content Management) and even CRM (Customer Relationship Management).

This links the data into the whole of a project’s information interactions and management functions, keeping clients and main contractors informed of every aspect right, through from design to commissioning, handover, operation and maintenance of the built asset, which is the true goal of BIM after all. With that in mind, Viewpoint adds another M to the acronym - Building Information Modelling and Management (BIMM).

**THE FUTURE OF MOBILE**

The Viewpoint White Paper also looks ahead to other technologies that it sees enhancing the building site: GPS, QR (Quick Response) codes, augmented reality, RFID, NFC and iBeacons. GPS is already known and understood, locating an event not just in time but in exact location. QR codes, similar to barcodes, are machine readable images that open up other applications such as website pages or on-site instructions for dealing with a complex repair issue, the code being read by the mobile device camera.

Augmented reality harnesses GPS and cameras, adding digital data to real-time images - showing interior HVAC, for instance, on a building frontage. RFID tags (radio instead of barcodes) can be used to track construction tools and plant, enhancing site security. NFC (Near Field Communication) is a set of standards providing functions similar to walkie-talkies, for close, or touching contact for exchanging data. Finally, iBeacon is an Apple trademarked technology, similar to NFC. It is a low powered, low cost Bluetooth technology that transmits ‘wearable’ data to inform wearers of their proximity to on-site hazards.

**THE INTERNET OF THINGS**

This is all part of the ‘Internet of Things’ - the growing number of building components, systems and equipment that transmit their own data. This is something that Viewpoint has recognised, and has possibly acted as an additional catalyst for them to add MCS to their line-up of Information Management applications. The mobile computing world raises numerous issues, but also enormous opportunities for companies that recognise its true value.

[www.4projects.com](http://www.4projects.com)
Having exhausted your creative talents designing that ultra-modern office complex, there can be few things more therapeutic than adorning your masterpiece with plants, vehicles and other embellishments. And now you can plant your virtual gardens in more applications, as Graphisoft has announced the full integration of e-on software’s LumenRT 2015 application within ArchiCAD, following requests from the software’s users.

The ability to use LumenRT’s large library of plants, vehicles and characters to populate rendered 3D ArchiCAD created models, and to build up rich, immersive scenery that comes complete with wind-blown trees, moving vehicles, animated characters, wavy water, clouds and atmospheres, provides the sort of effects that are needed to bring any visual presentations or videos to life.

LumenRT is available in two versions: Studio and GeoDesign. Studio is aimed at architects and designers and enables them to add landscape content to their designs, created via architectural applications. GeoDesign provides additional capabilities for landscape designers and urban developers, traditionally using software like MicroStation Traffic and VISSIM, who can use the software to display real-time pedestrian and traffic animations, or to create custom terrains and objects.

LumenRT features a Dynamic Immersive Visualisation Engine (DIVE) which combines 3D atmospheres, sculptable terrains, and PlantFactory vegetation to form a powerful solution that delivers higher levels of natural realism with cutting-edge, real-time rendering. The company also has an interest in environmental issues, and

Graphisoft ArchiCAD is now fully integrated with LumenRT 2015 on both Mac and PC, enabling architects and landscape designers to present their designs with the utmost realism.
includes analytical tools in its line-up, the titles of which speak eloquently for themselves - Vue, Ozone and Carbon Scatter!

**BENEFITS OF LUMENRT**

Besides content rich scenes that feature additional static objects in a number of common formats, LumenRT can create super HD hi-fidelity images and videos up to 3840 x 2160 in resolution, which can be used to produce walkthroughs that incorporate layering and sectioning, or to perform lighting and time-of-day studies. In addition to which, developers can use the new animation path painter and waypoints to give characters and vehicles defined paths or routes through scenes.

Scenarios can be set up as 3D immersive LiveCubes that can be shared via any web browser, enabling them to be interactively explored on any web connected device (e.g. PC or tablet) with performances that rival high-end gaming PC’s. You can edit scenes inside LiveCubes in real time, adding plants, vehicles and characters as easily as painting with a brush.

You can also edit individual material properties or load pre-made materials from the LumenRT material library, including artificial lights. There is also a tool for sculpting and painting terrain - an alternative to using an imported digital terrain with the building model. LumenRT's advanced vehicle traffic animation support includes the import of MicroStation Traffic and VISSIM animation paths for large scale traffic simulations, with the bonus enhanced support for jitter-free pavement markings (a problem that occurs with some similar applications).

As one of the leading proponents of BIM, Graphisoft has emphasised the software's relevance to the BIM collaboration process - the ability to export LumenRT content and information together with the model geometry for use within Graphisoft's BIMcloud and EcoDesigner.

Graphisoft’s advanced BIM-integrated Green design solution. The LumenRT content can also be used with BIMx, Graphisoft’s mobile app for BIM visualisation.

**STUDIO VERSUS GEODESIGN**

Bearing in mind the complexity of the software and the tasks required of the processors, e-on software recommends that preprocessing task and the navigation and viewing tasks be performed on separate processors, the former with enhanced processing capabilities; Core i5 or higher, at least 2Gb of free RAM and 10Gb or more of free hard disk space. Navigation and Viewing can be performed on standard 32 or 64bit workstations with at least 1Gb of RAM, 500Mb of free hard disk space and a Shader model 4 compliant video board.

When you tick off the differences between Studio and GeoDesign you will discover that it mainly boils down to custom-built objects and the creation of complex animation paths and routes for traffic simulation, and the creation of terrain data. All other features are available in both levels of the application.

Five render modes are available - draft, standard, full lighting, superior and extreme - and I would love to analyse the difference between the latter two of those! It also includes a technique called Baked GI, which is used to create faked global illuminance for a given scene. The software can use content created in CAD, GIS and BIM applications to add sunlight, artificial lights and other BIM information, and to convert camera animations (rather than the more complex custom character and object animations only available in GeoDesign).

There is a whole ream of tools that can be employed to enhance the realism of visualisations, and which can all be modified on the fly with interactive editing such as adjusting the time of day, changing the weather - and therein lies a lot of interesting content and related questions - cloud movement and seasonality. Individual scene objects can also be moved about, materials adjusted and camera animation paths created.

**ADDING CONTENT**

Vegetation, vehicles, characters and animals are available from LumenRT’s extensive library, with different plant variations available. Unless you’re creating a mini Kew Gardens they should be quite sufficient for any purpose! The vegetation variations reflect the way that plants look at different times of the year, and even factor in tree health.

Plant Factory technology, one of the industry's leading plant simulation applications, actually allows users to move a slider bar and watch foliage change throughout the seasons. If that’s not enough, a Plant Factory Add-on also allows users to create custom plants and trees.

Other enhancements include vehicles with movable wheels and operational lights, adding further realism to animations and scenes. To provide a final 'atmospheric' touch, you can add fully animated 3D skies with adjustable cloud densities and patterns. The 2015 version of the software also includes a more life-like sea water generator with adjustable wave patterns and shore foam.

**EXPORTING CONTENT**

Still images can be exported up to the latest 4K Ultra HD technology - 3840 x 2160 - and video to full HD standard at 1920 x 1080 resolution (GeoDesign can actually export 4K Ultra HD video, as well). Export quality offers draft, standard and superfine modes. The software also includes standard video editing and multi-clip compositing tools, and you can even add a soundtrack.

LumenRT 2015 is described by e-on software as a “3D immersive communication platform for architects” and it’s an apt description, as visualisation and animation tools are used purely to convey design information to clients and potential customers. The same software is used throughout the film, television, entertainment, education and gaming industries, as well as in construction - all dedicated to digitally replicating scenes with the utmost realism.

www.graphisoft.co.uk
The sky’s the limit!

Vectorworks Cloud Services keeps drawings synchronised on and off-site

It’s not just construction site workers, inspection teams and site managers who are taking advantage of mobile devices and the greater mobility of information they can bring to the job at hand. Architects and engineers can now download their drawings to iPads, iPhones, laptop and other handheld devices, and use them for on-site planning meetings dealing with practical issues on the spot.

The process has to be easy, though, with automatic synchronisation and updating of files between the work station and mobile devices. Hence the introduction of Vectorworks Cloud Services, part of the company’s Service Select subscription program that handles all processes in a very straightforward and simple manner.

**SERVICE SELECT SUBSCRIPTION**

Vectorworks Service Select maximizes a company’s investment in Vectorworks software. It is about more than maintaining customer loyalty though. Besides keeping customers up to date with application developments, it focuses the minds of software developers wonderfully well on their actual needs. The mere fact of developing a customer related programme fosters a mutually beneficial environment, with direct input from customers balanced against more focused support and training.

Cost comes into it as well, with programmes designed to optimise a customer’s actual requirements at the best possible price. The range of services available with the Vectorworks Service Select programme is quite extensive, and includes free software updates, upgrades of Vectorworks software as well as incremental product enhancements, additional learning resources and training and priority technical support.

Working to a scheduled programme also allows users to plan software and training budgets more accurately.

Vectorworks Service Select is the only route for access to the software’s web and mobile solutions, Vectorworks Cloud Services and the Vectorworks Nomad app, a view and markup application available for iOS, Android, and Kindle. It gives the user VIP access to new libraries, textures and other components, and you can even get a discount on training courses and other services along with access to a growing library of on demand learning tutorials.

**VECTORWORKS CLOUD SERVICES**

Besides providing an alternative computing resource, which lets users transfer resource intensive processes to the cloud, freeing up the desktop for more immediate tasks, the Vectorworks Cloud Services web portal allows users to view, share files and organise files from a web browser. It can also be used to download Vectorworks folders and files to mobile and web devices, synchronising them for use on site, and, after marking them up, annotating and otherwise commenting on them, uploading them automatically to the originating folder as a revised version. Vectorworks files can contain several sheet layers and viewports. To make this available on a mobile device, users log into their Vectorworks Service Select account, access Cloud Services, and open the Cloud Service Synchronisation folder.

Files of folders are merely dragged from one folder, together with all sheet layers or viewports, to the Synchronisation folder, where you can create sub-folders, if necessary, on the fly.

You can check on the status of uploads and the synchronisation process in the Recent File Synchronisation window, a process that could take some time depending on a number of factors: large file sizes, high sheet layer DPIs, complex textures, a lot of line or area lights in a scene, lots of light objects and shadows, and, of course, render settings set at the highest level.

When you synchronise the files Vectorworks Cloud Services uploads them in the specified Vectorworks Cloud Services folder to the Amazon cloud servers and then ‘processes’ them. You get a PDF containing the sheet layers from the Vectorworks file and a .VWX scene file for 3D viewing in Nomad. The PDF file is for sharing and markup through Nomad, or sharing through the Vectorworks Cloud Services web portal. Markups are saved as additional PDFs and are not merged back into the .VWX file, but are strictly a PDF based communication.

The Vectorworks user who receives the marked up PDF would then of course make revisions to their Vectorworks file. When those changes are made the file will be synchronised again in Vectorworks Cloud Services and the new version of the PDF and the .VWX file will be viewable in Nomad. Additionally, the version history for the PDF file is kept and is viewable by the user on the Vectorworks Cloud Services Web portal.

**LIMITS AND DROPBOX**

Users are limited to 5Gb of total storage on Vectorworks Cloud Services. If that’s not enough you can always use Dropbox, which is integrated with the service, enabling users to view and open Dropbox files in Vectorworks Nomad and the Cloud Services portal, and annotate PDF files stored in your Dropbox account using the Nomad mobile app.

It’s all about maximising the opportunities provided by the latest mobile devices - and it’s wise to get onboard now as the technology is evolving fast! www.vectorworks.net/service-select
The ninth Construction Computing Awards were held on November 20th at the Hotel Russell in London and, as with the previous ceremonies, they seem to have grown once again. Over the following pages we’ve invited our winners to give us a quick overview of their trophy-worthy products, projects and teams, a testament to the success of the industry as a whole as we move further into 2015.

The Construction industry is currently going from strength to strength in the UK, reflected in the plethora of cranes gracing the London skyline. There is just as much going on underground as well, with Crossrail just one amongst a number of stations up for refurbishment, as I am sure anyone living and working in London knows.

Does the South East have a disproportionate amount of investments in construction? Without question! There are lots of prestigious projects in the rest of the country but, being spread out a bit, they lack the impact and scale of London’s ongoing work. One of the biggest, HS2, is explored in this issue of the magazine, but as we are concerned at The Hammers with celebrating the achievements of companies within the industry as a whole, we look forward to plenty more projects from around the UK and beyond being put forward for consideration for the 2015 awards.

Until then we’d like to wish our current crop of worthy winners a hearty congratulations and thank everyone who took part in the 2014 awards for making them such a success - from the readers of the magazine for voting through to our sponsors and everyone who attended the ceremony itself.

Oh, and be sure to keep an eye on the links below for the latest news on the 2015 Construction Computing Awards and to see photos and video highlights from the 2014 ceremony!

www.constructioncomputingawards.co.uk

Twitter: @CCMagAndAwards
2014 awards

One to Watch Company
WINNER: Sypro Management Ltd
RUNNER-UP: BIMobject

2014 was a great year for Sypro Management Ltd. We have experienced success and growth both nationally and internationally. Securing the award of One To Watch Company 2014 at The Hammers ceremony in November, was a great boost for our team and evidence we are doing the right things, in the right sectors. With the addition of newly released products into new sectors we are confident that come November 2015 we will be competing for more awards against large, credible businesses at The Hammer’s 2015

Best Use of IT in a Construction Project 2014
WINNER: Conject with conjectFC for Connect Plus
RUNNER-UP: RedSky IT with Xcipio for Portview Implementation

"Implementing robust financial control, effective quality management and collaborative working across teams are outcomes we strive to provide all our clients. The fact that one of our clients (Connect Plus), has been recognised by Construction Computing for utilising Conject to achieve measurable and sustainable business improvement on the M25 works programme, is a hugely rewarding signal. It confirms that our team’s focus on improving outcomes for our clients is considered best-in-class." - Steve Cooper, Managing Director, Conject Ltd.

Best Use of IT in an Infrastructure Project 2014
WINNER: Arup with MassMotion for Union Station, Toronto
RUNNER-UP: ComplyServe with ComplyPro for Qatar Rail Integrated Rail Programme

Everyone values recognition from their peers, so winning was a great boost for the MassMotion team around the world; especially as it came at a time when putting the finishing touches to MassMotion Flow. This makes our 3D crowd simulation technology available to a much wider audience working on projects of any size. Following our success at Union Street Station, Toronto, MassMotion continues to be chosen for major projects around the world including Rail, Stadia, Airports and Theme parks; and have the ability to try new designs, plan for evacuation procedures or simply provide invaluable information about the efficiency a building.
BIM Project 2014
WINNER: Mott MacDonald Ltd with Autodesk Revit for Multi-discipline Station Design on The Klang Valley Metro, Malaysia
RUNNER-UP: Jonathan Reeves Architecture with Vectorworks Architect 14 for Lee Bay, North Devon

It is a great honour to have won "the Hammers" BIM Project of the Year award. It has been a real boost to the multinational team who have worked so hard on the project over the past 4 years.

The project has been something of a game changer in many ways. Our multidiscipline teams collaborated across continents for the first time, through the use of BIM: we were instrumental in introducing our client to the benefits of the BIM environment. Our teams built on their BIM experience and developed innovative ways of working together and extracting data from the models. We are continuing to build on the experiences of this project.

Best use of Visualisation 2014
WINNER: Solius with Autodesk 3ds Max, Adobe AfterEffects, PhotoShop, Vray, Unity 3D for Radisson RED
RUNNER-UP: Peregrine Mears Architects with Vectorworks Architect 14, Artlantis, SketchUp, Adobe for Petroc Further Education College

Solius were absolutely delighted to win a Hammers award for our work on Radisson RED, and would naturally like to extend a very sincere thanks to everyone who voted for us! Our approach to the Radisson project centred on being involved early in the design process, and returning maximum engagement and value by transforming high-quality CGI content into exciting, bespoke, interactive software. This end-to-end 'content to engagement' approach is something we have developed over recent years, and to see it recognised in this manner was very exciting indeed.

Contact us: sales@soluis.com / 0141 548 8686 / 0203 301 6321

Building Performance Simulation Project 2014
WINNER: IES with Apache HVAC tool for John Lewis York
RUNNER-UP: Sefaira/Sheppard Robson - Sefaira PlugIn - Bechtel House Facade

We are delighted to have received the trophy for Building Simulation Project 2014 in the Construction Computing Awards for the use of the IES ApacheHVAC tool on the John Lewis York store. It's terrific to have our software recognised for its unique and in-depth capabilities and on such a fantastic project. Special recognition must go to Building Design Consultants, Lateral Technologies and Controls company, Next Controls. The collaboration between the designer, controls specialist and us (the technology company) is what makes the project so special. Since the stores opening in April 2014, the companies have undertaken a unique integrated data acquisition process with Next Controls monitoring and collecting real operational data from the store for Lateral Technologies to analyse using our state of the art technology, IES-SCAN. This process has proved to be a very worthwhile exercise and we are extremely proud to be part of this very successful project.
Collaboration Project 2014
WINNER: LSI Architects with Graphisoft ArchiCAD for UEA Crome Court Student Residences
RUNNER-UP: Tekla (UK) Ltd / Waldeck - Tekla BIMsight - London Bridge Station

This £10.1 million project was the first on the UEA’s estate to implement BIM Level 2 with a specific focus on delivering a complete 6D Asset Information Model (AIM) and comprehensive COBie Data Drop 4 for use by the estates management team in CAFM software concept evolution. We were incredibly fortunate that everybody involved in the project bought into the BIM process and fulfilled their role and supported others to fulfil theirs. We believe that when teams work collaboratively, they become better than the sum of their parts.

The practice and collaborating parties are delighted to have received recognition for their work with this award and will be explaining more on the process at BIM Show Live in April.

Team of 2014
WINNER: Dome Technology - iSnag Team
RUNNER-UP: URS Infrastructure & Environment Ltd - Technology & Data Solutions Group

Dome Consulting is a consultancy practice providing commissioning management, operation & maintenance and other building services-related roles for the construction and property development industry.

Dome Technology provides innovative software solutions such as Dome Connect, the powerful project collaboration and O&M platform, and iSnag the pioneering mobile snagging and defect management application that took the accolade of Team of the Year at the recent Construction Computing Awards. 2015 will also see Dome Technology launch its new software platform, Gravity - the next generation in BIM coordination and delivery, project collaboration, commissioning management, asset management and CAFM.

www.domegroup.co.uk
Email: central@domegroup.co.uk, Tel: +44 (0) 20 7440 9320

Cloud Based Technology of 2014
WINNER: Comply Serve - ComplyPro - Comply Serve Cloud Based Technology
RUNNER-UP: Safetybank and Higgins Group - Safetybank - The Future of Health & Safety Management

We were thrilled that our collaborative progressive assurance software, ComplyPro, received the Cloud based Technology of the Year award. We were also a runner up in two other categories: Infrastructure Project Of The Year, for our partnership with Qatar Rail, and Product Of The Year. ComplyPro is deployed on many of the world’s largest infrastructure projects and is fast becoming the de facto standard for delivering progressive assurance. These projects include the Doha Metro programme in Qatar, Etihad Rail and Riyadh Metro in Saudi Arabia, London’s Crossrail programme, Banedanmark Signalling and Electrification in Denmark and Adelaide Electrification in Australia.

Our engagement enables collaborative working between client and supply chain, from design through build assurance, whilst demonstrating evidence and visualisation of progress to key stakeholders. This progressive approach to assurance de-risks project gateways, timescales and budgets.
**BIM Product of 2014**

**WINNER:** Graphisoft for ArchiCAD 18  
**RUNNER-UP:** Autodesk - Revit

We are delighted that for the fourth year running, Graphisoft ArchiCAD has won the prized ‘BIM Product of the Year’ award at the Hammers. Four years, WOW! ArchiCAD continues to lead the BIM sector for design and modelling - realising the collaborative promise of BIM with IFC data exchange and COBie. We work hard to ensure that ArchiCAD supports the wider OpenBIM strategy whilst maintaining its leading BIM position. Huge thanks go to the readership of Construction Computing for taking the time to vote for ArchiCAD as the BIM Product of the Year. Receiving this recognition from users of BIM solutions, and from our peers, makes it all the more special.

To contact Graphisoft about ArchiCAD please email mail@graphisoft.co.uk or call: +44 (0)1895 876222.

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**Structural Design Software of 2014**

**WINNER:** Tekla (UK) Ltd for Tekla Structures 20  
**RUNNER-UP:** Autodesk - Robot Structural Analysis Professional

Tekla UK Ltd is delighted and proud to win the Structural Design Software of the Year 2014. We see this as recognition for the work we have done promoting the fact that Tekla is much more than a tool used just in the structural steelwork industry. It has become an established and well-rounded BIM solution aimed at the entire construction industry. We would like to thank everyone who voted for us on this occasion and to pass on our congratulations to all those customers who use Tekla to design amazing innovative structures. Many of the projects our customers create push the software to its limits and in fact many of the landmark projects in the UK and around the world involve Tekla software at some stage, be it design, detailing, manufacturing or during the construction phase. As a market leader, we aim to continue to work with our customers to help them achieve their goals, creating accurately detailed and highly constructible building information models and delivering world class building projects.

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**Collaboration Product of 2014**

**WINNER:** Viewpoint for 4Projects by Viewpoint  
**RUNNER-UP:** Asite - Adoddle 17

“We greatly appreciate the recognition by Construction Computing and are equally proud that the construction industry at large recognises our products are making a difference in how projects are delivered. The Viewpoint team is a dedicated crew and consistently looks to improve construction software technology for the betterment of our customers and the construction industry at large.” - Rob Humphreys, Vice President Product Management, Viewpoint Construction Software
Document and Content Management Product of 2014
WINNER: Asite - Adoddle 17
RUNNER-UP: Bentley Systems Inc - ProjectWise

This is the third year in a row that Asite’s Ateam have won this respected award. The Adoddle platform is a mature and full-featured content management system which is designed to handle a wide range of content from intelligent forms to multimedia supplier catalogues running into the millions of line items, video, complex BIM and product models, and files of all types, stored in one central, secure repository. Asite are market leaders and educators in Collaborative BIM assisting property owners and the AEC supply chain to achieve level 2 BIM by 2016 in line with the UK government’s Construction Strategy.

Asite in collaboration with Comit IT and BIM4SME invite you and your teams to take part in this year’s biggest BIM competition for SME’s, Build Newcastle Live: www.buildearthlive.com/newcastle

We would like to thank everyone that voted for Adoddle and to the Construction Computing Awards team for putting on a great awards ceremony event.

Estimating and Valuation Product of 2014
WINNER: RedSky IT for Summit Estimating Valuations
RUNNER-UP: ConQuest - ConQuest Q Series

A big thank you to our customers for voting for us across the categories and for making Summit the best Estimating and Valuations Software product of the year 2014. This is a key module in the range of software that RedSky offers and has become an essential part of many of the businesses in managing their contracts.

More and more companies are opting to integrate all their key processes in integrated system as the benefits of using a single database for storing data are immediately realised when accessing for management information. Single Subcontractor and material database allows both estimators and surveyors access to the data in one place for easy production of budgets and valuation of work against them.

For more details contact us on 020 30028600 or access our website for case studies and testimonials www.redskyit.com

Construction Accounting Product of 2014
WINNER: Eque2 for EVision
RUNNER-UP: Access Group - Access Dimensions

Eque2 are absolutely delighted to receive the ‘Accounting Product of 2014’ award for the third consecutive year for EVision at the Construction Computing Awards. Powered by the latest Microsoft Dynamics NAV platform, EVision is our contract management software which is specifically developed for construction. EVision provides companies with full control of their commercial, financial and operational processes, helping to ensure that construction projects reach completion on time and to budget.

We would like to thank everyone who voted for us, our lovely customers, and our team at Eque2!

For more information on EVision or Eque2, please call 0845 080 4940 or alternatively you can email us at construction@eque2.com
Project Management / Planning Product of 2014
WINNER: Asta Development for Powerproject
RUNNER-UP: Trimble - Vico

Asta is pleased to have won the award for Project Management/Planning Product as recognition for the contribution that Asta Powerproject makes to the construction industry, and wish to thank all those who voted for their support. Available in stand-alone and enterprise versions, it has evolved over the years with input from our users and is the preferred software of thousands of construction professionals throughout the world who tell us they like it because it combines easy to use drag and drop functionality with powerful feature rich capability. The product continues to evolve with recent releases of Asta Powerproject BIM and Site Progress Mobile adding to the functionality available. Asta Powerproject: The power behind successful projects.

For more information see www.astadev.com

Hardware Product of 2014
WINNER: Faro - Focus x330 3D Laser Scanner
RUNNER-UP: NVIDIA for QUADRO K6000 Graphics Card

The FARO Laser Scanner Focus3D was able to prevail in the hardware product of the year category of the renowned Construction Computing award contest. The Focus3D impressed due to its extremely powerful and accurate three-dimensional measurement method, which offers numerous advantages compared with conventional measurement systems. By means of three-dimensional scanning of surfaces, the laser scanner can record all spatial and surface geometry with millimetre accuracy with approximately one million measurement points per second. Much less time is spent in data recording, compared with other measurement methods. The resulting colour image of 3D measurement points shows an exact digital reproduction of existing conditions. Detailed 2D and 3D plans and complete 3D models can be created in a very short time with the precise data.

We would like to thank you for voting for our product.

Editors Choice
WINNER: Nemetschek Vectorworks Inc - Vectorworks

We were delighted to receive the Editor’s Choice award, one of the most prestigious awards, at this year’s Construction Computing Awards. It is wonderful that Vectorworks is now recognised as a major diverse BIM solution for all types of construction projects from small to large and for all types of architectural practices no matter what their size.

For over 25 years, Nemetschek Vectorworks Inc has been a global leader in design technologies providing elegant architectural and landscape software that offers BIM capabilities in a flexible, hybrid-design environment. For more information on Vectorworks visit www.bimvectorworks.com or Tel: 020 8358 6668.
2014 awards

Channel Partner of 2014
WINNER: Excitech
RUNNER-UP: Graphisoft Connect

As a channel partner, Excitech aim to provide individualised solutions to our customer's needs, whether they are software, training, consultative or support related. The "Channel Partner of the Year" award is voted for by customers and is therefore testament to our continued hard work.

Adrian Atkinson, Excitech Managing Director, said: "I am proud to receive this award on behalf of Excitech for the eighth year running but refuse to become complacent. As industry innovations are developed, Excitech will continue to remain at the forefront, bringing the most up-to-date and relevant solutions to our customers whilst maintaining the same high quality of service."

Product of the Year
WINNER: Asite - Adoddle 17
RUNNER-UP: Graphisoft - ArchiCAD 18

2014 truly was the year of Adoddle, officially launched on March 17th in London's tech city. Adoddle 17 is already raking in accolades this year; finalist in the UK IT Awards for the Most Innovative Mobile App and now winner of the prestigious Construction Computing Product of the Year Award. Asite are set to change the face of Collaborative Software in the Cloud; with 360° clarity, Adoddle users are no more than two clicks away from their data.

Asite's CEO, Tony Ryan said, "Adoddle is delivering on my vision of simple but powerful Corporate Social Networking, or 'Cocial' Networking as we call IT at Asite. Our team are very proud to have won these two highly sought after awards."

Want to be part of the Adoddle revolution? Get in touch with the Ateam for a free demo or attend one of our global events. https://www.asite.com/newsroom/events

Company of the Year
WINNER: Viewpoint Construction Software
RUNNER-UP: Trimble

"Being recognised for not only the Collaboration Product of the Year award, but also for Company of the Year is remarkable, and a testament to the hard work the Viewpoint team has put into making a great product that makes available the right data, to the right people, at the right time.

The construction industry's adoption of our solutions continues to grow rapidly, as evidenced by the use of Viewpoint on recent projects with customers such as The Ministry of Justice, Hitachi Rail and Jaguar Land Rover amongst others.

Contractors and capital project owners are looking for new ways to manage their projects and we are poised to offer the products to make them more productive by refining the way entire project teams collaborate on the right data, when they need it." - Jay Haladay, CEO, Viewpoint Construction Software

One to Watch Product
WINNER: Bentley Systems Inc - ProjectWise Construction Work Package Server
RUNNER-UP: Comply Serve - ComplyPro

Architectural Design Software of 2014
WINNER: Autodesk - Building Design Suite Premium
RUNNER-UP: Bentley Systems Inc. - AECOsim Building Designer

Best Mobile Technology of 2014
WINNER: Bentley Systems Inc. for Bentley Navigator Mobile
RUNNER-UP: Graphisoft - BIMx
RedSky IT’s Summit system is the only truly integrated, construction specific, enterprise solution for the UK and Middle East markets. Summit covers the complete process within a single product:

Estimating & Tender Management, Budgeting, Planning, Requisitions, Procurement, Plant Management, Valuations, CVR, Job Costing Financials, Payroll & HR, Subcontractor Database & Management, Housebuilding, Service Management, Mobile Solutions, Document Management, Dashboards, Email Archiving, Forms Control, Workflow, Approvals, Alerting

**Scalability**
Whether you are a small growing subcontractor or a top 100 construction business there is a Summit solution to suit you, and as you grow you can simply add modules and licenses as required.

**IT Choice**
Summit gives you freedom of choice to choose the appropriate technology for your business: Hosted or on premise Microsoft SQL/Oracle Database; Windows or Linux; Scaleable thin client windows or web interface.

**Pedigree**
Over 1000 clients from your industry have chosen RedSky IT. These secure partnerships drive an unrivaled depth of functionality into our solutions.

**Customer Driven Solutions**
As authors of our solutions and not resellers of a 3rd party product, RedSky IT and our customers make the critical decisions regarding product direction and development.

For more information, call 020 3002 8700 or go to www.redskyit.com
As population pressures in metropolitan areas rise, major world cities often respond with expanding networks of trains to promote more efficient travel. The London Underground is no exception: it now serves Greater London and surrounding counties with 270 stations and 250 miles of track. Some 1.23 billion passengers were carried in and out of the region in 2012/2013.

At the geographic heart of this system are the world’s first underground railway tunnels, opened in 1863 and built just below the surface of metropolitan London using the cut and cover method. Later, circular tunnels - giving rise to the nickname ‘The Tube’ - were dug through the London Clay at a deeper level.

Now celebrating 150 years of operations, the Underground is still growing: The current Bond Street Station Upgrade (BSSU) project, slated for completion in 2018, has been dubbed “one of the most complex tunneling projects in the U.K.”

As London’s future Crossrail line intersects with the Bond Street Station, passenger numbers in the expanded interchange are expected to rise from 155,000 to 225,000 daily.

What makes the BSSU so complex is all the construction that is already there, located in London’s busiest shopping district, the West End, and comprising a complex web of train tunnels, pedestrian walkways and escalators that include connections to the Jubilee and Central lines. “The new tunnels are located in close proximity to so many existing ones,” says Dr. Ali Nasekhian, senior tunnel/geotechnical engineer with Dr. Sauer and Partners, London, the firm providing tunneling expertise to the project. “As a result, the design challenges we faced included complex tunnel geometry and alignment, limited clearance to existing building foundation, restricted worksite and strict settlement criteria.”

Dr. Sauer and Partners have been designing railway and road tunnels for over 30 years. In 2010 the company was subcontracted to a joint venture of Halcrow and Atkins (the main contractor is a Costain Laing O’Rourke JV), and has responsibility for preliminary-to-detailed design and construction on all BSSU sprayed concrete lined (SCL) tunnels. These include two access shafts, one lift shaft, four construction adits (entrance passages), two binocular cross passage tunnels, four large concourse and connection chambers, three underpass tunnels, two over-bridge tunnels cutting through existing platform tunnels, two niches for electrical and mechanical equipment and four inclined tunnels for escalator barrels. The total length of tunnels, at widths varying between four and 10 meters, amounts to some 450 meters.

The Dr. Sauer design team of eight engineers used Dassault Systèmes’ SIMULIA, Abaqus finite element analysis (FEA) software to perform all 3D numerical analyses ahead of the main tunnelling works. (Tunnel excavation began in the summer of 2013, with completion scheduled for 2015.) Dr. Sauer & Partners have employed Abaqus since the 1990s. “We find SIMULIA’s Abaqus solver to be very powerful, stable and speedy for plastic analysis of models with large numbers of elements,” says Dr. Nasekhian, who led the FEA modeling effort. “It is well recognised that the quality of FE models is largely dependent on the quality of the mesh. Of course, finer meshes require a larger number of elements. I myself had not used Abaqus before joining the Dr. Sauer team, and I found that pre- and post-processing, and creating and manipulating large, complex geometries, is amazing with this software.”

If any changes need to be made in the geometry, which often happens when you are creating the most efficient design, Abaqus lets you modify them fairly rapidly.
Such handy tools available in Abaqus/CAE reduce the risk of delay in delivering large 3D FE models.

GEOMETRY MODIFICATION
For the geometric foundation of their FEA models, the team first considered importing existing CAD models of the station complex from another type of software. But conversion and meshing issues would have added extra work. “We preferred to create our own working geometries right within Abaqus/CAE,” says Dr. Nasekhian. “This enabled us to modify the geometries easily if we had meshing issues.”

In the preliminary design stage, the team conducted a series of 2D analyses to establish the varying dimensions of tunnels required along the different structures. Once the tunnel geometries were “frozen” in final form, the creation of the 3D models could begin.

For a realistic assessment of the stresses and strains imposed by the surrounding soil layers, the ground through which the tunnels are being dug was simulated alongside the tunnel structures. Including the subsurface geology of the London basin-layers of Chalk, Thanet Sand, London Clay, River Terrace deposits and “made ground” from hundreds of years of human occupation—provided for soil-structure interaction analysis.

The majority of the new BSSU tunnels are located within the London Clay stratum, which has a very low permeability. The conventional method of tunnelling known internationally as NATM (the New Austrian Tunneling Method), is being used. Known in the UK as the SCL (Sprayed Concrete Lining) method.

The tunnel is divided into several excavation sequences; after each sequence, sprayed steel-fiber-reinforced concrete (primary lining) is applied to the exposed ground with robotic sprayers, rapidly stabilising it. When excavation of the whole tunnel is completed and deformations of the primary lining become stable, a sprayed waterproofing membrane is applied, followed by a final secondary lining of steel-fiber-reinforced concrete for a fully watertight tunnel. At tunnel junctions, steel rebar reinforcement is employed as needed to further support areas under severe flexure and tensile stresses.

REALISTIC VALUES
The major construction sequences (i.e., step-by-step excavation and lining installation) were incorporated into the Abaqus FEA models to provide the engineers with insights into the influence of each construction stage on the new tunnel linings and the adjacent assets.

To improve their computational efficiency, the team divided the labyrinth of existing and proposed BSSU structures into three separate models that varied in number of elements from about 450,000 up to one million. “We selected the limit between two adjacent models in places where the distance between the closest two tunnels on either side of the models is more than three times the diameter of the larger tunnel,” says Dr. Nasekhian. “In very congested tunnelling areas where this condition couldn’t be met, we modelled a couple of tunnels by overlapping two of the models.”

Dr. Sauer and Partner’s Abaqus analyses provided them with:

- A good estimate of ground movement and volume loss during tunnel construction, including identifying trigger values beyond which a ground-movement management plan would be implemented.
- An evaluation of the stress being induced in the adjacent existing structures while tunnelling was taking place. Deformations in the FE model were initially set at zero and then propagated with ongoing excavation steps.
- Dimensioning the new SCL tunnels and a basis for calculation of necessary reinforcements, especially at locations of stress concentration, particularly helpful for optimising SCL design at tunnel junctions, which helped avoid a great deal of rebar installation.
- Assurance of face stability during excavation.

The Sauer design team found that realistic simulation with 3D modeling gave them a deeper understanding of the many BSSU tunnelling challenges and helped them reach the best design and construction solutions.

“In this very complex project, our Abaqus models helped improve our preliminary design, which was based on series of 2D analyses and the design team’s experience, and led us to an extremely well-detailed final design,” says Dr. Nasekhian. “The ease of working with Abaqus allowed us to develop a number of techniques that improved simulation fidelity and saved time when running such large models. The confidence we have gained from our analyses has helped us push forward the approval process more vigorously and is providing the highest quality of robust design to our clients.”

www.3ds.com/products-services/simulia/overview/
I was pretty ambivalent about HS2 until I attended the keynote speech about it at Bentley’s Infrastructure conference last November. Living in Somerset we weren’t really going to see much benefit from it, as it would take three hours to reach the nearest station and it is going to cost a good deal of money, as everybody reminds us.

A very convincing argument, though, was put forward by Professor Andrew McNaughton, Technical Director of HS2, who, besides outlining the long term benefits for the whole country, explained that the whole project both relied on and was going to test BIM to the absolute limits. The Professor has been advising on major rail projects worldwide - Australia, Japan, the US and Europe - for many years, and has spent time as technical Director at Crossrail before taking on his current role at the most prestigious, important and possibly litigious rail project since the inauguration of the current network a couple of hundred years ago.

Therein lies one of the problems. Network Rail are spending large sums of money in an attempt to bring the current network up to date - akin to performing “open heart surgery” as Andrew described it. This is exacerbated by the growth of our population - faster than anywhere else in Europe - and the migration to cities. Obviously, he said, we can’t have all of them living in the South East. Instead we have to improve access between London, the Midlands and northern cities, so it’s as easy to attend a meeting in Manchester as it is cross London.

He pointed to the benefits that high-speed rail has brought to France. “It brings people together - not just businessmen, but families and friends,” he said. And, to give an idea of the time savings involved, he quoted some interesting figures; London to Birmingham down from 1 hour 24 minutes to just 49 minutes, and to Manchester in just over an hour.

Birmingham, the main hub, will be just 42 minutes away from Manchester and 57 minutes from Leeds. The West Midlands Interchange, close to NEC, has been mooted as UK City Central, a new sustainable city only half an hour from London.

IT STARTS WITH PEOPLE
With the UK being one of the most densely populated countries on the planet, with a lot of existing infrastructure, one of the biggest problems is the impact on people along the route - and, Andrew added, just about every tree, plant, and animal has an articulate group of committed people who represent their interests.

The starting point therefore has to be the people affected, before any technical issues and final route are decided. The underlying philosophy of HS2 is, he said, that “We want people to travel and connect. In doing so, we will be able to rebuild and rebalance the UK economy, with the Midlands and Northern Cities becoming part of the UK ‘Powerhouse’ and not just London.” It should support the creation of up to 400,000 jobs and, he added, HS2 has already seen regeneration worth £10 billion since 2003!
TOTAL BIM SOLUTION

HS2 has been designed to run with maximum capacity, connectivity, availability and reliability. The Passenger Operation Concept has to cope with a high density of trains operating at speed with absolute safety and a minimum of stress for passengers. It also has to persuade the vast number of stakeholders that the project is necessary, viable and achievable.

The only way to demonstrate this in real time to everyone, right down to a property owner adjacent to the route who wants to see what it will look and sound like from his bedroom window, is to build a virtual model of the entire route and show them, using a GIS connected gViewer on a mobile device, what it will be like.

HS2 are building a virtual model of the entire project - a digital railway - which will ensure people who don’t normally get involved will be able to part in the process.

The vast amount of data required, already running into terabytes of information, will cover every element of the project, fielding constraints and issues that arise from trains running every 2 and a half minutes at 200 metres a second, the establishment of maintenance schedules, and the need to keep up to date with individual train and passenger status. How will it cope, for instance, with a Birmingham Football match running into extra time and disgorging thousands of extra passengers half an hour later than scheduled?

A 21st Century Railway is being created which will still be running in 200 year’s time, and as Andrew said “we want our great grandchildren to say that we got it right!” The only way to do that is to “Build it Twice” so that everything has been thoroughly evaluated before the physical railway is built.

A COMPLEX SYSTEM

Building a high-speed rail system is a complex business covering many fields, all of which tend to have their own constraints and language, from control systems, power supply, communications, the track itself, structures, foundations and earthworks, tunnels and bridges and even noise mitigation. It is going to cut across numerous waterways and existing infrastructure, which has to be circumvented or rerouted.

The only way that all of these areas can be combined is to create a single encompassing digital model using BIM. The data has to be viable for the whole life of the project, from construction, commissioning, operation, maintenance, renewal and adaptation through a life that will extend for the next 200 years.

BIM, though, goes beyond the physical aspect of the railway, and gets involved in the political and environmental issues associated with the project. It becomes a business transformation tool, altering the way such projects are run in the future.

Without BIM there is no means of getting planning permission for the myriads of elements along the route, no way of checking every possible aspect. Not a bad plug for BIM, is it?

A NEW CUSTOMER EXPERIENCE

Without BIM, Professor Andrew McNaughton said, we would have given up already. It allows us to use lessons learned on other projects, integrate BIM platforms, inculcate a collaborative approach to design, standardise data creation, optimise information flow and provide absolute quality assurance.

But, harking back to first principals, it’s the customer experience that will matter. We all use trains. How would you like to use a system that allows you to book a seat at any time right up to minutes before you board the train and be guaranteed a seat? Or be able to change your plans on the hoof if your meeting overruns or you get caught in the (road) traffic and yet, when you get to the station, be directed to the exact spot where your carriage and your most convenient door will stop? And all this from a system designed to load a 1000 seat train in a couple of minutes and which will run every 3 minutes.

It can work - but it can only be accurately assessed if you build it twice, first with a digital model that’s used to check every possible aspect. Not a bad plug for BIM, is it?

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AHEAD IN THE CLOUD

Conject tools support PIM (Project Information Management) and the AIM (Asset Information Model) - from Project Control to Defect Inspections and Operations & Maintenance

What’s the difference between Project Control and Project Management in the built environment? At first glance one might assume they are one and the same thing, but they really are quite different. Project Management is the hands-on management of building resources and the construction process, keeping individual projects on track and on budget. Project Control, on the other hand, delivers all this plus the flow of information and documentation; change management, the control of risk and compliance and the capture and analysis of data for all projects, tenders and contracts across projects and programmes.

Both are concerned with ensuring that projects are successfully completed, but a good Project Control platform is a central resource that provides a single view of project performance - and this is what is uniquely provided by conjectPC, the collaboration platform for the construction industry from Woking-based Conject. It provides management with a clear oversight of project duration, costs incurred and all aspects relating to quality and project scope.

The aim of BIM and Government Soft Landings is to improve outcomes for any built asset owner/user. The adoption of BIM methods requires increased collaboration between different stages of the construction process - the full supply chain as well as asset owners and users - to ensure that outcomes are fit for purpose and deliver cost savings. This requires the consideration of the whole life of a built asset, and as the infrastructure, construction and real estate industries ramp up their readiness for the UK Government’s BIM deadline of 2016, a critical enabler is a software platform that can perform as a

CDE (common data environment), is PAS1192 compliant and supports the handovers of data in the correct formats, from the PIM and then the AIM for asset users.

Nowhere is this more evident than in the range of applications available from Conject. The company has based its collaboration tools on the ability to manage and integrate individual data components in a project, and to then interpret that data and use it to create units of work - a principal component of COBie and PAS1192 compliance - facilitating the preparation of data for managing the whole lifecycle of a built asset.

The unique view of Conject is that its heritage in the construction and real estate industries, as well as in building software, gives the company a uniquely holistic view of the life of built assets. Conject software may be better appreciated by looking at two applications that embody the component data approach: conjectPC for Project Control and conjectMI for Defect Management.

CONJECTPC

conjectPC is all about data capture. It is a cloud-based application that captures, collates and analyses data, presenting it in easily digested formats so that decisions can be made in a timely manner, based on the very latest and most detailed information. It comprises a range of configurable, integrated modules that are capable of assessing the impact of interrelated activities and showing how each of these has an effect on the key drivers of a project, namely time, money, quality and scope.

A fundamental module is Document Management, which gives project members instant access to up-to-date documents and models, available using document movement requests from the project Dashboard, which can be configured to suit the requirements of individual project members. Also configurable are the project workflows, the routes and means for communicating with other team members, the ability to assign and control tasks, the sending and receiving of RFIs and other information.

For Operations and Maintenance (O&M) purposes the data can be ‘distilled’, analysing asset structures into their component parts. Much of this asset data is still viewed in 2D, but there is sufficient information alongside each asset to form an Asset Information Model (AIM), enabling users to view it in 3D, produce an IFC file and enable COBie reports to be configured out of the box.

conjectPC provides a Contract Management module, enabling teams to efficiently execute change requirements, manage communications and follow workflows for all contract types, such as those found in JCT or the ubiquitous NEC3 (for which Conject is a licenced content partner). Commercial Management looks at the financial side of things, allowing managers to handle their budgets, costs, forecasts and cash flows - the costs of projects versus actual costs.

Supporting all modules is Project Workflows, a toolset that maps project processes, monitors progress and ensures compliance with quality, health, safety and environmental standards. Project Workflows can be chosen from a set of preconfigured common industry processes such as query management, approvals and team communication, or easily configured based on the needs of
the project.

The Business Intelligence module provides managers with the means to design and deploy a bespoke report dashboard, providing instant access to real-time information within the conjectPC collaboration platform. Report frequency and layout is user driven, helping project members to control risk, manage processes and change more effectively.

**CONJECTMI**

conjectMI is a cloud-based mobile application running on iPad or Windows tablets, enabling on-site teams to visually inspect work carried out and report on it in real time. By getting rid of paperwork and the trek back to the office to hand in snagging reports - not to mention the errors arising from third parties keying in data from grubby record sheets - it has been estimated that conjectMI can reduce data capture times by 40%, report editing by 90% and preparation time by 60%. In fact a major contractor, ISG, has recently reported that it resolved defects in 200% less time than it took before using the tool.

Snagging has become a real-time process, with defects immediately updating the drawings and alerting responsible parties for action, thereby improving construction quality and efficiency and contributing to on-time project completion.

Defects management work can be carried out offline with conjectMI. Before leaving the office, inspection schedules, drawings and other information can be downloaded to a tablet. This is useful when working on construction sites without internet access, or when underground. Snagging work can be conducted offline and, when internet access is again available, the new data can be synched to the web platform, thereby updating all team members with the latest information.

An instant view of completed and outstanding defects items is available at any time, showing the status of each. This can be customised to produce individual work phases, defect types and acceptance stages, so that resources can be allocated more effectively and trade teams (carpenters, electricians) assigned to dedicated snagging tasks. This effectively enables a complete snagging workflow management process to be implemented through the life of a project.

The snagging operation is quite straightforward. Users can bring up the appropriate room plan in 2D, select the component to be checked, and fill in a report - adding text, photo or audio comments as required to fully describe the problem. Access to the project space also provides other benefits, such as the ability to search for similar defects on associated products.

To inspect, find and allocate the resolution of a snagging defect to a sub-contractor requires the setting up of a simple workflow, highlighting and informing the team responsible for its solution, the timescale in which it has to be carried out and subsequently rechecked, and the results uploaded. All of this is handled in a simple spreadsheet format within ConjectMI, showing items that need to be checked within different phases and building zones, along with the responsibilities of the contractors, colour-coded to show whether they have started, are in progress or have completed.

Clicking on elements allows the relevant 2D drawing to be brought up that display the snagged components, using sliders to optimise small scale drawings within areas that contain a large number of defects. After the inspection process, reports can be compiled, together with relevant images and videos for transmittal to all relevant parties.

**ABOUT CONJECT**

Conject is a leading international software company, providing SaaS solutions to support BIM and manage key processes throughout the plan-build-operate lifecycle for the AEC industries. The Conject mission is to help its clients increase quality, reduce costs and better manage risks across their property and infrastructure portfolios.

Conject operates in 14 international cities; the UK office is in Woking. Conject applications are used by more than 40,000 businesses worldwide, and every month more than 3,000 new users of Conject software.

www.conject.com
You would be forgiven for thinking that the analysis of the flow of people through a building required a specialist application and the input from professionals who specialise in that area. Certainly, the case studies tend to focus on the mostly on large scale users of these applications, including a recent case study in this magazine on the redevelopment of Toronto's Union Square Station, which utilised MassMotion, a crowd analysis application developed by Oasys, Arup's software division. In fact Arup won the best use of IT in an Infrastructure Project 2014 for their Union Station work at the Construction Computing Awards in November (see the rather large Awards section in this issue for more details!).

However there are many other, smaller projects that could usefully employ traffic analysis to hone their designs. Designers of sports stadiums need to understand the rate at which they could be emptied at the end of a game; hospitals and other public buildings need to plan for rapid evacuation in the event of an emergency; and even cruise ships need to plan for pedestrians!

It's an obvious use for such an application when you think about it, as the latest cruise ships are like small, crowded and enclosed towns, with some serious access issues. Recognising the wider appeal of the software, Oasys has now introduced a scaled down version of MassMotion, MassMotion Flow, which is suitable for use by architects and fire engineers on smaller projects. It enables them to analyse specific pedestrian flow situations, and to subsequently modify their designs to provide better space optimisation and improved access.

MassMotion Flow is based on exactly the same analytical engine as the full version of MassMotion, with all of the real-time 3D visualisations and reporting capabilities in place. It does have limited capability to analyse complex events - such as the arrival and departure of trains at a mainline station, or security at an airport - and allows architects to single out specific events and to analyse human traffic flow around them.

It also lacks the ability to create Agent Actions for the thousands of human 'agents' that populate a typical MassMotion model. MASSMOTION

What, you may ask, are Agent Actions? Rather than having agents sticking to a predefined route through a 3D model, each is endowed with a task and sufficient intelligence to enable it to make simple choices - for instance if an elevator is busy, to head for the stairs instead. In fact the software looks at all of the idiosyncrasies of human behaviour, and as they pass through defined locations on their route - check-in desks, ticket barriers, baggage carousels - they can be issued with a 'token' that redirects them straight to the departure lounge or platform, or towards a café, a retail outfit or the loo!

The creation of security gates and agent tokens demands considerably more time and processing capability, time which an architect would wish to devote to more simple movement analysis tasks, and they will find more than sufficient functionality in MassMotion Flow.

Vision maps are another useful reporting function available in MassMotion, tracking track where agents look (cumulative eyeball time!) whilst they are proceeding through a concourse. The software assesses the information and presents it within a colour-coded 3D model to show the best positions to place adverts and other signage.
MassMotion Flow can obviously be used for space planning, which determines the flow of traffic and, surprisingly enough, it can use agents whose tasks have previously been created within MassMotion, as both levels of the software use the same simulation engine. This would enable architects to extract portions of the main model and run them for specific situations - a collaborative function that fulfils the software's BIM credentials. To be more specific, MassMotion models can already be used in MassMotion Flow, and the reverse will be available by the end of the year.

**MASSMOTION FLOW**
Rather than being used to calculate complex interactions within an airport, then, MassMotion Flow is more directly concerned with space planning. For instance, it analyses flow rates through a given area, say from the time that passengers step off a train or a plane to when they reach the station exit, or evaluates whether the capacity of a stadium section and its doors comply with the Green Book (the guide to safety at sports grounds).

MassMotion, by comparison, would link train or flight timetables to its analysis, and simulate all actions from passengers switching trains, exiting, buying tickets, being processed by security, or just standing about on the concourse.

**MASSMOTION MODELS**
MassMotion previously used Autodesk’s Softimage as a modelling and visualisation tool. As that software is now only available as part of a suite, and has been superseded by 3ds Max, Oasys is weaning MassMotion away from its reliance on the software, preferring instead to use proprietary software tools that do the same. MassMotion Flow only uses the proprietary version, whilst MassMotion uses either Softimage or the proprietary version.

3D models can be imported from all leading 3D architectural applications, Revit perhaps being the most popular at the moment. Revit models can be quite large though, and a typical project can include individual models for station buildings, platforms, underground trains, elevators, and so on, which have to be integrated as a single model. Fortunately, much of the detailing can be stripped out to reduce the overall size of the model required, leaving only the spaces and relevant features for the analysis - essentially a MassMotion problem for expert users. Even then, a simulation on a typical project for a prominent London station (which uses five Revit models stitched together) could take two hours to run a four-hour PM peak simulation.

**MASSMOTION OUTPUT**
The results you can achieve are similar for both MassMotion and MassMotion Flow. The 3D models can be viewed in any format and orientation and from any angle, right up to fully rendered models for presentation purposes. The human models are available in different characterisations, or as token people, depending on the scale of the model and tasks assigned, and they are given a lifelike walking gait for real-time walkthroughs.

Reports can be presented as video displays, in graph format, showing densities through given location over a period, with a timeline running through the graph. Both the graph and the video can be run simultaneously on the same screen. Other output includes the Vision Map, outlined above, Count Maps, which show the numbers of agents passing through a point at a given point in time, a number of tools for exploring agent egress in different situations, and various Density Maps for showing congestion levels.

Movies, images and data files can be extracted and used for many purposes, showing how buildings work or don’t work: an important aspect of all modern construction. Measurements can also be taken out of the software as well, to be used by the emergency services for their planning and training purposes.

**MASSMOTION FLOW TRAINING**
Because MassMotion Flow is aimed mainly at architects and fire engineers for more specific and smaller projects, it comes at a lower price than MassMotion. Users who may not have analysed pedestrian movement before can be provided with a couple of days training, enabling them to adapt to the concept and processes involved. With the emphasis on building performance being so important these days, it is only logical that similar emphasis should be placed on user (pedestrian) performance. The configuration of this software does appear to provide a task for almost any conceivable pedestrian activity. www.oasys-software.com
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