

BIM TODAY

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Counting the carbon cost

AECOM's Rhys Tyler and David Philp on how BIM can shape the transition to net zero emissions



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Introduction

Welcome to the September edition of BIM Today.

In our cover story, Rhys Tyler and David Philp of AECOM examine how BIM and machine learning can be deployed to count the cost of carbon and ultimately transform what we build - and how we do it - as the built environment works towards net zero emissions.

Women in BIM's Gergana Staykova details the group's webinar at July's online Festival of BIM & Digital Construction, which included contributions from Natalia Diaz of AmbientePRO in Chile, Giulia Pustorino of Uruguay's /ARCHSOURCING and Giulia Pustorino of UK-based Align Property Partners, who discussed their experiences of BIM transformation around the world.

Elsewhere, BIM4Water chair Jamie Mills talks about its growth as a cross-industry voice for digital ways of working in the water sector, and its continuing efforts to expand during the Coronavirus pandemic.

In addition, we have BRE Group chief executive Gillian Charlesworth on a sustainable recovery from Covid-19, Fiona Moore on the Centre for Digital Built Britain's BIM Interoperability Expert Group and Construction Innovation Hub programme director Keith Waller, who discusses the launch of the Value Toolkit designed to transform decision making in the industry.

Nick Tune, digital engineering director at Atkins, looks at CUSP, a partnership with Cardiff University to develop an advanced digital twin programme, while Peter Ruffley, chief executive of Zizo, argues that robust data is the foundation of digital transformation.

Following a world-first agreement to install real-time sensors in thousands of social homes in Renfrewshire, Dane Ralton of iOpt argues the time has come to make IoT adoption in housing the "new normal". Nick Sacke of Comms365 says that with IoT sensor deployments being expanded in smart cities, hospitals, transport networks and more, stakeholders must understand how to integrate these new data sources into existing platforms to make the most of them.

There is a look at the Scottish Futures Trust's new Standard Information Management Plan, which aims to embed BIM processes in the Scottish Government's £1bn Learning Estate Investment Programme, while Adrian Timberlake of Seven Technologies Group examines the potential of BIM platforms in planning counter-terror strategies for large national infrastructure projects.

In our Case Studies section, we showcase the application of digital construction technology around the world, from the use of 3D scanning and AI to track work quality in real-time in a new Norwegian hospital to the BIM modelling and digital twin that are shaping Parramatta Square, part of one of the biggest sustainable urban revitalisation projects in Australia.

A special thank you to our contributors, who have taken the time to share their expertise and insight in exceptionally difficult circumstances, and if you would like to get involved, please do feel free to get in touch.

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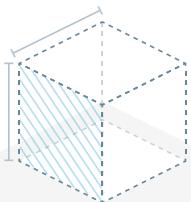
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Michael Murphy

Digital Construction Operations Manager, BAM Ireland



AECOM designs the world's first LEED Platinum arena,
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Counting the carbon cost to transform building

The drive towards a more sustainable environment is important ecologically and economically. Rhys Tyler and David Philp of AECOM discuss how BIM and machine learning can be deployed to count the cost of carbon and transform how and what we build

Governments and investors are increasingly counting the carbon cost of the built environment, which is responsible for a third of global carbon emissions. The use of Building Information Modelling (BIM) to capture intelligence expands the traditional role of BIM to include modelling energy performance across an asset's lifecycle to measure and track sustainability targets such as embodied carbon or energy efficiency.

This is important. It means we are being more proactive and moving from measuring carbon to reducing it wherever possible. AECOM was the first US-based company in the engineering and construction sector to get our emissions reduction targets approved by the globally recognised Science Based Targets initiative (SBTi). These targets include a 20% reduction in Scope 1 and 2 emissions and a 10% reduction in supply chain emissions by 2025 from our 2018 baseline.

Achieving net zero carbon across portfolios is a strategic organisational priority for everyone in the built environment as we develop and retrofit assets. There is a new urgency

post-Covid to renew focus on sustainability policies so that any recovery is a green recovery. At AECOM, we are using BIM together with convergent and emerging technologies such as machine learning to help our clients meet their sustainability goals. For example, in Sacramento, California, we designed the world's first LEED Platinum arena, which is also the first 100% solar-powered professional sports venue. Using rapid engineering techniques such as generative design, AECOM is helping our clients explore various design options and optimise their carbon footprint to determine whole-life sustainability costs to ensure clients can minimise their carbon footprint as much as possible.

So how can we count the carbon cost effectively?

Optioneering at the outset

In the UK, AECOM collaborated with the University of Sheffield to create [regenerate](#), an open source tool which helps organisations adopt circular economy principles to eliminate waste and reuse resources. The tool highlights design strategies that have positive impacts on the



Circular economy principles for buildings

[Click to enlarge](#)

Rhys Tyler

project build and ensures a minimisation of waste across the project's life.

"Machine learning packages don't require expertise in the statistical principles to use – and offer previously unobtainable levels of computing power at a fraction of the cost available 10–15 years ago. That's great news for the construction industry and the sustainability agenda."

In order to bring down carbon emissions across a project's life, we can also look at a variety of material options available, so we are actively sourcing lower carbon and 'local' products. AECOM has developed an effective toolkit that counts carbon early in the design process. Iterative design calculations create efficiencies in quantity take-off.

"The toolkit is designed for fast speed decision making using a parametric 3D model quantity extraction process to calculate the impact of embedded carbon that can be tested through the design stage," said Rhys Tyler, head of benchmarking & efficiency, cost intelligence UK&I. "We're excited to be creating an early stage energy performance evaluation using new technologies."

Machine learning to inform decision making

New technologies such as machine learning can further inform our decision making, particularly on projects

where constraints are numerous and the client may have hundreds of options to choose from. Machine learning can be informed by qualitative data from material specifications and standards such as BREEAM, LEED and WELL, as well as quantitative data, ie cost and carbon, to make decisions that are weighted towards better carbon outcomes. Its deep analysis has the potential to identify specific components, services or use cases that can be modified to decrease carbon footprints and predict ways these variables will change over time.

Recent advances in processing power, storage capacity and cloud services have made machine learning a more affordable tool for commercial organisations in the built environment. Machine learning packages don't require expertise in the statistical principles to use – and offer previously unobtainable levels of computing power at a fraction of the cost available 10–15 years ago. That's great news for the construction industry and the sustainability agenda.



David Philp

AECOM is currently collaborating with two UK water companies on applying machine learning to their historic cost data to improve predictive accuracy and identify the asset information that would be most beneficial to define or collect as early as possible in the design process. The improvement of data collected leads to more accurate calculation and quantification of cost and carbon.

Material selection and supply chain decisions

With Environmental Product Declarations (EPDs) and properties in interconnected data dictionaries, we can review and assess embodied carbon and other environmental impacts and bring this information into our BIM environment. Ensuring we know down to the smallest nut and bolt how supply chain decisions will impact client goals can be critical to reducing the carbon cost of a build, refurbishment or maintenance activity.

AECOM's David Philp comments that applied technology constellations such as BIM, dynamic simulation modelling and digital twinning can help us model and understand

the parameters of sustainable operations and optimise whole-life CO₂ outcomes, transforming how and what we build. With a drive towards high-performing assets and encouragement to use high-performance computing, energy analysis and the Internet of Things (IoT) to automate processes, we can better achieve the fundamental goal of net zero.

"Interestingly, we're finding net zero build operators are expanding their carbon reduction programmes to include the service provision and the asset's end user," he said.

"Clients are engaging end users more and more and beginning to use gamification or energy use applications in order to achieve full lifecycle sustainability."

Unifying data

Looking to the future, establishing a greater link between BIM and GIS data will help us advance our geo-analytics approach pinpoint the precise location of potential suppliers so we can make better informed procurement decisions based on a project's location. For example, teams working on a project hundreds of miles away will need to learn more about the client's local supply chain and model the use of a variety of materials based on longevity, carbon footprint and logistics. This will help extend the 'buy local' philosophy from the grocery store to the broader AEC industry and help local or regional suppliers to compete with global competitors who may have a cheaper product but cannot offer a similar low carbon footprint.

Rhys Tyler

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Digital technology supports HS2's supply chain management

Digital transformation helps EKFB maximise project performance across an 80km section of the UK's new high-speed rail link between London, Birmingham and the North

Causeway announces a partnership with Eiffage Kier Ferrovial BAM (EKFB), one of the joint ventures working with HS2 Ltd to deliver civil engineering works for the UK's new high-speed rail project.

The objective of the partnership is to use digital technology to provide the insight required to help EKFB deliver its HS2 contracts on time, on budget and to the highest possible standards.

Causeway's software solutions will support supply chain management, electronic invoicing and help EKFB maintain transparency into costs and visibility of real-time project performance. This will enable the commercial management teams within EKFB and HS2 Ltd to maximise the efficiency of the project.

A digital strategy to expose real value from data

David Lowery, executive director at EKFB, commented: "We want to be known for championing innovation. A key part of our strategy is to make the best use of data integration to provide one source of truth, in real time."

"We work with key industry suppliers and business teams to use data to increase

productivity, health, safety and wellbeing on site. Our digital strategy helps us to expose real value from data to manage operations, keep costs down and take a proactive approach to issues to drive the overall efficiency.

"Causeway offers the expertise and experience we need to manage an expansive supply chain and monitor the construction of many assets, including 15 viaducts, 6.9km of green tunnels, 22km of road diversions, 81 bridges and around 30m cubic metres of excavation. Cost management is essential to our success and Causeway is the partner that has the innovative capabilities to help us deliver our part of Britain's new low carbon high speed railway."

According to recent research by Causeway, two-thirds of construction professionals believe that digital solutions led to improved decision making, and 61% said that data sourced via a new digital solution improved collaboration, with 55% believing that real-time information was a key benefit of utilising new techniques.

Causeway's cloud-based e-invoicing, automated cost management, and centralised supply chain management solutions will provide real-time visibility of operational

performance, providing EKFB with the ability to optimise frontline efficiency and maintain control of delivery. The solution will help reduce EKFB's carbon footprint through a paperless supplier accreditation process and electronic trading.

"As one of the largest rail infrastructure providers in the United Kingdom, EKFB's decision to appoint Causeway is a testament to our steadfast commitment to developing best-in-class construction software solutions and our proven track record in the market.

"We are delighted to bring our expertise and experience to EKFB and are committed to making the construction of HS2 a success," said James Atkinson, EVP, Causeway.

To learn more, speak to [Causeway Technologies](#).



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Smart buildings and wellbeing: Wearing your heart on your HVAC

How long before your building “knows” more about you than you do yourself? BSRIA’s Dr Michelle Agha-Hosseini and Henry Lawson take a look

How long before your building “knows” more about you than you do yourself? As ever-more processing is crammed into smaller, lighter and cheaper devices, it was only a matter of time before people would be able to wear them as they go about their everyday lives.

I am wearing a smart watch as I write this, which is collecting all kinds of information about my movements, the amount of exercise that I take, my heart rate and more. This information can then be transmitted to another device or computer. It can also tell me when, for example, I get a phone call or email. This shows how wearables can transmit information in two directions: information about the wearer can be shared with the outside world, while the same wearable updates the wearer on what is happening in the wider world.

Comfort in buildings is “hot”

Perhaps not surprisingly, it hasn’t taken long for people to find ways in which wearables could be used to improve the inter-relationship between buildings on the one hand, and the people who live or work in them, or visit them.

One factor that is giving this movement legs is the growing emphasis on comfort and wellbeing in buildings, and the attempts to find ways that building technology can contribute to this. But how does one measure wellbeing, let alone optimise it? One way, of

course, is to ask people and there is good evidence that the mere fact of being consulted can increase people’s satisfaction and potentially their performance.

“Experience suggests that, if the wearer has a positive incentive to share their data then they are more likely to opt in to a scheme where wearable data is shared. The fact that most of us now, almost half consciously, share a huge amount of personal information via our phones or PCs is an indication of how much people might be willing to share when there is something in it for them.”

However, as anyone who fills in surveys will know, this can also become a tiresome distraction. So what if my watch can work out whether I am tired or too hot or too cold and tell the HVAC system, which can then adjust ventilation or temperature in my area without my having to ask?

Use (and misuse) of wearables

It would also provide objective information about the physical wellbeing of people in buildings, which would potentially be both more precise and more objective than

what you might learn by asking them. This immediately raises some challenging questions. The most obvious one relates to data privacy. Where data is shared with a building system, what control can there or should there be over its being seen or used by the people managing the building or even by employers?

If I am seen to be “falling asleep” (or worse) at work, could this lead to intrusive questions about my private life? At the very least, there would need to be clear and accepted rules about who can use this data and for what purposes, and what procedures are required to secure it against illegitimate access or use.

Experience suggests that, if the wearer has a positive incentive to share their data then they are more likely to opt in to a scheme where wearable data is shared. The fact that most of us now, almost half consciously, share a huge amount of personal information via our phones or PCs is an indication of how much people might be willing to share when there is something in it for them. Employees could be incentivised by stressing the health benefits of smart wearables, while customers could be attracted by special promotions relevant to their interests.

Making the building respond in the right way

There is also a practical hurdle to jump over. If I have detailed information about the state



of say 200 people in my building then this data will be of limited use unless the building system is granular and responsive enough to fine-tune conditions to meet individual preferences. Sensors will need to locate individuals accurately and, more importantly, the HVAC or lighting system needs to be capable of providing very localised conditions which can then follow a person round a building.

"Ultimately, wearables provide valuable hard data about employees' health. If the data is studied along with qualitative data gathered through occupant surveys, a comprehensive picture of the workplace can be established."

Without this granularity, data provided by wearables will have more limited value, for

example in setting a temperature that meets "average" preferences for a whole floor of a building.

BSRIA has already held two highly successful workshops on the subject of wearables and will be monitoring the development of this technology. The technology is definitely becoming available.

Wearables create and maintain a healthy workplace

Ultimately, wearables provide valuable hard data about employees' health. If the data is studied along with qualitative data gathered through occupant surveys, a comprehensive picture of the workplace can be established. The BSRIA Occupant Wellbeing (BOW) survey can be used along with data from wearables to indicate whether, and to what extent, employees' health is correlated to and affected by the physical factors of the workplace. This information can help building

owners and operators maintain and control their buildings better.



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BIM around the world with Women in BIM

In July, Women in BIM (WIB) hosted a webinar for the online Festival of BIM & Digital Construction, featuring a discussion on BIM Across the Regions. Here, the panellists examine the topics raised and their experience of BIM around the world

The webinar was moderated by core WIB team member Gergana Staykova. Gergana has been part of the digital engineering team at Laing O'Rourke for six years, working on many high-profile projects across the UK. Having grown up in Bulgaria, studied in Denmark and worked in Germany and the UK, Gergana was able to immerse herself in the international topic of discussion and explore the differences and similarities of BIM adoption across the regions with great interest.

Gergana's questions were answered by a panel of WIB regional leads, representing different corners of the world: Claudia Antunes, BIM consultant at StratBIM from Coimbra, Portugal; Giulia Pustorino, BIM architect at Align Property Partners from Cumbria, UK; Mercedes Carriquiry, founder of BIM consulting and production specialist /ARCHSOURCING from Montevideo, Uruguay; and Natalia Diaz, project director at AmbientePRO from Santiago, Chile.



Gergana Staykova

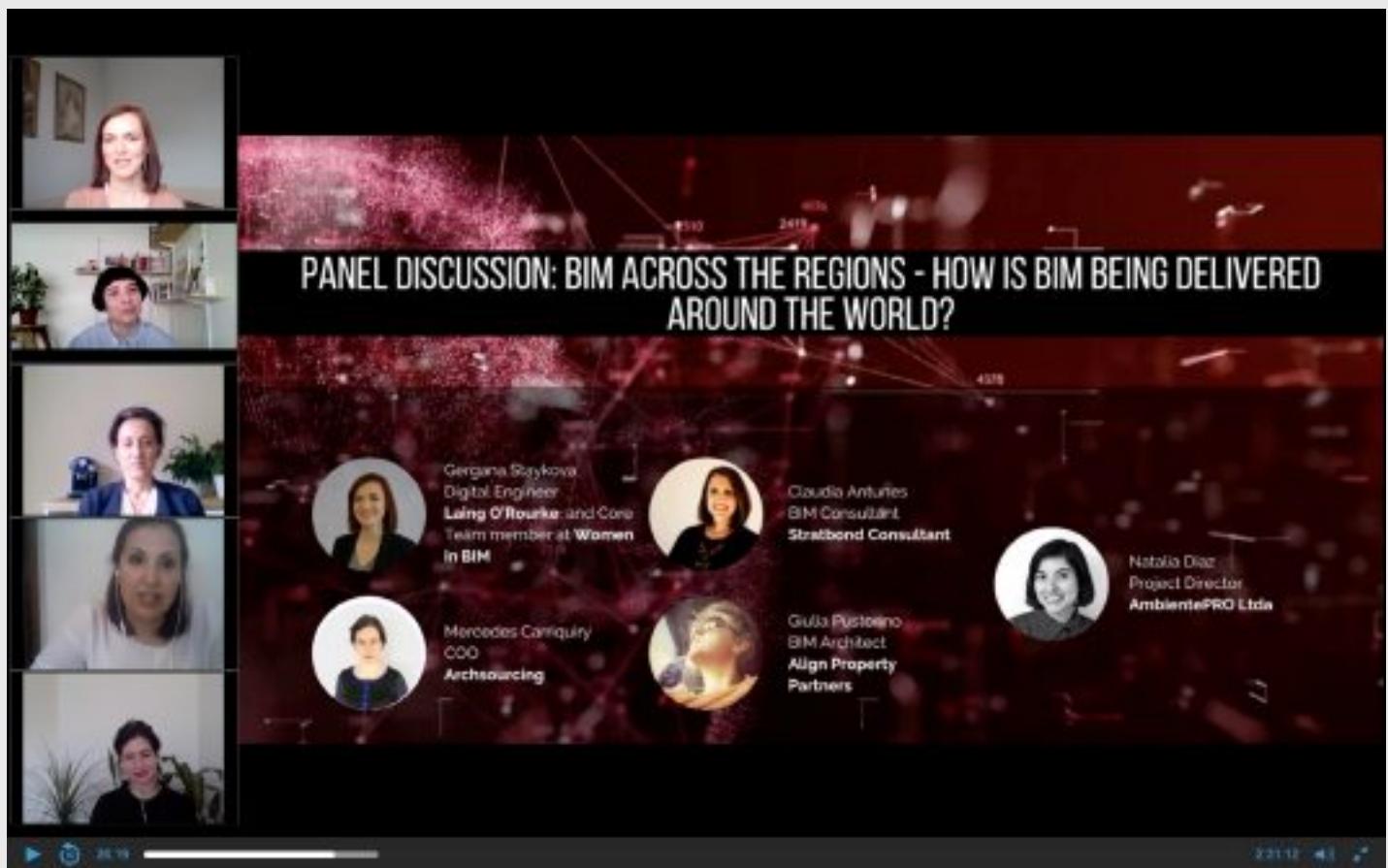
The panel discussion began with a conversation about the experiences of the speakers around female participation in BIM and digital construction roles in their regions. This was followed by a showcase of technical expertise and passion for innovation by the panellists during their exploration of topics such as BIM adoption and implementation, the role of standards, the existing misconception that BIM equals a piece of software and the untapped potential of information continuity through the project stages.

The topics discussed by the panel certainly sparked great interest amongst the live audience and here we have captured just some of what some our panellists had to say about their career experiences and an overview of what they brought to the debate.

Natalia Diaz, project director at AmbientePRO, Santiago, Chile

Chile is the first Latin American country to develop a national BIM strategy driven by the government. It is also a pioneer in establishing the Latin American governments' BIM group in 2018 alongside Argentina, Brazil, Chile, Mexico and Uruguay. The organisation became official in 2019 with Chile as the first president. The group includes eight countries that work together to improve the productivity of the AEC industry through digital transformation, supporting BIM implementation in the different nations with a collaborative regional approach.

Since 2015, Chile has been on a fascinating journey, which officially started with the definition of a national BIM strategy. At the start, the focus was working with public institutions to understand their processes and workflows. This period has been vital in promoting the principles of



BIM among industry stakeholders. Proof of this is the increasing number of local conferences, seminars and workshops related to the topic in recent years.

Another stream of work has been focused on filling the gap in BIM skills at different educational levels. For instance, the inclusion of BIM in universities' and technical schools' curricula, but also the development of training programmes for existing professionals. The government and private sector have collaborated to fund these initiatives.

As part of the Chilean BIM mandate, the definition of a common BIM standard was required. The document was launched in June 2019, and it is aligned with international standards such as ISO 19650. In 2020, we are expecting a number of public projects to include the BIM standard as part of their requirements. The first project will be a social housing scheme located in Santiago de Chile.

In Chile, we have a significant presence of women working in BIM. There is a group of remarkable women defining the national BIM strategy, developing the national standards and implementing BIM in the public sector. In fact, the governmental BIM programme and the

Latin American BIM group are led by a woman. There are other groups of professionals working on private projects, in technical and academic roles. It is fantastic to recognise women working in key positions across the Chilean BIM sector but at this moment, we lack figures promoting their positive impact on the industry. The next challenge is building a local community of women in BIM roles in order to contribute to BIM adoption.

Mercedes Carrquiry, founder of /ARCHSOURCING, Montevideo, Uruguay

I believe BIM is the tipping point of an industry shift. Technology in the AEC industry is a blank spot currently being disruptively developed by few brave visionaries. There is a lot of room for further research, innovation, process improvement and business - we should all see this as an opportunity to take the lead before anything else.

There is certainly asymmetry in terms of gender presence in the AEC industry and technology roles. Yet, it is unrealistic to expect that closely measuring it will make this pivot. I am thankful for having met inspiring people along the way who pushed me to grow, I am part of WIB to give back and help empower more people to take the lead.

It is no news that BIM adoption is growing at a world scale, no matter how early adopter or laggard a country can be, there is a clear step in that direction. However, it is hard to see a common skeleton to all phases of a project. Rarely does data continuously flowing from conceptual design and feasibility studies to fabrication and maintenance, which is why we need a more unified, open-sourced approach.

During the first year of /ARCHOSURCING, we still did some CAD development and used to charge less for a project if it was developed in CAD rather than Revit. But we were wrong and fell into the market BIM denial mindset and trap. During the panel, I admitted our initial mistake and that we should have charged the same for both CAD and Revit. As an industry, we remain anchored to age-old techniques and non-data-friendly individuals and these are holding us back.

Giulia Pustorino, BIM architect at Align Property Partners, North Yorkshire, UK

I likened BIM from the very beginning as a revolution, similar to what happened with photography when digital cameras arrived in the market at an accessible price. I remember that many of my friends said: "I will never give up my film camera for a digital one". How many of us own a film camera now?

"The real push for BIM implementation will come when we move the focus from BIM as a visualisation software to BIM as "Better Information Management"."

I started educating myself about BIM in 2013, while working as an architect in Pisa, Italy. I travelled to Zurich to meet an architect researching BIM, who showed me project examples and this was a turning point in my career. I was thirsty for more knowledge; however, few people in Italy were aware of BIM and my colleagues discouraged me from studying it further.

I moved to the UK three years ago, looking for a more stimulating environment. That, to some extent, I found. BIM is the elephant in the room – something that many in the construction sector strive to achieve. Especially in the North of England, where there are big public sector projects, the use of BIM is fundamental. Unfortunately, there is still a lot of confusion and, in my experience, the misunderstanding that BIM is Revit is very common. This

lack of knowledge is my biggest fear. If our colleagues fail to understand the real power of BIM methodology, we will end up with generational conflict.

It is my goal to understand how people with advanced technology skills can support the rest – how can we introduce BIM without leaving anyone behind? For me, the role of senior management is fundamental in this process and I always look for open-minded colleagues who want to discuss the advantages of BIM adoption.

Creating a 3D model reduces the number of clashes on site, but the key part is changing the processes that we follow during design. Early collaboration is the way to deliver projects on time and budget.

The real push for BIM implementation will come when we move the focus from BIM as a visualisation software to BIM as "Better Information Management". Everyone in the construction sector has a fundamental contribution to BIM, and it is important, that all those involved understand that in order to achieve it collaboration is mandatory.

The views of our panellists are echoed throughout the industry, with many digital construction professionals passionate about the need for greater understanding and acceptance for true industry digitalisation. Every day we are growing closer but there is still a hill to climb before we reach true unification. For WIB, we are campaigning for this day to come in the not too distant future.

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BIM4Water: Thriving and expanding during Covid-19



BIM4Water has moved from a start-up group in 2013 raising awareness of BIM in the water sector to become a leadership group with over 600 members who are taking practical and collaborative steps to implement digital ways of working in this sector. Despite the pandemic, the group has endeavoured to expand its activities and influence across a wide range of organisations

BIM4Water was established as part of the UK Government BIM Task Group initiative to promote BIM across construction. The group's mission is:

"To lead, drive and support organisations to realise value through the digital transformation of the water sector."

BIM4Water aims to lead the digital transformation of the water sector through Better Information Management and provides a focus for setting standards, best practice and to consider the cultural impact and the benefits when implementing BIM as a building block for creating digital twins.

As a cross-industry group, it is open to all bodies involved in the management and delivery of water and wastewater assets. The group's make up is reflective of the sector, collaborating with water companies (20), consultants (26), contractors (18) and the supply chain (68).

BIM4Water is governed by the Steering Group, which has 10 representatives including owner-operators, consultants, contractors and suppliers, and secretariat support from British Water. Initially with four working groups, BIM4Water has expanded its activities to six Task Groups. These are:

Water Industry Classification & Hierarchy Standards Task Group (WICHS)

(Chaired by David Bell, enterprise data architect, Anglian Water).

Working in collaboration with water companies and NBS, the WICHS group's aim is to map the Uniclass 2015 classification to the various asset naming conventions currently being used across the water industry.

As many UK water companies currently capture their assets using a multiple-level hierarchy format, a big opportunity for the WICHS is to abstract their existing

structures, mapping them to a normalised level within Uniclass, which will support both regulatory objectives, and assist with the enablement of a national digital twin – one of the Centre for Digital Built Britain's (CDBB) main programmes.

An asset hierarchy is a framework which is used for segmenting an asset base into various different levels - or classes:



Skills Task Group

(Chaired by Simon Frampton, Blueprint Recruitment Solutions).

The aim of the Skills Task Group is to investigate and prepare the water industry with the necessary digital skillsets and culture to assist and support resources and succession planning throughout AMP 7. The group is also working to raise the profile of careers supporting digital ways of working through the education sector and building links with schools, colleges and universities to promote the different types of digital technology and enable the creation of career paths.

The Standard Libraries Task Group

(Chaired by Richard Stirland, asset data team manager, Anglian Water's @one Alliance).

The Standard Libraries Group focuses on the standard exchange of digital product data using data templates and an agreed process for the creation of BIM4Water Product Data Templates (PDTs). PDTs are arrangements of property groups and properties that describe the construction and performance of assets. The PDT can be used as mechanism to exchange data from the manufacturer to the project team and ultimately populate the owner-operator's asset management systems. The next steps for the group will be to continue the development of PDTs and look at ways of automating the development process.

Group chair Richard Stirland said: "We have a new batch of product data templates in circulation among our group currently, undertaking our review process, before release on the BIM4Water webpage. Our aim is to develop a PDT

for every product in the water industry, and it's key that we drive this forward with energy."

"As for many people, it has been a challenging time for the SLG in the current climate. We had agreed an engagement event to take place at the Water Equipment Show (WES) 2020, focusing on product data and WIMES, which had to be postponed. This event was a key milestone for us to engage with large numbers of manufacturers and supply chain representatives, as part of our work in driving adoption of PDTs as a standard within the water industry.

"But for every challenge, there are opportunities and positives we can take away. With meetings in person not a possibility, there are ways to engage virtually and options to explore around shorter, but more frequent, interactions. The WES has been rescheduled for 2021 and the additional time enables more preparation to target our audience over the next few months."

The Owner-Operators Task Group

(Chaired by Marcus Chambers, digital process lead, Skanska).

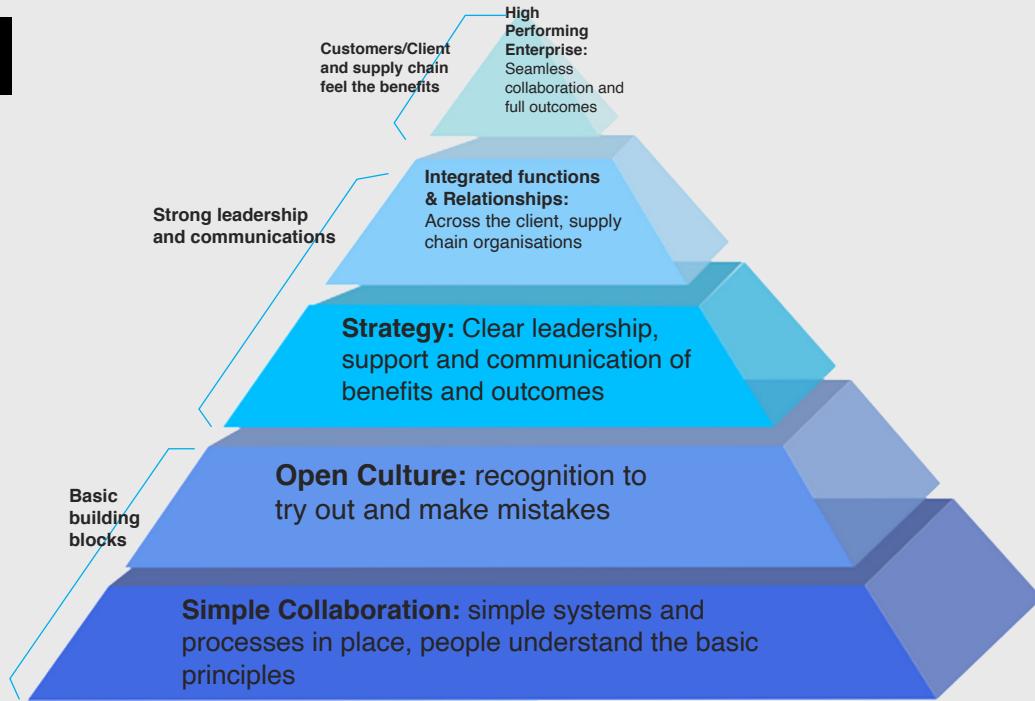
The group aims to enable owner-operators to maximise value through digital transformation and Better Information Management. The group has published guidelines on the adoption of BIM and is currently working on the maturity of BIM across the sector using the "digital hierarchy of needs". The group also publishes case studies that demonstrate the benefits of BIM and the lessons learned.

Water Data Task Force

(Chaired by Max Gamrat, senior data engineer and programme manager, Affinity Water).

The key role of this group is to aid the strategic development of open and secure data across the water industry and to support the vision for a national digital twin. To date, the group has formed a core group of key members including water companies, regulator, government and specialist partners, supporting strategic plans for data sharing and digital twinning. In addition, the group is working with the Digital Twin Hub (managed by CDBB) and the Geospatial Commission.

Digital hierarchy of needs overview



The 4D Task Group

(Chaired by Clare Kovacs, national rehearsal lead, MWH Treatment).

The 4D Group is working on the best practice of using 4D (sequencing of construction), which includes the digital toolkit, contractual arrangements and highlighting the benefits such as health & safety, time and financial savings. Current published guidelines include 4D benefits and the digital rehearsal, where 4D is applicable during the project lifecycle and supported within Employer Information Requirements.

Group chair Clare Kovacs said: "The current climate has driven the adoption of digital rehearsal and visualisation as a clear communication tool; as more and more teams remain working remotely its more important than ever to empower individuals with clear information, enabling them to make safe and educated decisions."

"As a group, we have continued to meet virtually and have been working on a 4D supportive EIR; our aim is to start getting 4D and collaborative practices from top-down, as we see the benefits throughout."

"In addition, we have been defining the best practices for work breakdown structure and how best to integrate our supply chains models."

Growing collaboration

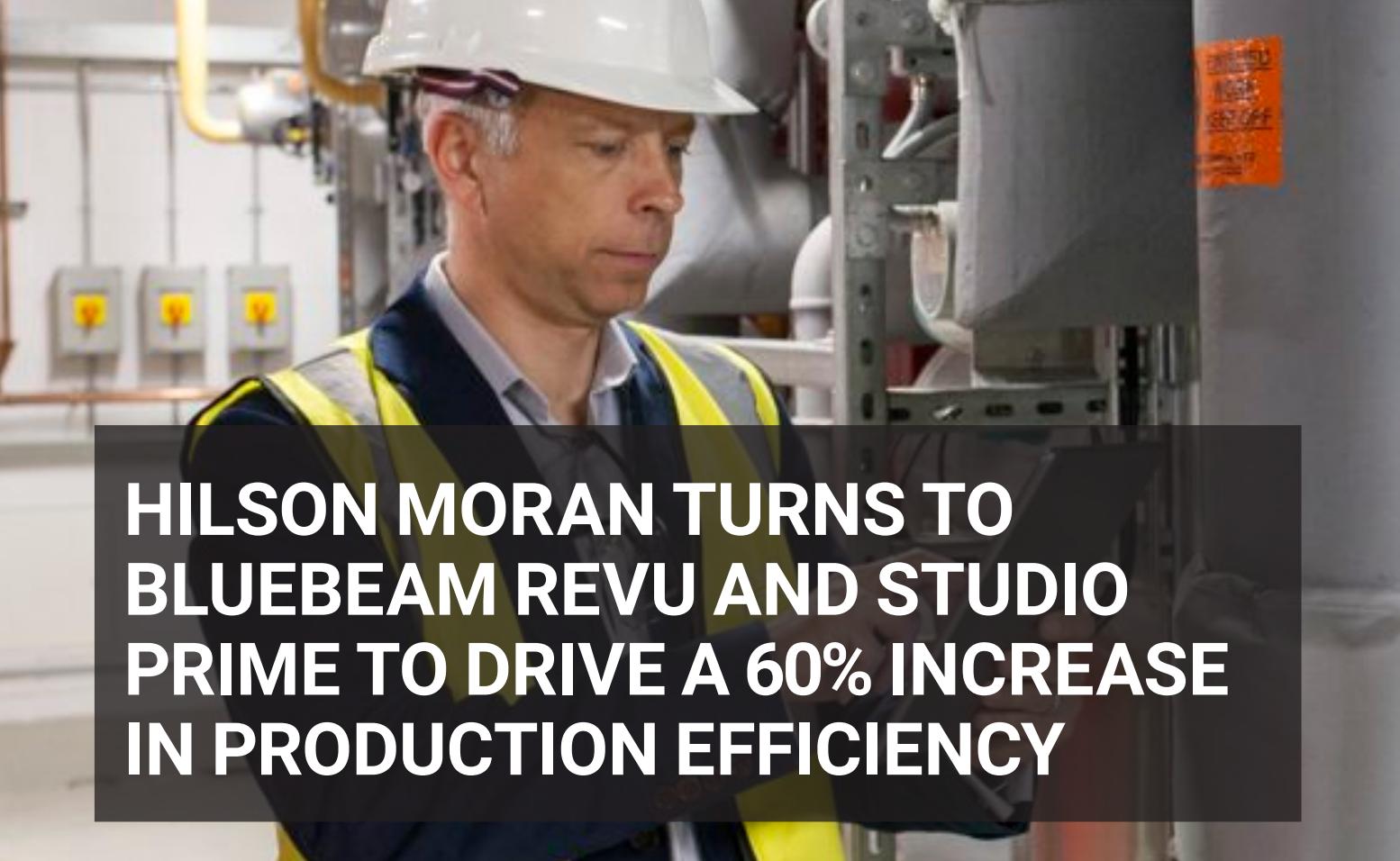
BIM4Water has also used the changes to "business as usual" to reflect on its own organisation and on how it

collaborates with others. During the last few months, BIM4Water has made partnership agreements enabling closer working and ideas sharing, and to offer support with organisations such as the UK BIM Alliance, CDBB (Centre for Digital Built Britain), SWAN (Smart Water Networks Forum) and Teeside University. This work will continue at a pace, and any interested groups should contact BIM4Water (see below).

One of the major disappointments of 2020 has been the postponement of the BIM4Water Awards. Last year saw the highly successful launch and BIM4Water had bigger plans for 2020. However, 2021 will see the awards return, early June at the Etihad Stadium in Manchester. Further news of the awards, and how to enter, will be out later this year.

Jamie Mills
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HILSON MORAN TURNS TO BLUEBEAM REVU AND STUDIO PRIME TO DRIVE A 60% INCREASE IN PRODUCTION EFFICIENCY

As an international multidisciplinary practice offering design consultancy services for the built environment for over 40 years, UK firm Hilson Moran has significantly increased their investment in digital solutions. A change in philosophy came with the successful implementation of Bluebeam® Revu®, as the firm embraced technology and customised its usage to open a new chapter in the industry-leading firm's timeline.

The Revu Phase

When Hilson Moran first rolled out Revu, the firm went from 10 licences to an enterprise-wide set of 229 licences within a calendar year. Engineers quickly gravitated towards the sophisticated PDF markup technology in Revu, drawing review, batch overlay, and even custom tool sets, which "the lab" designed exclusively for use by Hilson Moran. Paper use also greatly declined, saving the firm money in the form of lower printing and shipping costs for drawing approvals. "We found real benefits,

and I did some measuring looking at just paper use," says Ugarow. "As a company we do measure how much paper we use across the business. We've done that for the last three or four years now, and it's a fact that we are using less paper. Reducing that constantly about 30% over three to four years."

Using Studio and Studio Prime

The Studio capabilities of Revu provide the added ability for multiple users to sign in to the same drawing review sessions, offering

simultaneous, real-time editing for users who can be located hundreds of miles apart.

"What this has given us the opportunity to do is to collaborate with our other offices," explains Ugarow. "We have offices here in the UK in London, Farnborough, Cambridge and Manchester. We also have two offices in the Middle East; in Qatar and Abu Dhabi. We use two or three of our offices to coordinate the design, so again, Revu's Studio feature is actually perfect for that."

Given the need for regular cross-office collaboration, the firm decided to add the cloud-based subscription for Studio Prime, which offers all the collaborative possibilities of Studio, but with secure administrative controls and the ability to customise the product using an open API for cross-software collaboration. "I think adopting Studio Prime certainly gave us a bit more level of comfort because you know these days cyber security is a massive issue. A lot of our clients are very sensitive in terms of the projects they do but at the end of the day, you can't sort of push against the tide," says Ugarow.

The Results: An Undeniable Comparison

Hilson Moran's focus on project efficiency played into the firm's effort to measure the impact of incorporating Studio Sessions in Revu into their process. "It's very important to try and gain some metrics so you can measure the success of newly introduced technologies," reiterates Ugarow. "That's certainly something that we did early on in terms of adopting the Bluebeam Studio feature. We did have two projects very similar to one another for the same client. The first one, which was done a year earlier, was really designed using the traditional sort of methodologies, so engineers really

had their thoughts together. They drew and sketched their own systems and then merged them together. We had workshops and discussions about how to coordinate those. With Revu's Studio features, and the second project, we did all that work in the collaboration environment. What we found is that just the sheer number of hours we had recorded during the first version was a lot more compared to the hours spent using the Studio feature. We actually found that if you look at just the production process, [using Studio] was almost 60% more efficient, which was quite a positive surprise!"

Where Do They Go From Here?

The value of the Studio capabilities and subscription-based Studio Prime in Revu has opened the door for more intensive project standardisation within the organisation.

"There's going to be some real benefits once we start engaging with external partners, whether it's architects, or structural engineers on the project, or even clients as well. We see huge benefit in that, and I think we're pretty much there to do that on projects now," elaborates Ugarow. Given the 60% efficiency increase in production, earned by using the Revu application's Studio and Studio Prime on projects, working and communicating with project partners will only get easier, giving Hilson Moran a clear advantage within the highly competitive construction industry.

Learn more about Bluebeam Revu at bluebeam.co.uk.



A transformational recovery from Covid-19

The construction industry needs to come together to build a greener future, says Gillian Charlesworth, chief executive of BRE Group

The Covid-19 crisis is undoubtedly a challenge for our sector but it also presents an opportunity to accelerate the changes many in our industry agree we need. Let us not waste it. The economic stasis brought on by measures designed to limit the transmission of the virus has led to a period of reflection soon followed by a rapid call to action: how do the construction and built environment sectors recover in a transformative way?

The recent [roadmap drawn up by Construction Leadership Council \(CLC\)](#) is full of thoughtful proposals. With a long-term ambition to deliver better value, through collaboration and partnership, the plan carefully balances safety and productivity. It also outlines how improving the sustainability and resource efficiency of our industry is fundamental in our quest to achieve net zero by 2050. The roadmap's approach to building a better future is very much in BRE's DNA, with our organisation having been at the forefront of construction innovation since 1921. As a partner in the government-funded [Construction Innovation Hub](#), we are playing our part in some of the greatest challenges in history.

Decarbonising buildings

It is increasingly understood that buildings currently account for 40% of the UK's carbon emissions. Since most carbon emissions in the built environment come from energy use, the simplest step in addressing the problem is by reducing consumption through energy efficient design. This is a core part of BRE's work, and our team of experts has an extensive track record of working with developers to reduce the environmental impact of construction processes, materials and operations, as well as providing information and benchmarking on all aspects of the sustainability of buildings.

Sustainability needs a holistic, societal approach, embracing not only decarbonisation but also the homes shortage, the need for greater resilience, tackling poverty and ill health, addressing the requirements of our ageing population, and ensuring reforms to our planning system deliver. The CLC plan laid out sustainability-focused approaches that maximise value to all involved – owners, occupants, shareholders and society as whole – while minimising impact on the environment.



Gillian Charlesworth

The different drivers and levers of change are growing in number and impact. Building on the government's net zero target, it's great to see lenders placing increasing weight on lending on development and property with increased efficiency and lower running costs – thus incentivising developers to incorporate innovative solutions into their stock. The finance sector – through the Green Finance Initiative – is putting a great deal of work into identifying financial instruments the market could provide to enable and drive change.

The Green Homes Grant – which was revealed in the Chancellor's summer statement – should be available for homeowners from September 2020. Encouragingly, the scheme will involve a "whole house approach", through which a retrofit specialist will determine the measures to ensure the best value for money for the owner – and the taxpayer – in the home. Sensible actions to help boost the economy like this are welcome and it's reassuring to see the government placing such emphasis on housebuilding and the wider property sector, through a firmly 'green' lens, given the sector's importance to the economy and the deeper, longer-term challenge of achieving net zero.

Influencing change

Influence is crucial among those who want to see this change. Leaders in the built environment continue to explore ways they can make a difference. With the climate crisis coming into sharp relief as both a threat and an opportunity, the time is now for the construction industry to be more prominent and guide the green recovery. Multifaceted solutions are required. Building on the CLC's roadmap, we need greater collaboration – within industry

and with government – and a suitable regulatory landscape that upholds the highest standards, while also fostering innovation. This combination will be fundamental in achieving greater and more rapid decarbonisation and improved safety. New skills will be needed to drive performance and implement new methods.

At a more personal, individual level, it has been said many times, but we need our homes to be places that people want and communities welcome. In the last few months, many of us will have been giving much thought to the way our homes and other buildings we spend time in might be affecting our health and wellbeing. BRE has seen an increase in enquiries to our air quality monitoring and testing team. This focus on wellbeing and safety can only be positive for individuals and businesses, as we improve living and workplace standards from both health and productivity perspectives.

I frequently feel when talking or writing about these issues that the points I'm making are rather obvious. I think they are, but I am also acutely aware, particularly in the midst of the current global crisis, that the goal of net zero carbon may seem as elusive as ever and, to some, irrelevant in a crisis.

We need practical solutions. The CLC roadmap shows a route through and the recently published [Construction Innovation Hub Value Toolkit](#) provides solutions and a direct response to the increasing conditionality government is placing on development, starting with the public sector. Supply chains are galvanising, new skills are being developed and our stakeholders' expectations and demands are changing. While the scale of the challenge is vast, the opportunities are becoming visible and the momentum to act is palpable.

Gillian Charlesworth

Chief executive

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Helgolandkai: BIM pilot project in port construction

In Wilhelmshaven, a 130-year-old quay is once again writing engineering history as a BIM pilot project

Built between 1877 and 1886, Helgolandkai served for a long time as the "first entry" for Wilhelmshaven's shipping traffic. Since then, the artificial bank, with a usable length of about 100m, has seen many a construction project. The structure was also continuously inspected, with the main inspections most recently showing that the quay facilities can now only be used to a limited extent. This is now changing.

Since the beginning of 2019, a comprehensive rehabilitation project of the 130-year-old structure has been awarded to Tiefbau GmbH Unterweser, a company of the LUDWIG FREYTAG Group. Unlike the previous rehabilitation work, however, this time it is a milestone in the history of German port construction: the owner and operator, Niedersachsen Ports (NPorts), has chosen the construction project as its first pilot project for Building Information Modeling (BIM).

WK Consult (WKC) was commissioned for the project planning and structural design. Engineers from the BIM department of LUDWIG FREYTAG, in cooperation with the civil engineering team of Eriksen und Partner GmbH, from Oldenburg, were responsible for the implementation planning and technical processing. The project planning was supported by the BIM management of albert.ing.

Subsequent BIM processes

The rehabilitation of the quay comprises a technically demanding package of measures: a new wave sheet pile wall is placed in front of the existing sheet pile wall, anchored and



then backfilled. The head of the quay has to be erected and a staircase of the sheet pile wall has to be presented. In addition, fixed ladders, crosses, head bollards as well as mooring and mooring dolphins have to be installed.

As the conventional planning was almost completed at this point in time, the BIM processes were subsequently simulated. All in all, this resulted in a number of new tasks for object planning. The object-oriented 3D model also served as a pilot for model-based communication with NPorts via a common open BIM platform (Common Data Environment).

Performance items and quantity calculations were attributed in the model and additionally linked to tendering software.

Furthermore, WKC supplied the contractor information requirements for the construction tender and the integration into the conventional performance specification. Based on the design model, the BIM model authors at LUDWIG FREYTAG created an execution model (including 2D plan derivation) with a significantly higher level of detail (LOD 400 instead of LOD 200), also with the help of Allplan Engineering, which is maintained and enhanced up to the transfer model (LOD 600).



"Thanks to Allplan, several problem areas in the model could be identified and solved that would not necessarily have been noticed in a pure 2D design for a linear structure of this type."

One quay, 14 specialist models

ALLPLAN software proved to be a powerful and reliable tool for the designers. The basic components in particular could be modelled quickly and easily. WKC created a total of 14 specialist models. The reason for splitting into individual specialist models was that this made both visual and rule-based model checking easier and, if changes were made to the model, only the relevant specialist model had to be re-exported and replaced.

This also applied to various testing software such as the Solibri Model Checker or the open BIM platform (CDE) implemented in the project, on which the individual specialist models were combined into coordination models by the contractor and transferred to the BIM management team on the client side.

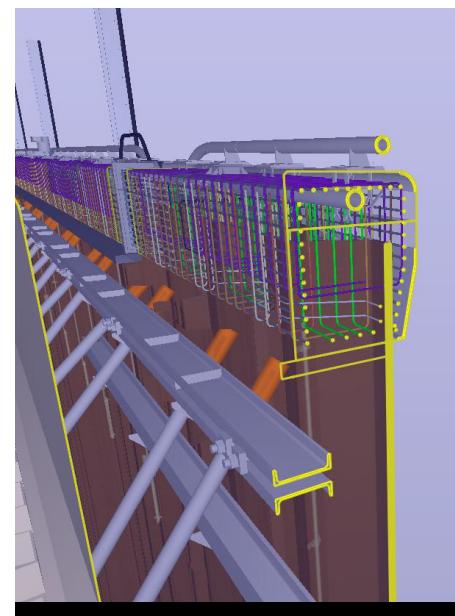
It was decided to perform the calculations exclusively directly in Allplan, which - like the derivation of 2D plans - worked perfectly.

Pragmatic implementation planning

In the course of the implementation planning, LUDWIG FREYTAG reversed the separation of the sub-models - at least partially - and restructured them. In order to better assign the demolition components to the existing components, the existing and demolition models were combined. In addition, the engineers took advantage of a function in Allplan that is not normally used in hydro-engineering. They simply used the program's flexible floor assignment to divide the overall model into sub-models. This enabled them to work in a well-structured manner and to achieve a high-performance IFC export, as all drawing files of a sub-model are automatically assigned to the sub model via the floor.

Successful experiment

Overall, the BIM pilot project Helgolandkai can already be considered a success. Christian Tiedemann, BIM designer WK Consult, said: "Thanks to Allplan, several problem areas in the



Loaded design models of sheet piling, anchoring, waling and concrete beam, including reinforcement and equipment components

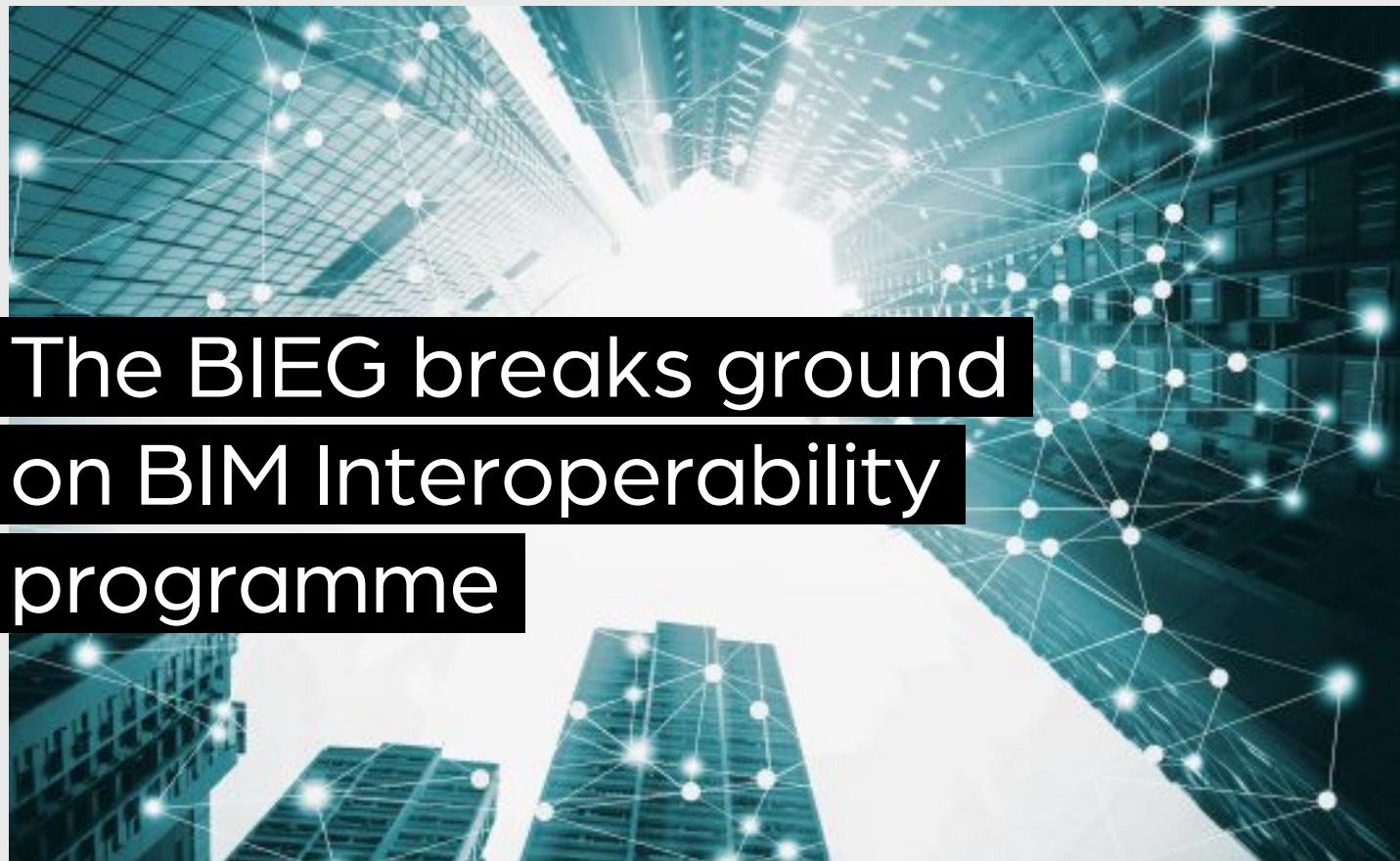
model could be identified and solved that would not necessarily have been noticed in a pure 2D design for a linear structure of this type."

In particular, collisions of components - especially the anchors, both among themselves and to the existing structure - could be successfully avoided. The quantity take-off was clearly more error-free and easier than in a conventional, manual way.

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The BIEG breaks ground on BIM Interoperability programme

The Centre for Digital Built Britain, as a partner in the Construction Innovation Hub, has launched a new BIM Interoperability programme to improve data sharing in the construction and infrastructure sectors. Fiona Moore, chair of the BIM Interoperability Expert Group (BIEG), shares the group's progress to date, and how they will be working in partnership with industry to co-develop solutions

Many in the construction industry will be familiar with Building Information Modelling (BIM). It is a process that describes the ability to author, exchange, assure and subsequently use and reuse trusted information (data) to the benefit of all those involved in an asset's lifecycle, from inception through to the asset's disposal or reuse. Over the past decade, the UK has taken a leadership role in the development of standards for BIM, and in adopting the process within public and private organisations.

Our [recent consultation](#) and BIEG Report has shown there is further work needed to address interoperability to achieve whole-life benefits of BIM implementation. Interoperability is the ability of two or more systems to exchange information and to use the information that has been exchanged. Interoperability across the lifecycle of an asset is essential to support the support the whole life "golden thread" of asset information, as called for in the Hackitt Review.

Addressing interoperability in BIM

As part of Construction Innovation Hub, we are scoping a programme of work to address the recommendations and enablers identified the BIEG Report. Our initial focus will be on practical BIM implementation and the interoperability challenges faced by those who design, build and operate built assets, the benefits that BIM interoperability will deliver and how improvement can aid construction sector resilience and recovery in light of Covid-19. Although there are longer-term benefits to improving BIM interoperability, not least of which is how it prepares industry by providing the foundations for the National Digital Twin, our immediate focus is on the here and now, by addressing immediate practical challenges.

Five initial workstreams have been identified from the enablers contained in the BIEG Report, as follows:

- Workstream 1: Classification Schema Alignment.



The image shows the front cover of the 'BIM Interoperability Expert Group (BIEG)' report. At the top left is the 'CONSTRUCTION INNOVATION HUB' logo, which consists of a stylized hexagonal geometric pattern in blue, green, and yellow. To its right are the 'INDUSTRIAL STRATEGY' logo (featuring a red and blue starburst design) and the 'UK Research and Innovation' text. Below these logos is the title 'BIM Interoperability Expert Group (BIEG)' in a bold, dark font. Underneath the title is a large, abstract network diagram composed of numerous small teal-colored dots connected by thin grey lines, forming a complex web-like structure. In the bottom left corner of the cover, the date 'March 2020' is printed. At the very bottom of the cover, the website 'www.constructioninnovationhub.org.uk' is listed.



Fiona Moore

The BIM Interoperability Steering Group (BISG) has been set up to provide clear reporting lines in to government. The BISG consists of representatives of the Infrastructure & Projects Authority, the Department for Business, Energy & Industrial Strategy, the Environment Agency, Transport for London and the Construction Leadership Council, and has overseen the development of the BIEG and Interoperability programme since its inception.

- Workstream 2: IFC & COBie.

- Workstream 3: Education and Skills.

- Workstream 4: Standards.

- Workstream 5: AIM CDE.

In early autumn, we will be announcing our industry partners and workstream leaders. We're extremely keen to engage with the construction sector on our programme of work, to ensure as open and inclusive a process as possible, so that it benefits the majority.

Working in partnership with government

The BIEG Report also addresses the need for government leadership and promotion to help improve BIM interoperability in the UK. Government has responded by making a clear commitment to address the technical issues associated with BIM Interoperability and by acknowledging that its position on BIM must evolve to better reflect current technology, standards and process development.

Join us

To be kept informed of developments within the BIEG Steering Group, or to express your interest to be involved, connect with us at:

<http://www.cdbb.cam.ac.uk/Contact>

Fiona Moore is an information management consultant to CDBB. She is chair of the Public Sector ISO Transition Working Group (PSITWG) and BIEG chair.

Fiona Moore

Chair, BIM Interoperability Expert Group

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Closing the door on cheapness: Construction Innovation Hub launches the Value Toolkit

Value-based decision-making is the lynchpin of a transformed construction sector, says Keith Waller, programme director of the Construction Innovation Hub

Even if Covid-19 had not befallen us, the announcement of the Construction Innovation Hub's Value Toolkit would undoubtedly have been hailed as a key milestone in our four-year transformative programme. The economic fallout of Covid, however, has given this crucial piece of work an even greater importance.

As the country moved into lockdown and building sites fell silent in the earlier part of this year, we at the Hub began to quickly accelerate key elements of our programme in support of the massive effort to rebuild our sector, which inevitably would have to follow. Key among these was our Value Toolkit, a collaborative initiative intended to help policymakers and clients make faster, informed decisions that incentivise industry to respond with innovative, high value solutions.

Why value, why now?

As we get Britain building again, there will be a natural temptation to go back to the familiar, outdated practices rooted in cost minimisation and risk transfer. We have, as

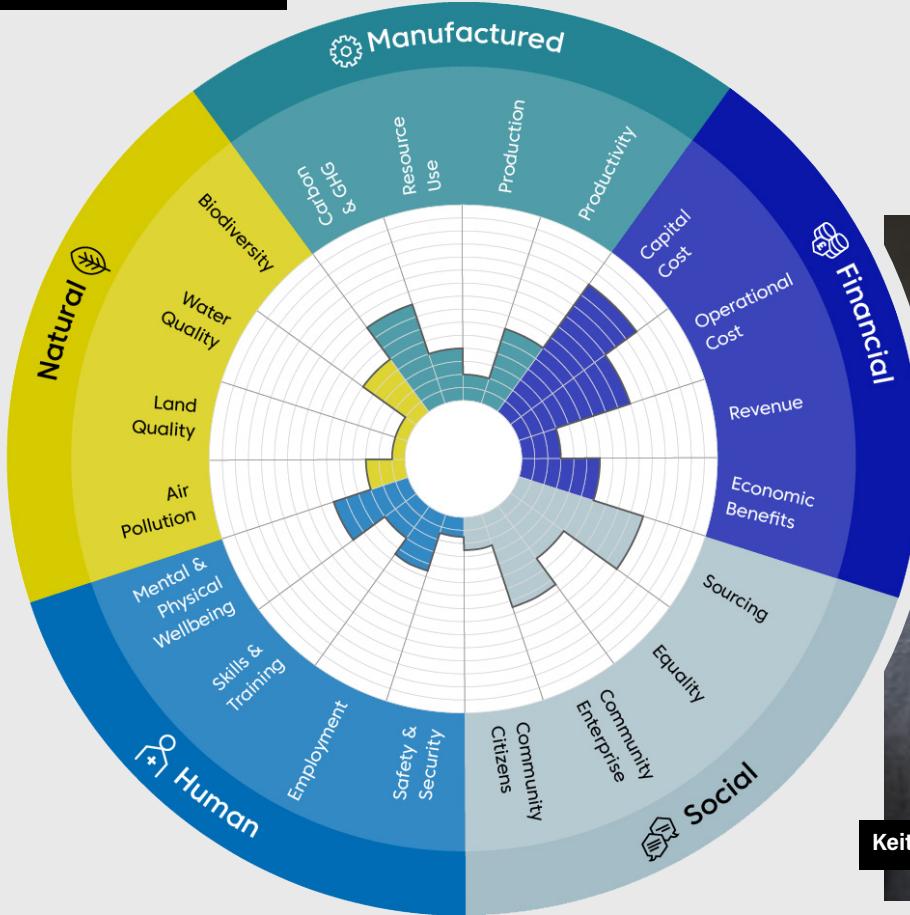
a sector, an historic affinity with cheapness. We tend to see value through the prism of pounds and pence rather than in the much broader sense. This was not sustainable before the Covid-19 crisis and it is far less so today.

With the [CLC Roadmap to Recovery](#) and the package of measures recently announced by the Prime Minister and Chancellor, we are about to embark on the largest sector recovery effort construction has perhaps ever known. But as we work together to jump-start the engine of this crucially important sector of the British economy, we have a unique opportunity to veer off the route we were on before the crisis and instead move in an entirely new direction. Our destination must be a future where a common understanding of value and value-based decision making is delivering better long-term outcomes.

Working together to build a better future

We recognise, of course, that this isn't something that can happen overnight and that's why we have collaborated closely with key industry and government players to

Aligning to client's value drivers and broader strategic policy objectives.



Keith Waller

develop the Toolkit. If we want to see real and lasting impact, we need buy-in from policymakers, clients and industry at large. We are very fortunate to have strong support from some of construction's leading voices like ACE, CE, CECA, CLC as well as organisations like RICS, RIBA, CIOB and Social Value UK, who are helping us to develop a new industry-wide definition of value, a keystone of this crucial project.

"...as we work together to jump-start the engine of this crucially important sector of the British economy, we have a unique opportunity to veer off the route we were on before the crisis and instead move in an entirely new direction."

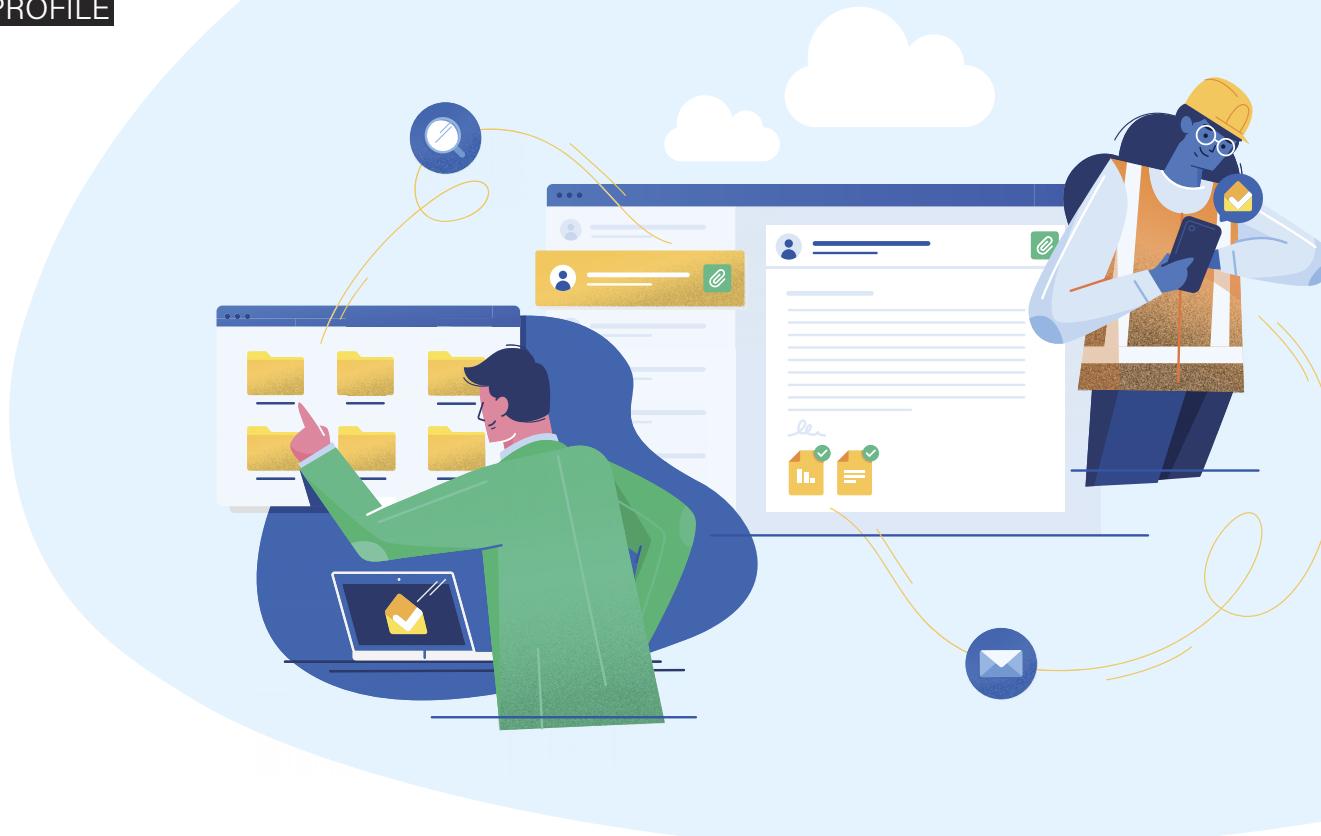
The response we've had so far has been deeply encouraging. When we launched the Toolkit at a webinar attended by over 400 representatives from across industry and government, I was deeply heartened to see not just the appetite to move in this new direction, but also by the sense of urgency. Some 81% of our attendees believed that cost is the main factor when making decisions through the lifecycle, while an overwhelming

96% agreed that a value-driven approach would enhance innovation in the sector.

Construction's fixation with cheapness runs deep and it won't disappear in one fell swoop. However, with momentum building for substantial change and now a Toolkit to enable that change, I believe that we are closer than ever to making a permanent shift to embed a lasting shift towards value-based decisions that drive better social, economic and environmental outcomes.

Keith Waller
Programme director
Construction Innovation Hub
<https://constructioninnovationhub.org.uk/>





Introducing Mail Manager

In a little over a decade, Mail Manager has evolved from an Outlook add-in to a fully fledged, industry-wide email management tool for helping architects and engineers to take control of their project emails

Over 10 years ago, Arup had a problem. Email represented their biggest communication solution on projects, but it was exposing the business to an unnecessary level of risk, while also draining the productivity of project teams.

So Arup thought: "What if we could find any email on any project without wasting time filing?"

Arup looked at solutions available, but everything was a sledgehammer to crack a nut (more than what we needed). Mail Manager was initially developed as an Outlook add-in for their own architects and engineers to take control of their email.

As and when staff left Arup, they wanted to take Mail Manager with them so Arup identified email management as critical for the whole industry.

Mail Manager is now used by business of all sizes across project-based industries.

Reasons clients enjoy working with us is:

- They address their email headache overnight.
- Staff love using the software.
- The add-in has been designed by people who work on projects, for people who work on projects.
- They get much better access and visibility to project information, regardless of whether staff are in the office or working remotely.

Since forming Mail Manager, we've gone from five people to 50 in two years, and more and more people are starting to take email more seriously.



Mail Manager

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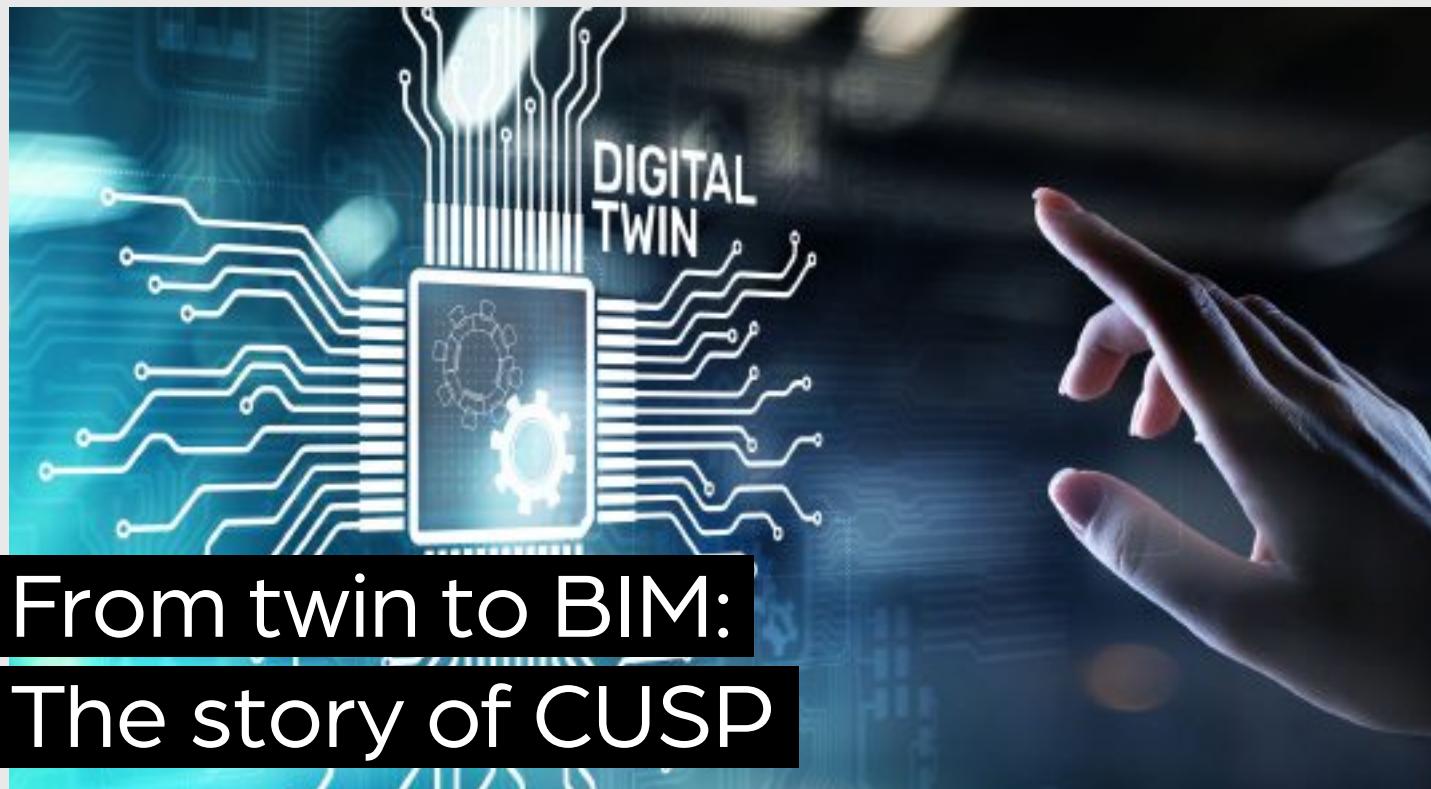


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From twin to BIM: The story of CUSP

The story of CUSP, a partnership between Atkins and Cardiff University to develop an advanced digital twin programme, shows how the idea of technology becomes reality. Nick Tune, digital engineering director at Atkins, discusses the journey

We talk about BIM and digital engineering as a new thing but, in reality, the technology has been there for decades. What we now realise is how powerful that technology's application can be in helping us to overcome construction's most pressing challenge – productivity.

CUSP, Atkins' partnership with Cardiff University to develop an advanced digital twin programme, shows how the idea of technology becomes reality.

A long legacy

Back in 2008, Cardiff University established a research centre on Engineering Informatics, with Professor Yacine Rezgui as chair. At the time, no one realised how far ahead of his time Professor Rezgui was in terms of his vision for a digitally enabled construction sector. Although it wasn't called "digital twin", the work this research centre undertook was, in effect, construction's first digital twin project – a project called KnoholeM, part of the European Union Research Framework Programme.

The premise was to reduce the energy consumption of buildings by using BIM coupled with the exploitation of

near real-time energy performance data in order to simulate and devise scenarios that could maintain comfort in the buildings for occupants while minimising energy consumption.

"CUSP incorporates not just data, but machine learning and AI algorithms that learn the performance of the asset."

At the time, the UK government BIM programme hadn't yet been established, and BIM Level 2 hadn't yet entered our consciousness. But work had already begun, and the spark of BIM and digital twin had been lit.

One small step for BIM

Following on from KnoholeM, Cardiff University won another EU Framework project to utilise BIM and real-time data on a district scale to reduce energy consumption and maximise the use of renewable energy. Even in 2020, this kind of project would be seen as hugely innovative.

The thinking developed in these first BIM projects was brought by Professor Rezgui and his team to support



Nick Tune

Welsh Water, Milford Haven Port and others in improving the performance of their assets. A BIM star was born.

From kernel to corn

So, why has it taken so long to bring this amazing research to market? The simple answer: the industry wasn't ready. And it's no surprise really; construction has historically been slow to adopt new technology as our contracting models, and the risk and rewards mechanisms within them, don't always encourage innovation.

It was only in 2011 that the UK construction strategy was launched and the UK BIM Task Group was established to put BIM at the heart of the industry's plan for transformation. Even then, BIM wasn't mandated for the public sector until 2016. The sector has been wrestling with what BIM is and how it can improve productivity for decades. You could still say our BIM journey has only just begun.

So, while we were learning to adopt BIM – and that means best practice Information Management, not just 3D CAD – Professor Rezgui and his researchers at Cardiff took all their know-how and developed a platform that consumes BIM, GIS, historic and live data and structures it via a semantic ontology that means the data has relationships to allow it to easily be queried. With the help of Atkins, they created CUSP – a programme we can all use to better manage our assets.

CUSP incorporates not just data, but machine learning and AI algorithms that learn the performance of the asset. By adding the parameters you wish to manage, for example "I want the temperature to be between 19-21C in a building and I want to maximise the use of the renewable energy my asset produces", CUSP learns your asset's performance and provides the most optimal way to operate the asset based on those requirements.

And here is the best part: because it's built on a semantic ontology, it can easily be lifted and shifted to different use cases, such as improvement in the maintenance of a highway or optimisation of a rail network.

Fast forward

If we fast forward to 2020, the industry is well and truly on the BIM (Information Management) journey and digital twins are increasingly recognised as a way to improve the delivery and management of assets.

Our industry is now primed and ready for CUSP. Over the last decade, it has been tested and improved by the team at Cardiff so that it is ready to really drive a step-change in digital transformation and most importantly, the productivity of the sector.

Atkins has partnered with CUSP because we believe now is the time to bring it to market. If we want to transform infrastructure delivery for improved productivity and whole-life value, we need to be investing in technology like this, that will truly allow us to deliver better outcomes.

This next phase of the industry's digitisation is the most exciting. It's where we'll see programmes like [CUSP](#) drive value and shift the productivity dial up a notch. The more we embrace these technologies, the more we'll see smarter decisions made and predictability improved.

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Creating a robust data foundation for digital transformation

There is no one-size-fits-all approach to digital transformation – but data transformation, using trusted information to learn about products, customers and competition, should be part of any company strategy, says Peter Ruffley, chief executive of Zizo

How many digital transformation strategies will ever extend beyond the boardroom? What, in effect, do they really entail? Digital transformation is being merged with the Internet of Things (IoT), machine learning, even Artificial Intelligence (AI) to create an unmanageable, unfocused concept of "doing things better" without addressing the fundamental, underpinning essence of that change: the data.

With so many innovative technologies coming to the fore, it is easy to get distracted but organisations need to focus on the core objectives; what is the point of increasing the amount of data collected if the business does not have complete trust in that data? Why make data look visually appealing if people still won't use it to automate processes and decision making? If individuals are not prepared to accept that data resources enable better decision making than intuition, a business cannot be digitally transformed – however much it has expanded its connection with customers, suppliers and partners.

Data transformation should be a key part of any company strategy, not only a key element of digital transformation. Whereas digital transformation reflects the change that is impacted across the entire business through new technologies and approaches, data transformation reflects the changes that should be made across the business using data – whether that data is found internally or externally across industries or in the wider population.

Putting data front and centre

Data is changing everything that we do as human beings: how we interact with each other, our governments and those we choose to do business with. As such, it is now vital that organisations use data to learn more about their customers, their own products and their competition to stay in the game.

Right now, while digital transformation may be a board-level objective, when it comes to strategy or roadmap, there are some concerning signs. On the one hand,



Peter Ruffleay

organisations are investing in new ways to capture data, such as connected devices. On the other, they are embracing exciting visualisation tools, such as exploding pie charts and genomic analytics. Spot the gap? Where is the underpinning data structure? Where is the essential data trust?

Boards of major corporates still fundamentally do not understand that the data held within their business is as big an asset, if not bigger, as the machines and the factories, and can have a much wider impact on their bottom line than launching a new product or service. The current unicorn businesses such as Uber are so successful because they have simplified the movement of data between two parties. They work so well because they have convinced each party that sharing data with each other enables a simpler, faster transaction. If big corporations thought the same way, imagine what they could do with the wealth of the data they own.

A cloud-based analytics platform provides the essential data foundation. It creates the building blocks for the cultural change that will define a digitally transformed organisation, an organisation that will have immediate visibility of all data and, critically, implicit trust in that data. While existing applications will continue to perform as usual, the digitally transformed platform will enable organisations to rapidly build new applications that use diverse data resources to drive operational change. And with this data platform in place, organisations can confidently scale and embrace a raft of digital innovation, from AI to cognitive analytics.

A data-first culture is one that makes decisions based on all the information available to it, using data found within the business. An example of this could be using data to experiment with new business models and new products

to drive innovation, but with the ability to share the data across the business to gain further insights, bridging gaps in teams and breaking down silos of data. In order to achieve this idea of "data democratisation", the business must learn to trust the data that is being used. This is where big data comes in. By having access to all of the data at a granular level, we are able to remove elements of "gut feel" and the "anecdotal" decision making which many companies still rely on.

A solution-led approach

There is no one size fits all, of course; no prescription for a digitally transformed organisation. But by taking a solution-led approach, rather than a nebulous "digital" strategy, organisations can embark upon the transformation journey. Critically, the focus must be on addressing specific business requirements, whether prompted by the need to upgrade a dated system or respond to new operational requirements. By ensuring developments are business-driven, data-led and customer-focused, with the right foundation a business can use its data to make essential change.

Communication, vision and transparency are essential components when undergoing this pivot. As with anything transformational, there will be areas where people are not willing to embrace change; however, if the reasons for the change and the future effects can be proven and highlighted using the data that we are looking to use then winning the hearts and minds of the naysayers is possible.

With access to affordable, secure, flexible and scalable cloud-based analytics, the rest of the transformation will take care of itself. Remember that not every idea will be a good one, but no idea is necessarily bad when you back up the reasons why using data. This approach is key to moving forward.

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National Digital Twin: Data for the Public Good

The National Digital Twin is moving closer to becoming a reality

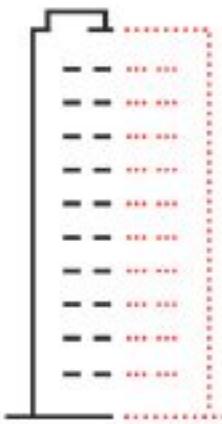
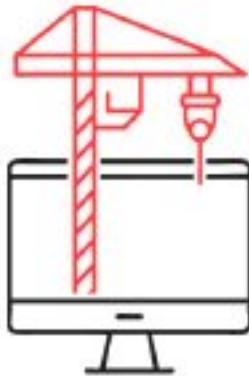
The concept of digital twins is neither new nor lacking successful real-world use cases. NASA has been creating digital models of physical systems for decades to enable simulations, diagnostics, and predictions for space missions. A digital twin allows us to monitor a physical entity in real-time during its operation to support better outcomes and, in relevant cases, optimise performance.

As the Centre for Digital Built Britain (CDBB) asserts: "Creating an eco-system of connected digital twins - a national digital twin - opens the opportunity to release even greater value, using data for the public good."

An NDT would provide a digital model of a nation's infrastructure network made up of a federation of connected digital twin models across sectors, including transport, energy, water and telecommunications.

Most stakeholders in the built environment already collect significant amounts of data; however, we have not yet optimised how this data is collected, assessed and managed. The framework seeks to establish a foundation to support effective information management across the built environment and enable secure and resilient interoperability of data — all of which are critical to the successful delivery of an NDT.

Simply put, the insights generated from a digital twin are used to make decisions in the real world, so an emphasis on establishing a strong digital infrastructure to guarantee that the right information reaches the right hands will ensure resilience.



Towards a National Digital Twin

In the context of the built environment, these digital models enable us to learn from data to improve how buildings and infrastructure are planned, managed and maintained. The digital and physical assets are connected via securely shared data, and this bi-directional flow of information allows us to create responsive structures that use less energy and perform better over their lifetime.

With the growing adoption of the Internet of Things and 5G, the prospect of a National Digital Twin (NDT) seems increasingly viable.

Leveraging data for good

In 2017, National Infrastructure Commission (NIC) in the UK published a report, Data for the Public Good, which highlighted the need for a comprehensive national programme to create standards for the best possible use of data in the built environment. In response to this, the Digital Framework Task Group, part of the CDBB, developed the Information Management Framework, which included guiding values - the Gemini Principles.

A new way of thinking

The main barriers to the development of an NDT are humans rather than technology. We've only begun to fully comprehend what is achievable when the value of data in the built environment is unlocked. A cultural shift is necessary for stakeholders to start treating information as an asset - that is, recognising



its value and correctly managing it through its lifecycle.

As Mark Enzer, chair of the Digital Framework Task Group, explains: "It makes us see infrastructure as a system of systems... This perspective drives us to focus on the whole lifecycle of assets, not just their initial delivery."

An NDT unlocks value during the operational phase by enabling better decisions at the project, asset, network and system level. As it becomes more diverse and interconnected over time, the more value that it will deliver and this benefit span the economy, society, business and the environment.

As per the Gemini Principles, an NDT "must be used to deliver public good in perpetuity". In this regard, it is a national resource and, as such, its purpose should start with the needs

of the end-user (the public) and should help to deliver inclusive social outcomes.

Collaboration and a new collective understanding

An NDT will only work if there is a corpus of functioning digital twins that can be connected to form an ecosystem. Fortunately, we are moving towards a new collective understanding that, to borrow from Mark Enzer, technology is an "enabler of something more important and longer-lasting - an information value chain that delivers better social, economic and environmental outcomes in the UK".

As stated by the CDBB: "The catalyst for the development of digital twins is people working hard to make digital twins work for us all. It will be a collaboration between research institutions, universities and the

private sector which will accelerate our progress towards the National Digital Twin."

Ultimately, the move towards an NDT in the UK has already begun - it is a question of when, not if.



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A digital approach to enabling a world-class learning estate

The Scottish Futures Trust has launched a new Standard Information Management Plan which will enhance infrastructure delivery and performance within the Scottish Government's £1bn Learning Estate Investment Programme

The [Standard Information Management Plan](#) (SIMP) provides a common approach to embed robust information management processes within infrastructure projects using Building Information Modelling (BIM). If we create, manage and share information on our infrastructure projects efficiently and leverage associated technologies, the benefits will be significant across the asset lifecycle through the reduction in waste, improved delivery and, ultimately, improvements in how we manage and maintain our assets.

The Scottish Futures Trust (SFT) is leading the BIM programme on behalf of Scottish Government to ultimately help the public sector better procure and care for their buildings through the use of BIM and its data-rich environment.

The Scottish Government's £1bn Learning Estate Investment Programme will implement the new SIMP and it will support the delivery of low carbon, digitally enabled schools and campuses.

Under the first phase of the Learning Estate Investment Programme, announced in September 2019, the Scottish



Paul Dodd

Government will invest between £220m and £275m in partnership with 11 local authority areas to replace 26 schools.

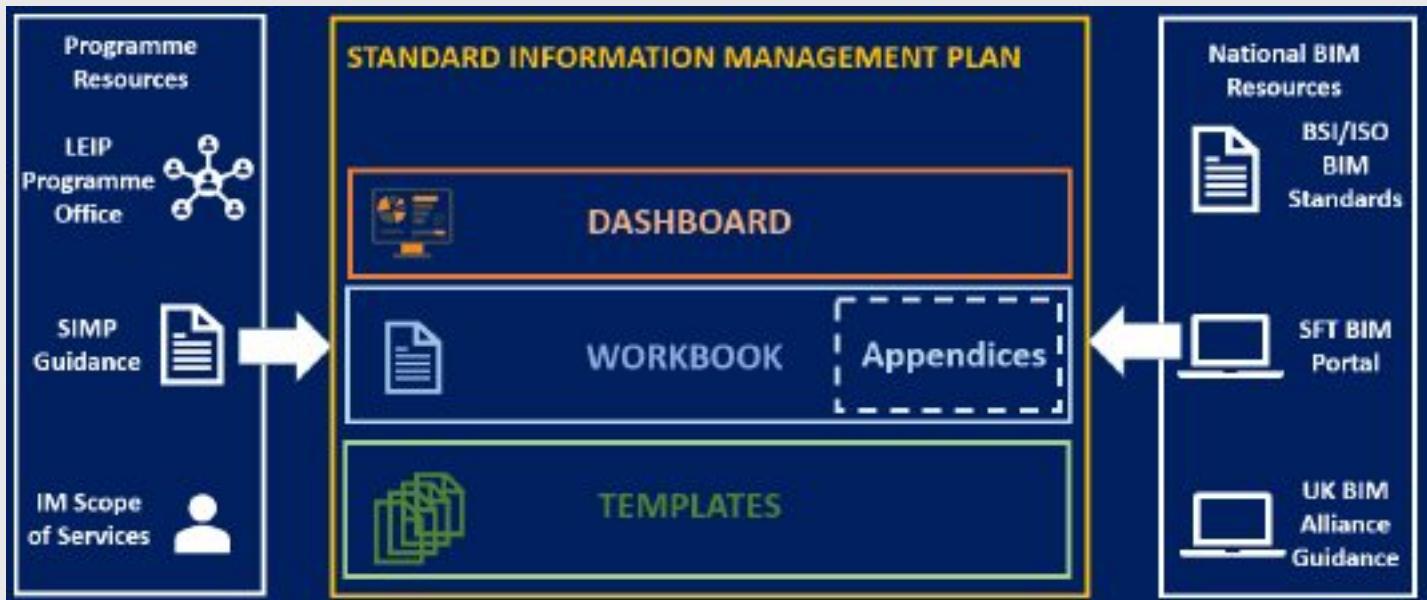
Andy Dally, who is head of School Building at the Scottish Government, said: "To support the efficient design, construction and operation of projects, the Learning Estate Investment Programme recognises the importance of good information management and collaboration by all parties. The Standard Information Management Plan has been embedded within the programme to help achieve this aim."

In addition, the ability to create, manage and collaborate with project information digitally will support projects' progress within the restrictions imposed by Covid-19.

Supporting consistent information requirements within projects

The SIMP has been developed to enable contracting authorities establish and ensure the delivery of appropriate project and asset information using BIM, in accordance with BS EN ISO 19650 Parts 1 and 2. It has three primary objectives:

Constituent parts of SIMP



- Support a consistent approach in how public bodies specify BIM and how information is delivered to improve efficiencies and resilience during the asset lifecycle.
- Enable delivery of accurate as-built digital information models and operation and maintenance manuals to support effective asset management.
- Comply and align with new international standards in the adoption of BIM.

The SIMP has been developed in partnership with industry and public bodies. The plan provides an innovative approach to support informed and consistent information requirements within projects.

Paul Dodd, who leads SFT's Infrastructure Technology team, said: "Setting clear information requirements at the outset of the project will best support the adoption of BIM in accordance with ISO 19650. The SIMP seeks to support contracting authorities develop compliant, consistent and proportionate information requirements and realise the benefits this will bring."

The plan provides new and innovative dashboard to develop an information management strategy at the outset of the project, a flexible information workbook aligned to ISO 19650 that sets out clear information deliverables during the project lifecycle and, finally, a suite of templates to support the structuring of information through the project lifecycle.

As industry begins to respond to the new international standards, the plan will support upskilling and wider adoption quicker and in doing so, realise the benefits it will bring sooner. SFT will continue to collaborate with contracting authorities and industry to refine the plan going forward and welcome feedback in its use.

David Carson, pre-construction director at BAM, said: "BAM fully supports SFT's Standard Information Management Plan as we believe it will bring clarity to the industry by providing clear and standardised information requirements for projects, meaning that all parties, clients, designers, contractors and subcontractors, are clear on the information they are required to deliver at each stage of a projects lifecycle."

The SIMP is free to use and access for public sector projects and to find out more, please access the BIM guidance portal or contact the SFT Infrastructure Technology team to discuss further.

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How technology can support social distancing

The world as we know it is changing. The bottom line is that buildings are not going to be able to reopen and operate safely without robust post-pandemic planning for pedestrian movement, says Oasys Software

Real people get confused and break rules. It's one thing to hang signs and tape lines and crosses to the floor but will people stay in their boxes and comply to the rules? Will they have real fear of proximity? Knowing how to manage your space as guidelines ease, or if the government asks you to double down again overnight in the face of new waves of infection, is vital.

Designing with social distancing in mind

It will come as a relief to learn that raw materials for greater certainty and the flexibility to keep up with a dynamic situation over the months, and possibly years, are all readily available. The likes of 2D and 3D CAD drawings for your building can be used to render a 3D model of the building, which can be populated with realistic, intelligent agents whose behaviour is modelled by pedestrian movement software.

One example of technology that can be used to help map social distancing in a building is MassMotion, which is

used by global consulting engineers and architects. It's rather timely that the software world's ubiquitous move towards subscription rather than outright licensing has come at just as professionals across the built environment are grappling with the need to understand pedestrian behaviour in more detail than ever before.

Its proximity modelling tests and visualises scenarios within computer models. Its native 3D design means that crucial potential pinch points like stairs and elevators are also modelled accurately and can be observed in animated visualisations. Its power means that new parameters can be entered into the model and a new simulation will run to test new ideas within minutes. Proximity modelling tools are used to show how close people are likely to get and for how long and highlight risk areas.

Technology for existing buildings

Technology will be crucial in designing and building future structures to ensure social distancing is far more



achievable for the building's occupants. But how can technological solutions help support social distancing measures in pre-existing buildings? After all, spatial awareness cannot be accurately relied upon.

Currently, personnel distancing systems, known as PDS, are being trialled around the country. These proximity warning gadgets can be fastened to a person's arm or belt, or in the case of construction sites, on to a hard hat. The technology can also be added to lanyards or wristbands. Once the exclusion zone has been programmed, these tags will sound an alarm and vibrate if the wearer gets too close to another wearer.

This technology will be particularly useful in warehouses and shops, allowing staff in a highly mobile environment to focus on their jobs around the building and let the PDS alert them if social distancing measures are being breached.

The future of building management

Understanding and optimising how people use space is increasingly recognised by architects, but can it also inform smart environmental and energy management?

As well as wearable smart sensors for people, there had been an innovation of smart sensors for buildings that detect the number of occupants in a space would suggest that there is a growing overlap here.

Pedestrian movement analysis could be a long-term addition to our toolbox, not just an interim response to the pandemic.

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Unibail-Rodamco-Westfield

Model Checking & Clash Detection

Unibail-Rodamco-Westfield has three main ways in which they use the rules-based checking inside Solibri Model Checker; space and dimension checks, model revisions comparison, and data validation.

– Space & Dimension Checks

Running space and dimension checks in Solibri Model Checker is a quick and easy way for the team to ensure that it is adhering to project standards and regulations, while coordinating various disciplines' models. For Unibail-Rodamco-Westfield, who are continuously developing multi-purpose facilities, this is an important aspect of model checking undertaken on projects.

– Model Revisions Comparison

At each design gateway, the team at Unibail-Rodamco-Westfield issue a revision comparison report to Design Managers, as well as internally checking and verifying these results and displaying during the design review meetings.

– Data Validation

A key topic when discussing model checking and configuration of rulesets for checking data is 'consistency' – and this is something Unibail-Rodamco-Westfield are grasping and nailing when it comes to the checks it runs internally. During our interview with Lucas and Lewis, it became apparent that there was a clear message being passed through Unibail-Rodamco-Westfield's projects, a message that ensures consistency and discipline at every stage to allow for a data-rich and accurate federated model.

The team has developed rulesets for checking naming and tagging within its models, with live feeds and referencing to a database of codes/tags in the pipeline, which allows for further checking and verification of the data.

“

Unibail-Rodamco-Westfield's investment in BIM and technology goes far beyond keeping abreast with our competitors. We've seen real value and returns in its application which plays a vital role in facing the challenges involved in the design and construction of complex projects. The resulting information models allow us to harness the power of data giving greater control over our built assets as well as enabling collaboration within our diverse range of business units.

Keith Whitmore, Head of Design & Construction UK/Italy and Co-Director of Construction Management Europe

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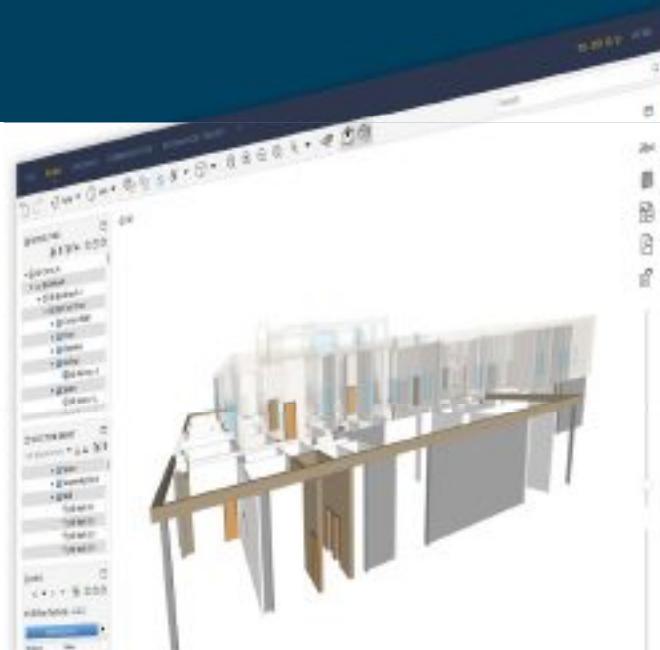
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The role of BIM integration in preventing terrorism

Adrian Timberlake, chief technical director of Seven Technologies Group (7TG) and an expert in technology that uses AI for counter-terror and other security settings, examines the potential of BIM platforms in planning for terror prevention strategies in the design of large national infrastructure projects

With ever-larger national infrastructure projects on the horizon, such as HS2, the need to embed counter-terror systems in building design becomes more important.

Acts of terror are varied in method but the one common denominator is crowds or areas of high footfall. Therefore, it is necessary to consider and plan the implementation of effective counter-terror measures for buildings that can house large crowds or act as transport links, like terminals.

In addition, because London is an information and media hub it makes the city, and any transport going to and from it, more vulnerable than other parts of the country.

Contributing factors to the success of counter-terror measures include optimising the location and implementation of security cameras and barriers, and designing the layout of a building to minimise areas where a dense crowd can gather, in which acts of terror could be 'hidden' from the eyes of security teams.

But the key to watertight counter-terror security measures lies in early and effective planning. This is why BIM – which allows for collaborative planning from the earliest stages of a project's conception – is so critical in embedding counter-terror systems, especially new technologies, in buildings and related infrastructures.

What new technologies can be used to combat terror?

The advent of artificial intelligence (AI) has vastly improved counter-terror technology. AI serves as an intelligence gathering tool to recognise terror risks and to facilitate early alerts to law enforcement personnel to prevent crime.

Facial recognition is just one example of the capabilities of technology that uses AI. As facial recognition uses biometric data to match a face to an identity, it can significantly enhance the accuracy of CCTV systems and speed up intelligence operations.

Another option is infrared cameras, which can reveal hidden weapons. The technology works by sensing temperature over a surface or object, so can detect objects over a certain size hidden within clothing as they block emission of body heat.

“...the key to watertight counter-terror security measures lies in early and effective planning. This is why BIM – which allows for collaborative planning from the earliest stages of a project’s conception – is so critical in embedding counter-terror systems, especially new technologies, in buildings and related infrastructures.”

The benefit to security teams extends beyond greater awareness of potential security risks, as the technology allows for suspects to be non-invasively screened rather than searched. This not only reduces the risk to security personnel if the suspect is carrying a knife, but it may also help to reduce incidences of negative ‘stop and search’ experiences on law-abiding members of the public where suspicion was due to human error.

All of these technologies can be programmed to automatically alert police whenever it recognises a confirmed terror suspect or known offender entering a vulnerable area such as a terminal.

While AI software is often integrated into traditional signallers of security - cameras and e-gates in airports, as an example – there is potential to improve the effectiveness of security systems by integrating technologies within the structure of a building itself.

Hiding in plain sight

There is much evidence to suggest that obvious or overt security measures can make law-abiding citizens feel uncomfortable and fearful. The debate around facial recognition and privacy is a prime example. Unfortunately, while security and counter-terror measures are necessary to keep people safe, highly visible measures may serve to remind the public of the constant threat of terror. But BIM is working to change this.

Designing buildings with more joined-up counter-terror systems in mind allows for greater options in providing discreet security. If small camera lenses were built into walls or ceilings, for example, it could help to reduce the ‘fear effect’ of more obvious security measures while additionally making it more difficult for criminals to spot cameras and avoid them.

Early implementation of new technologies may also create economies in cost and hardware, as late implementation can incur additional building work. Integrating counter-terror measures at a late stage may also force project leaders to settle for options that retrofit within the current specifications of the building, rather than what is needed to best safeguard the public.

Adopting BIM strategy in the construction of large national infrastructure projects will be key in mitigating issues in integrating effective counter-terror measures, keeping people safe and upholding national security.

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Scaffolding: Reaching greater heights with technology

Mattias Kuduk, VDC and innovation manager at global temporary access provider HAKI, discusses the technologies that are having a positive impact on a sector where safety, quality and performance are high demands on a project's agenda

Technology is enabling the wider construction industry to achieve so much; it is streamlining delivery, reducing risk and driving productivity across a project's supply chain. BIM, virtual/augmented reality and IoT (Internet of Things) are now common terms within the industry's vocabulary, with some if not all construction sectors now using at least one of these technologies in their daily operations.

For the scaffold and temporary access sector, technology is reinventing the wheel, with BIM in particular enabling clients to interact with impressive 3D models of intricate designs.

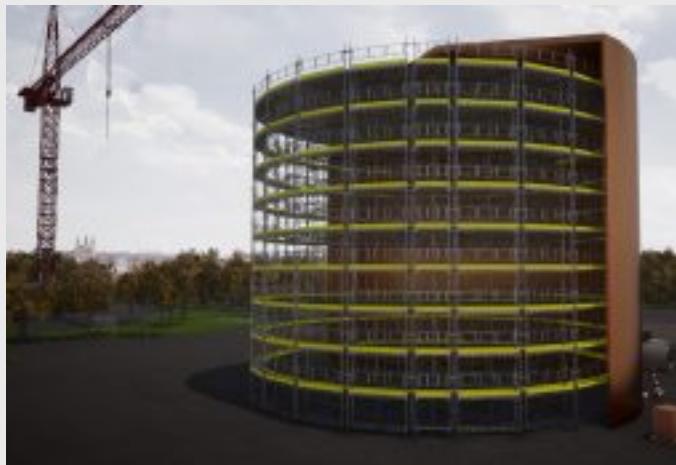
Simple designs for complex structures

BIM is giving a project's entire supply chain improved visibility when it comes to planning, designing and managing built assets. From enabling architects to design-out risk to providing contractors with the capability to digitise construction sites, this intelligent 3D model is optimising work processes and collaboration in a notoriously disjointed industry. Not only is it bringing the construction industry into the modern age, BIM is also

improving the levels of safety in which buildings are made and maintained. In a post-Grenfell society, we all know how essential its presence is.

For the scaffold and temporary access industry, BIM is enabling internal and external design engineers to produce simple 3D scaffolding blueprints for complex structures. Unlike 2D CAD drawings, 3D modelling produces detailed designs in far less time and with more reliability. Designers can reap these benefits with the tools such as the HAKI Design Tool and HAKI BIM; two solutions in which the former enables designers to configure scaffolding designs on a cloud-based platform – Inventor iLogic and Configurator 360 from Autodesk – and the latter advances this configuration on to Revit for greater customisation and capability, particularly when it comes to interacting with the components within the 3D model.

As BIM progresses, the scaffold and temporary access industry will see the wider adoption of 4D, 5D and 6D iterations. HAKI is currently engaging in 6D BIM on



Hinkley Point C (HPC), the UK's newest nuclear power site. This version is processing live connections to the sites to inform decision-making. Each week a site is scanned for updates, where this data is assimilated and then disseminated to the project's supply chain, meaning weekly progressions can be viewed. With 6D BIM, the HPC project's supply chain has full visibility of a project, which is currently the largest construction site in Europe.

Visualising the future

On construction projects, virtual or augmented reality (VR/AR) gives a clear visualisation of how a project will function in real-life. A project's 3D BIM model is loaded on to the AR software to give full visibility of the components. Users can then interact and walk through the 'project world' to review the work prior to construction. This process adds another crucial layer to scaffold projects, enabling designs to be viewed and interrogated before moving to the next stage of development.

HAKI has developed a version of such software named HAKI Playground, which allows users to walk around the project directly onscreen. This can be used on any device including a PC, tablet, smartphone, Xbox and PlayStation.

After a project has been completed in Revit or HAKI BIM, it can be exported to the gaming platform Unity. An avatar lets the user walk around the project as if it was in the real world. The user can, for instance, see the detail of a scaffolding beam and analyse its compatibility with fellow materials, enabling money to be saved and risk to be mitigated on projects. To provide even greater accessibility, the HAKI app is making use of smartphone technology to enable its customers to view products in AR, in order to find information quickly.

As well as being suitable for a number of devices, HAKI Playground negates the need for any headsets with glasses – a real bonus for those constantly moving around a project. The application also allows a number of stakeholders in the supply chain to experience the solution in VR at any one time and is not restrictive to one person, unlike most other applications. This is particularly beneficial for group environments and collaborative or collective feedback.

Keeping connected onsite

The Internet of Things basically encompasses every and any object that uses the internet to connect with another 'thing'. Smartphones, Fitbits, Amazon Echo, each household has at least one of these objects (which are in constant dialogue with another). For the construction industry, the IoT has radically changed the way projects are managed and built; there are apps for project management, deliveries, timesheets etc. IoT is essentially allowing important decisions to be made anytime, anywhere, freeing up site-workers from the shackles of their office computers so work can be performed in any location with decent Wi-Fi.

IoT is of particular value on temporary access projects on offshore oil rigs, or any programme of works that are located in hard-to-reach places. Having a device which can keep these sites connected with external supply chains is crucial, especially when it comes to deliveries and any other urgent matters.

BIM, AR and IoT technologies are just a few of the innovations that are streamlining programmes of temporary access works across the globe. Preventing risk, improving project delivery and offering real value, it won't be long before technology is completely indispensable to the sector.

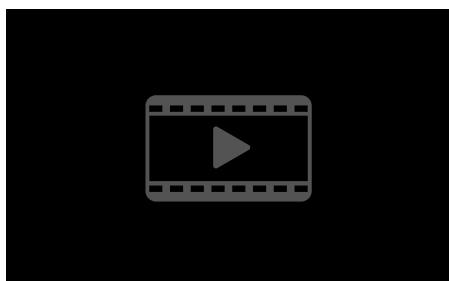
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Agenda	
Day 1 (Essentials of Advance Design)	Day 2 (Concrete and Steel Design)
<ul style="list-style-type: none"> - Introduction to Advance Design user interface. - Loads and combinations. - FE analysis and results post-processing. - Steel design according to Eurocodes. - Calculation reports. - And more 	<ul style="list-style-type: none"> - Creating plate elements. - Creating levels. - Modal and seismic analysis. - Concrete design according to EN1992. - Concrete analysis results. - And more.

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Customer Advance Design training feedback

"Thank you, Craig and Sara, for the training. The course was very useful for me as a part-time user. Looking to become more of a full-time user going forward." Nigel Hills – Fordham Consulting

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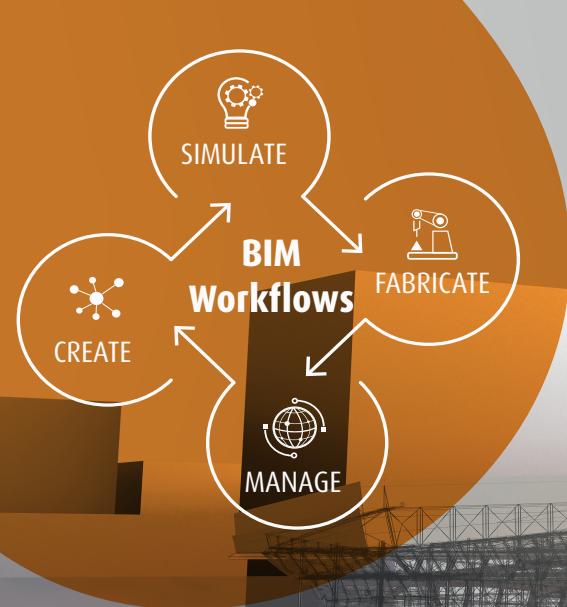
SIMULATE

FABRICATE

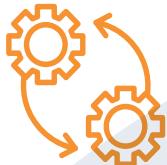
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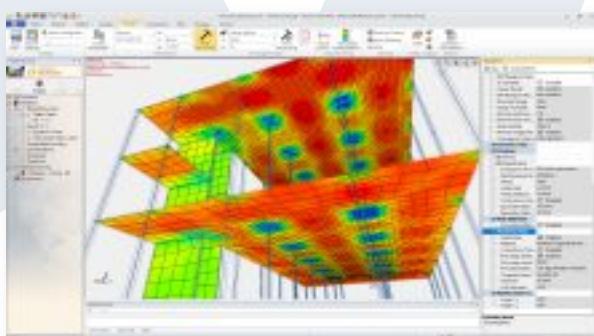
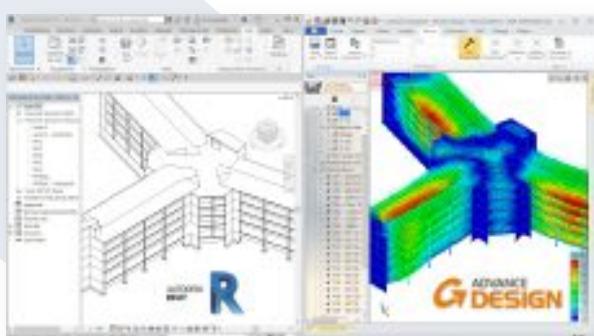
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IoT in housing: The time is now



Following a world-first agreement to install real-time monitors in thousands of social homes in Renfrewshire, iOpt founder and managing director Dane Ralston says it is now time for IoT adoption in housing to become the “new normal”

Established in 2016, UK-based iOpt uses data analytics, high-tech sensors and the latest IoT technology to allow owners and managers of large rental property portfolios, such as social housing landlords or build-to-rent investors, to remotely monitor the internal environment of their assets.

iOpt has 11 partners on its books with 300,000 properties under management by customers, including Renfrewshire Council, Leeds City Council and Places for People. Founder Dane Ralston has a 20-year track record in asset monitoring and predictive maintenance, having worked as a partnership builder with Goodrich Aerospace, Turkish Airlines and Aston Martin.

In just three months of lockdown, we witnessed three years of digital evolution, according to analyst McKinsey. That trend will accelerate as businesses and local and national governments increasingly turn to technological solutions to deal with the long-term health and economic consequences of Covid-19.

The nation was just easing out of lockdown in June when we announced winning a tender worth up to £1m to install real-time monitors in 2,400 social houses in Renfrewshire – a world-first that seeks to improve the lives of tenants while cutting property management and repair costs, supported with £150,000 from the Scottish Government's CanDo Innovation Fund.

The new two-year project, which begins when lockdown restrictions are eased, sees sensors fitted into selected empty properties being prepared for new tenants, who will also be supported with energy efficiency advice and guidance.

iOpt's bespoke algorithms and machine learning techniques predict when and where issues such as mould growth will arise, allowing preventative intervention before repair costs or tenant health issues escalate. The technology vastly reduces the amount of property visits, cutting down on carbon emissions, while helping to identify and support vulnerable tenants who may be struggling with fuel poverty.

The Renfrewshire partnership was four years in the making, so our current groundwork was prepared long before the words Covid-19 or pandemic entered into our everyday language.

Like a number of our pilots across the UK, the focus was purely on energy efficiency and the questions we had to answer were: does real-time remote monitoring of housing let us evidence that energy efficiency projects result in benefits to the property condition and savings for tenants, can we quantify those savings and can we do it at scale?

The answer to all these is a resounding yes.

Our studies have shown maintenance savings of approximately £190 per year per property, a significant sum for local authorities juggling with budget priorities at a time of financial pressure.

The ROI of this technology goes well beyond direct cost-savings. Benefits include:

- 1.** Having real-time accurate visibility of asset conditions means the housing provider is in control, allowing for predictive and proactive maintenance interventions. It is well documented that proactive actions are typically five times less costly than reactive ones.
- 2.** Instant access to information means reduced administration, improved communication and fewer, more focused property visits.
- 3.** Having access to our data means that insurance companies and financial institutions will have more faith in housing providers, which can lead to reduced premiums.
- 4.** Working collaboratively, data can inform customers' future home design and system and material procurement.
- 5.** And, critically, early warning of potential issues means healthier buildings and healthier tenants.

However, it is now vital we accelerate the adoption of this technology to tackle health and fuel poverty issues relating to poor housing exacerbated by Covid-19. Housing is now very much in the frontline of the war against the virus.

Remote monitoring and the 'new normal'

The relationship between our work and combatting Covid-19 is two-fold. In the new norm of social isolation and lockdown, there are clear benefits for customers in remote monitoring rather than physical monitoring.

And real-time data monitoring of temperature, air quality and occupancy levels is an essential tool in curtailing the spread of the virus as more people spend more time indoors during the winter months.

There are a number of studies that prove a clear relationship between inefficient housing and the spread of Covid-19.

[Preparing for a Challenging Winter](#), a report prepared by the Academy of Medical Sciences, says the right level of heating and ventilation in our homes reduces the risk of transmission. Coronavirus spreads more easily indoors and poor ventilation and overcrowding increases the density and build-up of infectious viral particles in a room.

According to the report, lower temperatures due to inadequate heating or poor insulation also reduce the body's immunity to viruses.

Our systems are already picking up some early warning signs. We have seen CO₂ emissions – the key indicator of poor ventilation that accelerates the spread of Covid-19 – increase by 40% as a result of more people staying at home during lockdown.

It has been long accepted that housing and public health go hand-in-hand.

The cost of poor housing to the NHS is estimated to be at least £2.5bn a year. To put that in context, that's the same annual cost to the health service as treating smoking-related illness.

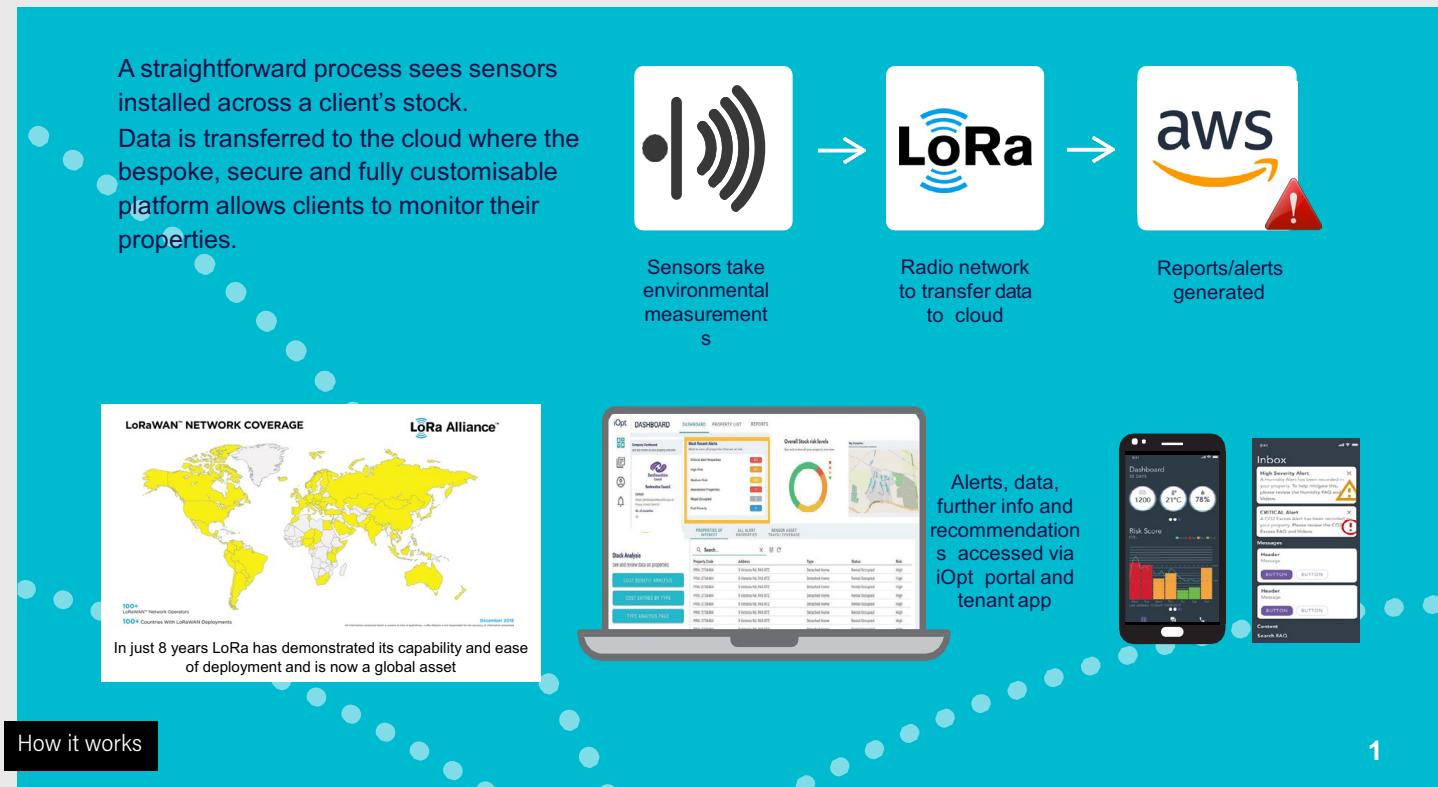
The most significant health gains can be achieved through prevention by using data to understand how we can best improve the quality of life for tenants.

Information is critical

The information we gather is critical in not just dealing with the current issues but also in preventing future problems. It can also be used to inform asset owners as to what aspects of their properties are the best performing, such as the most efficient types of boilers or what building types may need to get upgraded first with insulation.

As an example, working with Home Group and BRE, we are looking at a batch of 50 homes, with five property types, to examine which are the most efficient. This, in turn, could be extended to street and ultimately city levels.

All businesses need to be agile and adaptable to the needs of their customers. We worked with Leeds City Council on improving tenant experience and engagement by developing an app for tenants that works in conjunction with the full remote property monitoring platform.



The app keeps tenants updated on their property environment and prompts them to change their practices if required through educational info.

Last year, we were one of five companies chosen from 111 in a global competition to support the digitalisation of Places for People to help them drive team efficiencies, so asset managers can make fewer but more focused face-to-face tenant visits.

Looking to the future

As for the future, our own business was founded in 2016 so it is still relatively new. But we see a growing appetite for an IoT solution that delivers cost savings and is aligned with goals on health, the environment, energy efficiency and the smart cities revolution.

This market extends well beyond the UK. While there are 9m homes in the UK social and private sector, there are 40m in the US. In the Netherlands, 70% of housing is social, while in Singapore 78% of the population lives in publicly governed and developed homes.

The problems that we face are truly global and thrown into sharp relief by Covid-19. Poor environmental conditions cost money and cause health issues; hot dry countries with poor aircon see viruses spread due to low humidity; tenants in wet, mild countries are more prone to respiratory problems.

Our next round of investment will give us the ability to tackle that market, with a focus on recruiting more talent and refining our technology.

We have a scalable and sustainable business model and an IoT-driven solution that tackles a worldwide problem – a solution that improves the lives of people and protects valuable housing assets. The hard work and evaluation have been done and now it is time for IoT and energy efficiency adoption to be the new normal.

If there is one thing that we have learned from the current crisis, it is that this technology is no longer a "nice to have" but an essential part of an integrated approach to public health. It is time we all work collaboratively in the IoT space to accelerate what is already a proven success and seize this opportunity to build a fairer and healthier society.

Dane Ralston
Founder and managing director
iOpt
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Creating a digital map of underground assets

With accidental cable and pipe strikes resulting in high costs, project delays and potentially life-threatening injuries, the Geospatial Commission has partnered with Ordnance Survey and the Greater London Authority to develop a National Underground Asset Register that will digitally map the world beneath our feet

Accidental strikes on the myriad of underground pipes and cables in the UK cost the economy £1.2bn a year. Workers who strike gas pipes and electric cables by mistake put themselves and others in danger of death or serious injury. But with no below ground base map to put utility companies on the same page when it comes to digging safely, the risk of asset strikes, project delays and disruption to the public remains high.

It's the reason the Geospatial Commission, an expert committee formed to optimise the UK government's use of location data, is doing something about it.

In collaboration with Ordnance Survey (OS) and the Greater London Authority (GLA), it is developing a pilot [National Underground Asset Register \(NUAR\)](#).

This neutral platform will pull in government and private data on the whereabouts of the UK's cables, pipes, sewers and ducts to build a standardised digital map of assets under the ground.

Users can then access the easy-to-use system via handheld devices in the field.

In 2019, the Geospatial Commission announced a 12-month pilot scheme to test how a NUAR could be designed and managed.

The commission chose two locations for the £2.4m pilot - London and the North East. The North East Underground Asset Register (NEUAR) was overseen by OS. The London Underground Asset Register (LUAR) was overseen by GLA.

OS's strategic propositions manager, Carsten Roensdorf, worked on the North East trial.

He said: "The situation in Britain is there has been a lot of complicated underground asset networks built in this country in the last 100-plus years.

"While network operators have information about where these assets are, there are gaps in the data.

"More importantly, there is no central place for all this information to come together to serve use cases such as safe digging.

"For example, before commencing an excavation, you need to have access to all the records from all the suppliers or asset owners of a particular area, to inform you about the risk of what you might find if you dig a hole."

Benefits

The benefits of an underground assets register would have a far-reaching impact on the utilities industry.

As well as helping users dig safely without striking a buried asset, it would help workers orientate themselves on site much easier, assist with more accurate and comprehensive planning to avoid delays, and allow asset owners to send and respond to data requests without having to maintain their own data response systems.

Roensdorf said: "What is really exciting for me is that we tried to approach solving a problem which has not been achieved before in England. And we managed to create a community in which we collaborated to solve the problem.

"It has been rewarding to see the reaction of people in the field, even guys who have been sceptical of new technologies are seeing the benefits and are asking 'can I have this for my day job tomorrow?'"

Challenges

The trial proved a collaborative mindset and trust between all organisations involved, and the willingness to share data, is a must to make it a success.

There were three key challenges to overcome: on a cultural level, a legal level and a technical level.

Roensdorf said: "What we tried to make happen in the North East was to embed a culture of data sharing, where organisations who might be obliged to give information about their data become much more proactive in providing relevant information for the benefit of all.

"If everybody puts data into this data sharing scheme then you can do new things.

"You can improve and re-engineer business processes that have been in place for a long period of time. Mainly around safe excavations, which can be based upon rich, integrated information that wasn't accessible before.

"You can make them a lot more efficient, a lot safer, and you can enable these facilities to provide a better service to their end customers through shorter disruption times."

With regards to the legal side of things, the NUAR pilot addressed licences and liabilities that come with the use of the third-party data.

Every organisation puts their own terms and conditions and caveats onto the data they share.

Roensdorf said: "In the long run, it would be desirable to come up with a joint set of terms and conditions for most of the suppliers to sign up to."

On a technical level, the challenges are around data quality issues. Data has been captured over many years with varying degrees of accuracy.

Roensdorf said: "The way we have approached this is to say we know there are issues with data quality, but that is not an excuse not to share data."

"We look at the data that is in NUAR, not as the definitive view of what is underground, but as the best possible intelligence of what might be there."

"The data providers have established the principle that even if we know the data is not perfect, we will share the data with the mindset that over time there will be continuous improvement in the quality of the data."

One key feature of the trial was that it allowed feedback direct from the field. Workers on-site can contribute notes such as inaccurate locations or unidentified buried assets.



Roensdorf said: "We always start with the data when it comes to an excavation, but then there is the experience of the field engineer who will add more information and intelligence to it to make a safe excavation."

"We were lucky in the North East that everyone was quite open to the idea of sharing in this way."

"We hope that as the benefits of these continual updates are realised, it will encourage this behaviour to become more widespread across the rest of the country."

Game-changer

Integrating the data on to a common map only works because all the utility companies already use a common base map to register their assets – OS Mastermap Topography layer.

OS was well placed to play the role of intermediary because all parties already relied on OS data above the ground.

Roensdorf said: "Utilities in the North East saw us as the trusted data broker. They were quite comfortable in sharing data with us and trusting us to distribute the data according to the terms and conditions that they set."

"Together with Northumbrian Water we brought the community together and proved we could create the technology to make this happen."

"We created the legal and security environment around it so everyone felt safe sharing data."

"This all aligned with the Geospatial Commission's objectives to create an underground assets register."

He added: "This can be a game-changer because it is essentially about digital transformation of utilities and local authorities' operations and how they deal with infrastructure."

"They have access to all the other organisations' data, which gives them better insight about the practicalities in areas, whether they are doing emergency works, replacement programmes or a new housing estate which needs to be connected."

Carsten Roensdorf
Strategic propositions manager
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MODULAR CONSTRUCTION:
HAS ITS MOMENT ARRIVED?

A photograph showing a construction worker in a yellow vest and hard hat working on a modular building under a clear blue sky. A crane is visible in the background.

Guidance in Construction
Protecting your rights in a tightening construction sector

A photograph of a multi-story construction site with scaffolding. A large yellow speech bubble graphic overlaps the top left corner of the image.

scotframe
timber frame | homes

Debating the merits of a fabric first approach

Inverurie | Cumbernauld | Inverness | Dundee | Swindon

Aldermore

A photograph of two modern, two-story houses with light-colored facades and dark roofs, set against a backdrop of hills and greenery.

3D laser scanning's mobile moment has arrived: Is your business ready?

Mobile 3D laser scanning is emerging as a valuable tool to gather building information in greater detail while saving time and money – and improving worker safety

Technological innovation is often broken down into what could be described as leaps and half-leaps.

Leaps are the giant steps forward. The integrated circuit, or microchip, is a good example. Capable of holding billions of individual transistors, it more than any other 20th century technology, paved the way for the impressive computer power we take for granted today. The increasing megapixels of a smartphone camera or a software upgrade are, by contrast, a half-leap – an incremental point of progress.

Leaps and half-leaps are important partners. If all we had were leaps, change would come too fast and unplanned obsolescence (versus planned obsolescence) would dominate. On the other hand, if all we had were half-leaps, said change would come too slowly and we'd still be bragging about our transistor radios.

Only the right balance of revolution and evolution makes sense. Thus, for the 3D laser scanning industry – forecast to be worth [\\$4bn](#) by 2025 – and AEC professionals who increasingly rely on these cutting-edge technologies, the next evolutionary step is the widespread embrace of in-field mobile scanning versus more traditional static methods.

Like with any incremental point of progress, the transition from static to mobile 3D laser scanning has taken time. It's also taken plenty of research and development that's given rise to a herculean increase in on-the-go



computer processing and cloud-based data sharing. Powered by sophisticated software that can directly import into any CAD system with 3D point cloud capabilities and that can optimise scan to BIM workflows, mobile scanners are ideal for large construction companies, general contractors, and facility and plant managers, who require the most accurate as-built models and building documentation while ensuring unmatched construction quality control.

Monetisation potential

Today's advanced mobile scanners come in two varieties: handheld devices and scanners mounted to wheeled tripods, small vehicles or carried as part of a backpack apparatus, where the operator walks at a comfortable pace and quickly scans an interior space. While mobile 3D scanning is mostly confined to industrial-grade uses, Apple's [LiDAR Scanner](#) for the iPad Pro 2020 (compatible

with the Measure app) is an example of the technology's broadening reach, as well as its lowering price point.

Regardless of which route companies choose, 3D mobile scanning offers similar immediate benefits:

- The ability to capture colour images while the scan is taking place, thanks to mounted cameras. This means the colourised 3D point cloud is ready for instant applications, saving time and money.
- On-scene flexibility means exploring tight spaces and hard-to-reach spots that a static scan would struggle to capture. Time and money are saved here too as no setup or scanner repositioning is required.
- Mobility allows operators to avoid other on-site distractions like people and extraneous

material. With mobile scanning, there is no need to wait for after hours to return to a scene to capture previously inaccessible data.

- Compared to their bulkier cousins, handheld scanners are easier to use and feature a faster learning curve. Getting your team up to speed in record time (with fewer support staff) means there's more time to get the job done.
- Enhanced capability to more quickly communicate site walk-throughs with clients – and to do so in a socially distanced manner with fewer people on site.

These benefits come at an important time as AEC professionals look to improve their end-to-end efficiencies and reverse two (possibly three) disturbing trends illuminated by a noteworthy [McKinsey](#) analysis. In the consulting firm's Imagining Construction's Digital Future report, it found that large construction projects typically take 20% longer to finish than scheduled and cost 80% more than budgeted. It also found that if anything, construction productivity has declined in some markets since the 1990s at a time when static 3D laser scanning was just gaining widespread use.

At a moment where the health and safety of on-site personnel are paramount concerns, getting the job done as fast and as accurately as possible is essential. It's also a matter of simple economics and ROI: if a static scan used to take hours to complete can now be done 10X faster, new business can be accepted faster than ever before.

The hybrid solution

That's true whether the new business exists in North America, 3D laser scanning's largest market, in Europe, with an estimated market size of [\\$2bn](#) by 2022, or in Asia-Pacific, the region with the fastest growth.

But as with any emerging technology, there's often a cost-benefit analysis. For industries using 3D scanners, there's a battle between ultimate speed versus ultimate quality. Today's



mobile scanners are fast, yes, but they still can't capture as many data points per second as their static scanning counterparts.

One solution to this challenge is for businesses to invest in a hybrid approach: a mobile scanner capable of switching between mobile and static modes. As a best of both worlds option, users can speedily scan a large indoor space, like a factory or an aircraft hangar, before a possible upgrade or total repurposing. And it can also capture the finer details of, say, assembly line equipment with the ability to scan up to 2m points per second via stationary operation.

The result is that as-built capture jobs that would normally require one hour or more to complete with a static scan, could be accomplished in as little as six minutes. That's an impressive 90% decrease. By toggling between static and mobile use cases, businesses can maximise their efficiency while improving ROI.

Scanning by leaps and bounds

So whether you're the owner of an office building looking to expand and require an as-built 3D digital image of the space as it exists, or if you're restoring a historic building to its original design blueprints, or planning to rebuild your hospital, mobile 3D digital scanning is increasingly the speedy and economic choice for a variety of industrial applications.



For businesses looking for an added edge, mobile scanning (and their mobile-static hybrid alternatives) might be the ideal investment.

Half-leap innovations might not always be front-page news. But in the words of American essayist, playwright, novelist and civil rights leader James Baldwin: "If you can alter, even by a millimetre, the way people look at reality then you can change the world."

For the AEC industry in Europe and elsewhere, 3D mobile scanning is the literal realisation of Baldwin's inspiring words.



Matthias Koksch
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IoT data: Maximising its value

As IoT sensor deployments are expanded in smart cities, utilities, hospitals, schools, agriculture, transport networks and many other places, Nick Sacke, head of IoT and products at Comms365, explains that stakeholders need to fully understand how to integrate these new data sources into existing data platforms and get the most value from them

Many technology commentators have talked about data as the "new oil". In the wake of fallout from the current epidemic, data might also come to be viewed as a utility – like electricity, water and broadband; a vital resource essential to shaping, supporting, securing and optimising, all life.

Through the rapid growth of IoT deployments, organisations are capturing more data than ever before. But there are still a number of questions around the use of data that need clarity. What is the value in the data? How can it be made available and used effectively to benefit all stakeholders – councils, citizens and businesses? How can it be monetised, if at all? In light of GDPR and the post-Covid-19 landscape, this is a highly topical area.

Mining the data lakes

The use of IoT adds additional data streams from new devices, environments and processes that organisations have not previously been able to connect to or explore. That data can be treated as a standalone asset in the proof of concept phase but the ultimate objective is to

combine it with other data to create "data lakes" that can be dissected and utilised. Yet, while many organisations and entities such as local authorities are collecting this data at pace, they are yet to mine that data effectively, examining it to generate new information and maximise its true value.

As more IoT projects are deployed and mature, vast volumes of data points, potentially in the billions, will be added to existing repositories. Data is amassing at a significant rate and this data will be valuable and useful to organisations and citizens. Some data may be designed to be collected and actively shared with third parties to aid decision-making for communities. An example of this is in smart city infrastructure – town planners, construction companies, utilities, public enquiry, service providers, among others, may want access to particular data for planning, building or to improve service offerings.

On the other hand, there could be conflicts in sharing data widely as IoT rolls out. For example, there may be an increasing number of data points measuring climate and



pollution but that could reveal data on a city's rising CO₂ levels, which results in the city being held up to scrutiny and fined. Measuring air quality levels has now become a top priority as the linkage between exposure to pollution and susceptibility to the effects of the new "mega-viruses" has been established. The balance of data insight versus the potential societal and commercial impacts could become a complex issue to manage.

But first, the data has to be mined and structured in a way that it can be used, so there must be a system in place around who has permission to use that data. Is the data available for free or on a commercial basis? Or is the data confidential and strictly for internal use only? Recent developments with the opening up of track and trace data during the Covid-19 epidemic has overridden GDPR concerns – will this become normal practice to ensure health for our city populations?

There is a lot of education going on in the public sector about how to use data, hiring data scientists versus using third-party resources, how to assemble the tools to make that data mining effective – getting the right expertise on board is crucial.

Asking the right questions and defining the queries for the datasets is also important. There is little value in collecting increasing quantities of data if you don't ask the right questions to gain the most insight from it. Benefits of using an IoT platform to process data include powerful analytics and visualisations that deliver trend analysis and even return on investment (ROI). These tools and visualisations can be customised and personalised to individual departments and stakeholders.

Securing data flows

When it comes to implementing a network infrastructure for IoT, security is a priority. For many IoT deployments, a combination of public and private data sources will need to be used but how will the data flows be securely managed? Some of the data will be related to mission-critical infrastructure and operations (such as traffic flows, energy and water infrastructure). Public domain or 'open' data published by central government, local authorities and public bodies includes environment (weather, flooding, air quality), transport (airports, roads, electric vehicles, parking, buses), towns and cities (housing, urban planning, leisure, waste and energy), education, health (hospitals, medicine performance) and others.

This is where middleware is required that can effectively segment the data network and prioritise appropriate traffic, enabling data to be routed correctly and efficiently to the right repositories and analytics engines. The more data that is amassed, the more the challenge will increase. A comprehensive data strategy is required that not only encompasses the variety of sources of data but also the routes and collection methods whereby the data is brought in.

Addressing cultural concerns

Culture continues to be a significant barrier to adoption when it comes to IoT deployments. The idea of 24/7 monitoring or corporations accessing our personal data makes people nervous. This is primarily due to the unknown facts about what happens to that data and the question of who ultimately owns it? Without insight into this, and how data can be used in a positive way, the automatic response to data being recorded and used is an initial degree of scepticism.

The good news is that IoT data is collected and delivered in an anonymised, secure format. This data is decrypted, collated, analysed and integrated with other datasets as part of a tracked process. The data composite is used primarily to provide an overall picture and to track trends and changes, as compared to personal data collected by an eCommerce site. Privacy by design is an inbuilt feature of an IoT system solution, mitigating privacy concerns.

As IoT continues to become a part of our everyday lives, we will likely see an evolution in this setup, perhaps even at a granular level where permission is granted for particular data to be used for specific purposes. Education is therefore crucial to overcoming cultural concerns, to communicate the benefits of IoT data use. For example, within smart buildings, how IoT can have a positive impact on elements such as energy usage, not just in terms of lowering bills but in turn reducing the impact on the environment and many more subsequent benefits. Another example is the use of air quality data to allow personalised views and planning routes into school and work.

There is currently a lack of legislative framework around how data should be shared and it is something the industry has been crying out for. In the meantime, GDPR is the only universal mechanism around data sharing and data processing, but it requires augmentation and localisation. We're now in the early adopter phase of data sharing, where organisations are looking to mirror best practice and consultancy, replicating what others are doing in terms of data mining and management in order to identify the best strategies, but are also trying new methods and innovations to see what the effects are.

The evolution around the use of IoT data is one that is continuing to develop at pace but can also be challenging for those organisations that are amassing growing volumes of data from initiatives and projects. Combining IoT data with other sources, mining and making it available in ever-more flexible and tailored ways to a variety of stakeholders is a complex task, requiring expertise and teamwork. Organisations who wish to make effective use of the new data utility should look to create an ecosystem of complementary experts and providers, capable of guiding the data collection, mining and distribution through the complexities, addressing all the necessary hurdles including infrastructure, security and cultural barriers. The potential prize contained in the use of data is great – better, safer, more efficient living for all.

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5 mobile systems that can improve construction workflows

Mobile systems backed with cloud-based technologies offer construction sites a previously unseen level of convenience and ease-of-use. Bryan Christiansen of Limble CMMS looks at five of these systems and how they can improve construction workflows

In the construction industry, there has been continuous drive for more [digitisation](#) to achieve various benefits. An integral part of that digitisation is mobile technology largely due to its ability to support seamless workflow.

A variety of mobile systems now exist with functions to improve every aspect of workflow at construction sites.

1) Project planning systems

The first major undertaking of any construction project is project planning. From designing the structure to ordering various materials to recruiting labour (whether as workers or subcontractors), project planning helps to provide a specific process to help construction managers plan, manage and execute a construction project.

Previously, project planning was managed through a combination of paper records, spreadsheets and enormous charts. These days, the need for operational excellence and optimal resource allocation means there is minimal allowance for waste or inefficiencies. Consequently, mobile project planning systems have become more relevant for

better worksite productivity. They provide access to accurate and reliable project data on the go and usually in real-time.

With mobile project planning systems, a construction manager can expect:

- A centralised repository for projects document storage, sharing and control.
- Resources management features to monitor resource usage compared to original estimates.
- A complete view of their projects from start to finish.
- Budget management and accounting features for efficient management of the project's budgets and forecasts.
- Real-time communication and collaboration among all users that improves the coordination of field operations.
- Time management features such as team dashboards, shared calendars and task prioritisation.

2) Reporting systems

A common challenge on many construction sites is that everyone is so busy doing the work, they struggle to find time to document what's been done. But with mobile daily reporting systems, it has become significantly easier to create and view daily reports. Site workers can easily take pictures or videos with their mobile devices, build up a report and upload it to be reviewed while they move on to another task. This speeds up the reporting process and minimises the chances of procrastination.

Typically, these systems allow users to report and track:

- Labour productivity based on actual labour progress against estimates.
- Internal issues, daily logs, weather information, crew mix, work performed, delays and disruption hours, accident reports, equipment and usage, and comments.
- Small issues before they escalate into bigger issues because they were not noticed early enough.

3) Mobile maintenance systems

The working condition of the equipment being used on a building project can to a large extent determine the project's success. Therefore, the construction industry requires that its vehicles, heavy machinery, and tools operate at maximum efficiency and function with minimal downtime. Also, each piece of construction equipment is usually expensive and needs to be maintained to specific standards to avoid serious problems later.

Without an equipment maintenance plan covering the entire duration of the project, there are high risks of extended equipment downtime, missed deadlines and safety incidents. A project maintenance plan will help to ensure that maintenance staff workflow is well-managed, that every asset gets the required attention, maintenance tasks are well scheduled and spare parts are optimally utilised. Prioritising maintenance will also help to lower overall maintenance costs long term. For instance, better maintenance practices will reduce the costs associated with lost productivity due to employee and equipment [idle time](#).

That being said, maintenance management even on the busiest construction sites can be streamlined with mobile-enabled computerised maintenance management systems (CMMS). Mobile CMMS allows its users to achieve the following:

- Generate, assign and track work orders for all maintenance tasks on the go.
- Schedule servicing when the tools are available and when the equipment is not in use.
- Communicate with team members and update maintenance-related information in real-time across single or multiple locations.
- Monitor equipment health remotely.
- Where predictive maintenance technology is being used, users can receive notifications and alerts of potential equipment failure and intervene before functional failure occurs.
- Generate and view a variety of maintenance reports at any time.

4) Blueprint management systems

Construction blueprints, or construction plans, offer site workers a detailed overview of vital project information such as measurements, quality specifications and building codes. There are several types of construction blueprints being used today, with some of them appearing quite complicated. However, no matter how complex they appear, every specification they contain matters. As a result, it is essential that blueprints are executed with precision and that the relevant parties have access to the information contained. Again, mobile systems are useful in this regard.

With mobile blueprint management solutions, users can:

Access and distribute project information such as plans and specifications, punch lists, documents and photos from any location.



- Access plans and documents that are automatically hyperlinked and sorted in versions.
- Easily search for and view full sheets.
- Publish multiple sheets to the field in minutes.
- Quickly locate any defects and cooperate with other planners and subcontractors.
- Insert older drawing versions without overwriting the latest set.

5) Tool tracking systems

Most construction managers and workers can relate to the frustration of missing equipment and tools just when they are needed the most. Where a project spans multiple locations, workers can easily lose track of tools and smaller mobile equipment. Mobile-first tool tracking systems are designed to address these problems. They enable site workers to manage inventory and pinpoint the location of registered items. Specifically, mobile tool tracking systems allow construction workers to:

- Access a central record of tools movement and history.
- Track who is responsible for each tool and small equipment at any time.
- Use data import technology to import lists from spreadsheets (eg Excel) and easily build tools catalogue.

- Assign tools and equipment to teams, specific jobs or individuals.
- Utilise their mobile phone or tablet camera as a barcode scanner when searching for tools.
- Confirm tool and equipment availability.

In conclusion

Mobile technologies continue to facilitate different processes in modern business. For the construction industry, they are proving to be increasingly valuable for standardising previously cumbersome processes such as reporting, maintenance and so on. Most importantly, they offer up-to-date insights across different stages of the project lifecycle, thereby saving project teams considerable time and money.

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Keeping up with data laws in construction

Construction and building sites are often attractive targets for thieves but now, the industry also has to contend with cyber-crime and data breaches. Helen Davenport, Jocelyn Paulley and Michael O'Shea of Gowling WLG discuss how to avoid being an easy target

Many people may not consider construction to be a high-risk target for cyber attacks and data theft compared with other industries, which may cause companies to be laidback when it comes to security, ultimately making them easy pickings for cyber criminals.

Cybercrime has become increasingly sophisticated over the years and the threat is often difficult to predict. It is paramount that companies invest more in their security measures, not only for defending against breaches but for also spotting when they are happening.

The consequences of lack of good security and vigilance should not be underestimated. It could affect the business's reputation if a breach is made public, cause financial losses and ruin profit margins, risk confidential or commercially sensitive information/assets being made public and also affect the lives of employees. Organisations that fail to comply with data privacy laws risk being fined by the data privacy regulator, the ICO, up to a maximum of €20m or 4% of global turnover, whichever is the greater.

Now, more than ever before, firms are relying on digital systems and infrastructure to allow organisations to continue to function. Over the course of the pandemic and lockdown, many employers and employees have had to abruptly get to terms with working from home. For some, that has been a new experience and for others, at least, a significant change in working pattern. For many employees, and employers, the right infrastructure and measures might not be in place or if they are, they may not have been properly tested. Further, when working from home, away from other colleagues and the workplace environment, and perhaps distracted by children or other family members, people may be less vigilant and, for example, may click on a link they would have thought twice about in the office.

Cyber criminals do not care and the National Cyber Security Centre has observed a surge in Covid-19 related scams and attacks. We have seen further examples of firms and suppliers suffering breaches (some of which were accidentally caused by staff), which illustrates the



Jocelyn Paulley



Helen Davenport

need for organisations to have appropriate technical and organisational measures to ensure personal data is processed securely.

Organisations also have to remain vigilant and make sure employees do not let their guard down because they may be working remotely. To help mitigate against the risks, companies should review their cyber security procedures and consider if additional measures should be introduced. These steps should be a top priority for firms that deal with high levels of sensitive data, which construction firms may well often do.

As a consequence of the lockdown, many construction companies will have had to work with new suppliers to ensure that materials and demand is met – this can also open up cyber security risks. It is important to have the right approach to suppliers and partners who you share personal data and other business data with as it could be hacked through their systems. Changes in business partners can also make phishing and other cyberattacks harder to detect.



Michael O'Shea

Data protection for employees returning to work

As well as managing the risk of a potential increase in cyber-attacks, construction firms have to contend with ensuring that they are complying with data protection laws when processing employee data. With the government gradually starting to ease lockdown restrictions and giving the green light for different types of businesses to return to work, employers will have obligations to ensure the health and safety of employees while at work, which may include collecting extra personal data, but they have to do this in a way that complies with data protection laws.

For some organisations, it may be appropriate to collect more personal data, such as information for track and trace, as one way to maintain the health of the workforce. This means that any internal Covid-19 risk assessments and plans must comply with the requirements under the General Data Protection Regulation (GDPR) and the Data Protection Act 2018.

Organisations should think about implementing the following measures if new personal data, particularly health data, will be collected as part of creating a safe work environment when employees return:

- Doing a data protection impact assessment.
- Assessing and identifying the types of personal data that they need to process in order to ensure that employees can carry out their work while complying with social distancing, hygiene and minimal contact with others.

"Cybercrime has become increasingly sophisticated over the years and the threat is often difficult to predict. It is paramount that companies invest more in their security measures, not only for defending against breaches but for also spotting when they are happening."

- Ensuring that they have a lawful basis for processing data (ie in the interest of public health).
- Having a clear process for documenting the measures used across the company and if processing special category data (ie health data) using that the company has an appropriate documentation policy, as required by the Data Protection Act 2018. Having a clear policy for notifying other staff, or any third parties, if one member of staff is taken ill.
- Reassessing the methods used to store the data to ensure that it is secure and only permit authorised personnel to have access to health records.
- Considering how long this data needs to be retained and ensuring that retention policies are updated.

The European Data Protection Board (EDPB) and the UK Information Commissioner's Office (ICO) have both issued guidance focusing on processing of personal data in a Covid-19 context. The guidance stresses that while emergencies may legitimise action being taken at speed, it is still important that emergency measures are limited to the emergency period and that all measures respect the general principles of the GDPR. Once the need for collecting data relating to Covid-19 no longer exists, organisations should remember to stop collecting and destroy records where they are no longer needed.



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Innovative fasteners and heat induction technologies enable faster flat roofing installations

The construction industry and our ability to "build, build, build" is key to the UK's economic recovery. Martyn Holloway, business development manager – flat roof at SFS, discusses how innovative fastening systems can lead to fast and reliable single ply flat roofing installations

Covid-19 has put the world on pause – and the construction industry in particular has been hit hard, with [680,000 employees on furlough at one point](#).

Of course, the government recognises this cannot continue. The rhetoric is "build, build, build" to get the construction industry, and the UK economy, on the road to recovery. It is vital, though, that we can turn this rally cry into practical measures for those on the frontline of construction – our contractors and installers.

Solving an age-old challenge: Speed of installation

Site productivity is one element that is more important than ever. This is needed specifically to help with offset delays following the introduction of site operating procedures as a consequence of the Covid-19 pandemic. Also, with autumn and winter coming, there are the more traditional delays such as extreme weather conditions to contend with.

Then there's the challenge of the shortage of skilled labour, which has been exacerbated by a heavily furloughed workforce. This, combined with an ageing workforce, means there is a real need to train new site operatives.

Amendments to existing Building Regulations, guidance documents and operating procedures are adding complexity to the industry, which in turn is increasing time pressure on site. Then

there's the intricacies of installation itself that installers must deal with.

Tapered insulation challenges

One such example is 'cut to fall' insulation systems. Growing in popularity for new build projects, these can be particularly challenging for installers.

Also known as tapered roof insulation, the aim of this system is simply to provide drainage when the roof deck itself does not provide adequate falls. This is achieved by increasing the thickness of the insulation to provide the slope and run off for the rainwater.

However, when using a conventional mechanical fixing solution to install the insulation, there is typically a myriad of different fastener lengths needed to allow for the change in insulation thickness. In turn, this increases the complexity and time on the job for roofers.

Concrete deck challenges

If 'cut to fall' insulation is being secured to a concrete deck, this can also slow down installation. Using conventional flat roofing fasteners may require pilot holes up to 100mm deep in order to rationalise fastener lengths, significantly adding to the drilling time.

Adhesive system complications

One of the biggest challenges for installers is if they are using an adhesive system to secure

the membrane and insulation layers. Weather conditions on the day can severely hamper progress, and the design is limited by a specified maximum wind load. Additional time is required to prime the deck and adhere each separate layer, including the Air and Vapour Control Layer (AVCL), insulation and membrane.

Adhesive systems also rely heavily on the skill of the installer to apply the correct weight of adhesive bonding agent per square metre for each of the AVCL, insulation, membrane and other layers required. If not secured correctly, the membrane will need to be reinstalled, adding unnecessary time on to the job.

Retrofit risks and difficulties

Another area where installers can hit snags is on retrofit roofing installations. Here, roofers will often face existing layers of membrane and insulation. These are typically overlaid with new membrane and insulation layers. However, using adhesive to attach these new layers and by not securing existing and aging layers, this risks potential failure of the roof.

Additionally, new or existing cut to fall systems or existing tapered screed layers will lead to a variation in the build up at any single point. Installing traditional mechanical fastened systems therefore requires installers to use a variety of fastener lengths across the roof, adding significant time and complexity to the install.



Making haste with mechanical fixings

These challenges can all be overcome with innovative mechanical fixings, which can securely fix every layer of the roof, provide reliable performance and long-life warranties.

Compared with adhesive systems, mechanical fastening systems are less weather dependent, and can be used in all exposure zones. For refurbishment and new build concrete decks, pull out testing will assist in calculating the appropriate fastener design load. When used in conjunction with the project wind load calculation, the correct fixing pattern can be determined to ensure a safe and secure installation.

For tapered insulation challenges on concrete decks, installers can use the innovative TIA system from SFS. This height-adjustable insulation fastener solution is specifically designed to self-adjust to the insulation thickness, as the fastener engages with the telescopic sleeve and the result is a considerably simplified install.

Drilling time is greatly reduced using the TIA system too, as it requires just 35mm deep pilot holes for all settings. When compared to the conventional practice of drilling up to 100mm deep pilot holes for tapered schemes on

concrete decks, this typically equates to 60% less drilling.

When the heat is on, use heat induction

A final area where contractors can speed up jobs is by using heat induction welding technology, such as the patented isoweld® system from SFS, to install singly ply membranes. Since its launch, more than 15m square metres of single ply membrane has been successfully installed.

This technique uses electric heat induction to weld the membrane to a specially coated metal stress plate located underneath. The result is an extremely secure fix without penetrating the waterproof layer.

Each plate only requires three seconds to weld and the SFS isoweld® system is also easy to set up and calibrate. Suitable with both PIR, EPS and mineral wool insulation types, the heat induction technology can be used in conjunction with PVC, TPO and EPDM single ply membranes.

The membrane fasteners are installed in field fix patterns in comparison to the traditional lap fixing and therefore significantly fewer fasteners are required. Typically, up to 50% fewer fasteners are required and the isoweld® field-fix system allows installers to use the widest membranes

available, which substantially reduces the extent of seam-welding required.

The TIA fastener system can be used in conjunction with isoweld® to offer a faster and more cost-efficient install for concrete decks.

A secure roof, a secure future

Embracing new innovation opportunities such as TIA and isoweld® is critical if we are to recover quickly. By incorporating new roofing technologies, site productivity increases, roofers can be more efficient and profitability goes up.

SFS is doing all it can to help installers and contractors during these difficult times not just to secure roofs but to secure futures as well. From the provision of office and site support, through to maintaining the supply of product from our factories, we will continue to go that extra mile and provide the industry with assistance where required, including efficiency savings through product innovation.

For more about SFS, please visit www.sfsintec.co.uk.

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Digital, data and... dystopia?



BIM Today columnist John Eynon talks data, conspiracy theories (and Bond villains) in a very far from post-Covid world

Good morning, UK – welcome to dystopia! Yeah, well, we're finally here: every dictator's dream scenario where total control of the populace is within easy reach and, of course, to quote Kenny Everett, "it's all in the best possible taste" and totally for your own safety health and comfort.

Whoa there! You're thinking, where's this come from? So let's backtrack a little.

Last time round, we considered some post-Covid thoughts. Three months on and we're still not really post-Covid, are we?

The world's largest economy is still struggling to get the virus under control, has the highest total of deaths and the president seems to wear this as a badge of honour. There is a subtext among many here, such as keep the economy open and if people get ill or die, that's the price we pay. Or rather, they pay. Of course, we're all in this together. Meanwhile in the UK, our leadership have now gone on holiday.

Mexico, Brazil, India, we see similar stories: the worst is not over yet by a long stretch. While in Europe things are calmer, we can see the threats of second spikes and further lockdowns that could take us back to square one. A second full lockdown could be devastating in many ways.

And yet when I was in London a few days ago, I was struck how few were wearing masks or taking social distancing seriously, and that included railway staff. On the beaches near where I live, the hols are in full swing like there's no tomorrow. Beaches rammed, car parks full, queues everywhere.

But the ramifications now start to travel further.

People travelling less, working more from home, impacting the stores and services that no longer get their custom. Even HS2 could be in doubt, as travel patterns are changing and, as one politician has said, digital is the way forward now.

So the digital revolution has received real impetus from a totally unexpected direction. Which is good, but the cost may have further ramifications.

And online fashion goes from strength to strength, taking millions per week. Wild!

An interlude...

Undated, untimed.

Darkened room.

Shadows.

Deep underground bunker.

Whispered voices.

(Feed begins)...

Loud purring

Ernst Stavro Blofeld: Thank you for coming. We are that unnamed strength that moves heaven and earth, that rules and directs the world. However, alarming events are threatening our control. You know why we are here. The continuing digital crisis.

Auric Goldfinger: Yes, this social media is getting totally out of hand, it's giving too much say and air time to the masses that should be serving us rather than pontificating on the web.

Dr Julius No: And the data! Look at the data they have access to, and WikiLeaks and those Anonymous hackers, very soon all our activities will be on that damned web for all to see.

Rosa Klebb: Ok. So who do we need to take out? I'll do it!

Blofeld: It's not that simple, Rosa. (Note condescending use of first name). There are too many. We'd need several Project Insights but we know what happened to that! No, we need to destabilise the global economy and the populations at large. Let's give them a bigger fear to worry about, and that will in turn put everyone back in their right place. We need to level the ground and reset

the conversation for these people, and take back control of their beloved data.

No: Yes! There are too many getting way beyond themselves, taking liberties.

Klebb: Yes, yes, I know all that. But who do I need to take out? Just give me a list! I can do it!

Goldfinger: So, what's it to be? Nuclear war? Market crash? Oil crisis? Alien invasion?

Blofeld: Good ideas but a little pedestrian these days, I feel. We need something with no apparent aggression, a little more subtle, I think.

No: What, like a natural event? Earthquakes? Tsunamis? Plagues?

Blofeld: Yes, maybe something like a global disease. Something that creates serious health and resources issues, extremely contagious and spreads very quickly, undetected. As easy as the air we breathe. Also making it much easier to introduce draconian totalitarian control measures for the populace. After all, it will be for the masses' own safety and comfort, poor things!

Goldfinger: Yes, I see now: forcing governments to close down major sectors of their economies, pushing up debt, more reliance on the financial sectors and we can then manipulate the markets and finances as we wish for our own ends. We bailed the banks out in the great crash, so about time we gave them a squeeze.

No: Of course! Then the world populations will be more worried about their own puny individual futures rather than the wider issues of freedom, democracy, life, art, meaning and the environment - pah!

Klebb: Listen! Just give me a bloody list!

Blofeld: Thank you all. Meeting adjourned. We know what must be done.

(Feed ends)



Post Script: Case Intelligence Officer – HODs Eyes Only –
While most of the more ridiculous conspiracy theories have been debunked, the 5G, for instance, recently, we can't quite rule this one out yet. Perhaps a background group to the Bilderberg Conference or the New World Order, want to reassert themselves and put us in our place, wherever that is? We will keep this under observation. Our sources remain intact. The Eye of Horus sees all. End.

Where were we?

Whether it was deliberate or not, and maybe we'll never know, but someone does. Covid-19 has had the desired effect, and disrupted the world economy in a way previously unprecedented to use yet again that over-used word.

As we can see we are now the Gen-C19 defined by shared experience, not age - but who are we really?

We are now different segments of people:

- On furlough.
- Redundant.
- Not working anyway.
- Furloughed and then redundant.
- Working hard all the way through.

For some this is just a long holiday, for others nothing short of purgatory. If you have a job, and/or are on



John Eynon

furlough and still have a job and an income, consider yourself very fortunate. The support for the self-employed has been shambolic.

For myself, still looking for job after a few months now, seeing adverts for a midweight design manager in the Midlands, over 250 applications. The job portals seem to be a lottery, recruiters are overwhelmed. I had two interviews recently with a London company, with four different people, offered to take a substantial pay cut and they still couldn't give me the job. I honestly didn't know what more I could do!

Major contractors are still making cuts, we might be being told about recovery, but I don't see it myself. Confidence is low out there. Margins tighter than ever.

That said, there do seem to be more opportunities developing.

But for me, standing back from this, it's the subtext, "command and control!"

The virus and the threat of lockdown is now a sword poised above us all:

- More lockdown restrictions – for your own good.
- More travel restrictions – for your safety.

- Track and trace – collect your personal data and movements for your own protection.
- Covid vaccination and face print recognition - for your own good as a good citizen.
- Impact across the whole of society, take the exam results fiasco, graduates (not) getting places or jobs, anyone getting a job even, businesses staying afloat, far-reaching implications, dividing, stressing, antagonising.

Since the advent of EPOS (Electronic Point of Sale) and increased use of electronic transactions, smart phones, internet, email, apps and all the rest, there are already colossal digital footprints for each one of us sitting in some server farm somewhere around the world. That data is used by Big Data machines to aggregate and predict our holiday patterns, our next car, the clothes we buy, the weekly shop and so on. Equally, it can be used in the other direction to build an exact likeness of each one of us - our likes, dislikes, behaviours and so on.

Our attitude to this is so blasé now. We dump data in the cloud second by second with abandon going to that grand sorting hat house in the sky.

Have you come across CoviPass, linked to test results and vaccination linked to personal data? All very intriguing - the flip side is you might not be able to travel, or get a job, if you don't have a test result on your phone app or proof of vaccination.

More restrictions, more of our data handed over in return.

You will know I'm a fan of dystopian sci-fi and as much as I know I'm a cynic, this is sounding more and more like a cross between The X-Files, remember Operation Paperclip and the small pox vaccinations, and V for Vendetta with the rise of totalitarian control? With a little bit of Animal Farm thrown in for good measure!

Jaron Lanier, in his book, Who Owns the Future?, writes about the use of data in our society, and muses about the use of our data, how it is monetised and who owns it anyway.

Maybe it's me and I don't usually like to get political. But for me, I'm not keen on some of the rhetoric flying about at the moment, and having on the face of it a benevolent

government hiding more control of freedoms in what are some of the leading democracies in the world.

Of course, we could just discuss digital twins, the golden thread, the horrendous recent statements at the Grenfell Inquiry, and the controversy over Autodesk licensing and lack of innovation, the industry open letters and good old ISO 19650.

Yes. All of these are important. Justice for the Grenfell 72 particularly and their families is paramount. As an industry, we should collectively hang our heads in shame. But there is a bigger picture, the very tectonic plates of our existence and freedoms are on the move, literally beneath our feet. And our data, your data, my data, are going with it. For instance, take the current exams crisis, young people's futures determined by an algorithm that reinforces past prejudices and quotas and penalises the underprivileged bright and gifted – all at a politician's whim! Wow!

In a world that is more and more driven by data and digital agendas, let's not lose our way, or our data! Let it be a firm driver for good and a better world for all.

And by the way if you happen to see V, Evie Hammond and Scully on a street corner with a couple of pigs in waistcoats standing on their hind legs, it's nothing to do with me...:o)

Let's all get through this somehow, and please accept my very best wishes to you and yours to keep safe, healthy and gainfully employed as you wish in these troubled times.

JOHNEYNON is an aging digital cynic, lives on the south coast, and wonders what's next.

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YOUR ONE-STOP SHOP **PLANNING DIRECTORY**

The PBC Today Construction Directory aims to be the one-stop shop for anyone seeking help and advice or products and services from the construction industry.

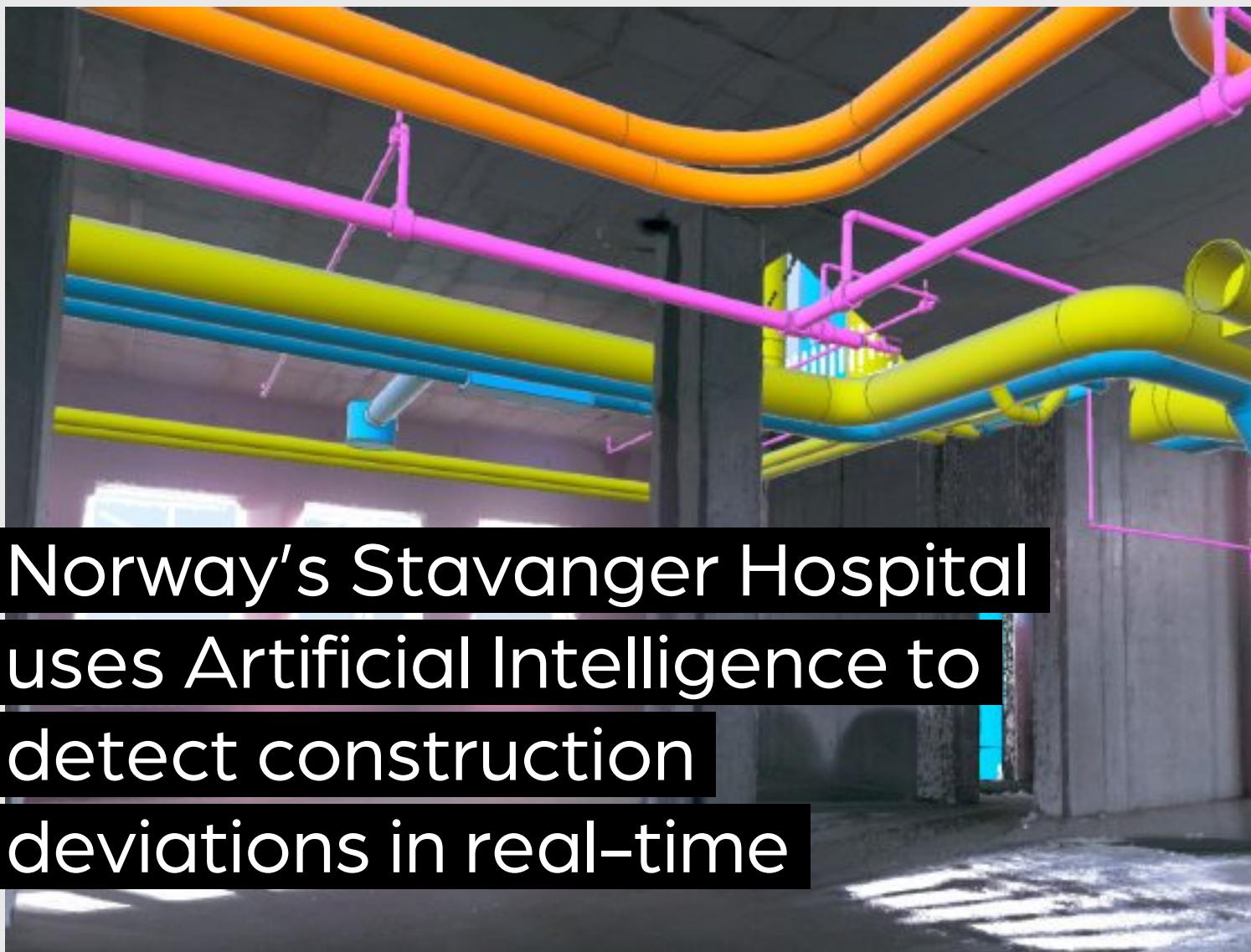
In conjunction with the now strongly established PBC Today digital magazine, which carries heavyweight content from both the trade and government, this essential tool is already well on its way to being the most comprehensive guide currently available.

Having built a huge database of over 50,000 email contacts for the construction industry, the directory is growing at a rapid rate with subscribers joining every day.



BIM TODAY
CASE STUDIES





Norway's Stavanger Hospital uses Artificial Intelligence to detect construction deviations in real-time

The new University Hospital in Stavanger, one of the biggest public construction projects in Scandinavia, adopted 3D scanning and AI technology to track work quality and avoid costly mistakes

Location: Stavanger, Norway.

Project team: Helse Stavange (client), SUS2023, Imerso, Norconsult.

Completion: 2023

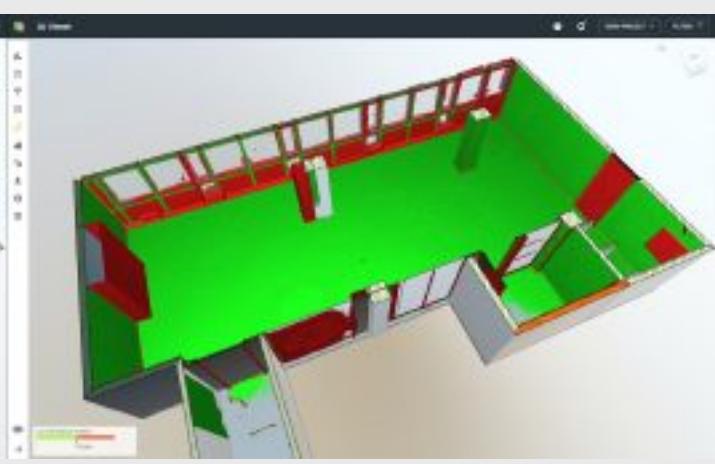
In Stavanger, the fourth largest city in Norway, located about 300km from Oslo, the construction of the new university hospital is going at full speed. Hundreds of people work on the project, which covers 130,000 sq m.

To closely keep track of the massive project, the developer SUS2023 has chosen to use 3D scanning and Artificial Intelligence throughout the entire construction

period. Instead of manual inspections that can take days, or even weeks, everything is checked digitally and with millimetre accuracy. A single person digitises the job site and the entire team can have access to the results.

To do so, the team uses a tech solution developed by Imerso, a start-up company based in Oslo. After the SUS2023 team scans the construction site, Imerso's platform compares the laser scans against the BIM plans and immediately reports problematic work deviations.

The goal is to detect issues as early as possible, so these can be corrected before the next phase of the construction process begins.



The project members can navigate the virtual job site together collaboratively from their browser, just like being there in person. It is possible to take measurements and screenshots from any perspective, and append comments directly to virtual objects. The team in charge of quality control had one day of training to use the laser scanner and to use the results in Imerso's platform.

"This is great security for us. It was a big advantage that this solution was so easy to learn and use. I didn't need much more training than to learn which buttons to press and where to place the laser scanner to achieve the best results," says Dan Børge Bø, construction manager for SUS2023.

At peak times, up to 1,000 people will be working on the project. The new hospital has a planned capacity for 640 patients and specialised world-class laboratories for day care, radiology and emergency departments. The project

was named BIM World Champion in the annual Autodesk Awards, and is budgeted at approximately £800m.

3D scanning as simple as taking a photo

Imerso makes the use of 3D scanning technology as simple as taking a photo. The only thing necessary to capture the room in 3D is a laser scanner, a tripod and a tablet. All the equipment fits in a backpack. The laser scanner is positioned to capture the area and the entire process is finished after a few minutes.

"Instead of manual inspections that can take days, or even weeks, everything is checked digitally and with millimetre accuracy. A single person digitises the job site and the entire team can have access to the results."

"All I have to do is press a button. And don't stand in the scanner's way. After scanning, I get the point cloud on the tablet. Then I save the scan and upload the results to Imerso," says Bø. The SUS2023 uses the Leica BLK360 laser scanner, which Imerso recommends, but other laser scanners can also be used.

From there on, Imerso's system uses the BIM plans as inspection targets and analyses the as-built reality captured in the 3D scans to search for work deviations. The digital twin evolves in parallel with the construction activities and gives alerts of clashes, saving the projects unnecessary costs by enabling the teams to rectify the problems early.



"It is a great advantage that we get an overview of the deviations right away, allowing the contractor to correct them before the next discipline performs their work. It is also a great advantage that it was so easy to both learn and understand. We can go straight into the platform and check what we need when we need it," says Henrik Thingbø from Norconsult, Norway's largest multidisciplinary consultancy firm, responsible for digital strategy in the SUS 2023 project.

This was the first time that a public organisation in Norway opened a competition for such an advanced system. Imerso was selected after SUS2023 opened a tender to the market.

"This way, the costs of non-conformity are also reduced," says Kari Gro Johanson, project director for SUS2023.

Partnerships and open standard

In just over two years, Imerso was deployed in over 30 projects – mostly in Norway but also in Sweden, Denmark, Germany, France and Switzerland. The works range from public to commercial and residential buildings.



The tech company has also established a partnership with Leica Geosystems to offer their clients the latest and fastest scanning equipment available.

Imerso is also a BuildingSmart member and ensures that all data is available in 100% open formats and compatible with Revit, ArchiCAD, Solibri and others.

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Digital collaboration is pushed front and centre in design development

With Covid-19 shutting down many sites, digital collaboration and BIM have allowed architects, engineers, clients and contractors to continue to make progress during lockdown. Chris Hughes of architect BDP describes how digital tools have supported the £1bn Edinburgh St James project

The familiar sounds of a construction site are the background music to any city. However, the global Covid-19 pandemic has meant that, like many other projects across the United Kingdom, Edinburgh was quiet and still as site activities on the £1bn Edinburgh St James project were suspended for 12 weeks, with work on site starting again in mid-June.

But as the city remained quiet, interestingly detailed design and manufacture of key components continued apace on this key development for Edinburgh during lockdown. Digital collaboration gave designers, engineers and contractors an opportunity to seize something good from the crisis. The approach of the project team, its decision-making processes and the adoption of the latest technology meant that the development of Edinburgh St James was uniquely placed to transition to a 'business as usual' approach for design development and coordination during the lockdown.

As a result of restrictions on-site, designers and engineers have been relying more heavily on digital collaboration

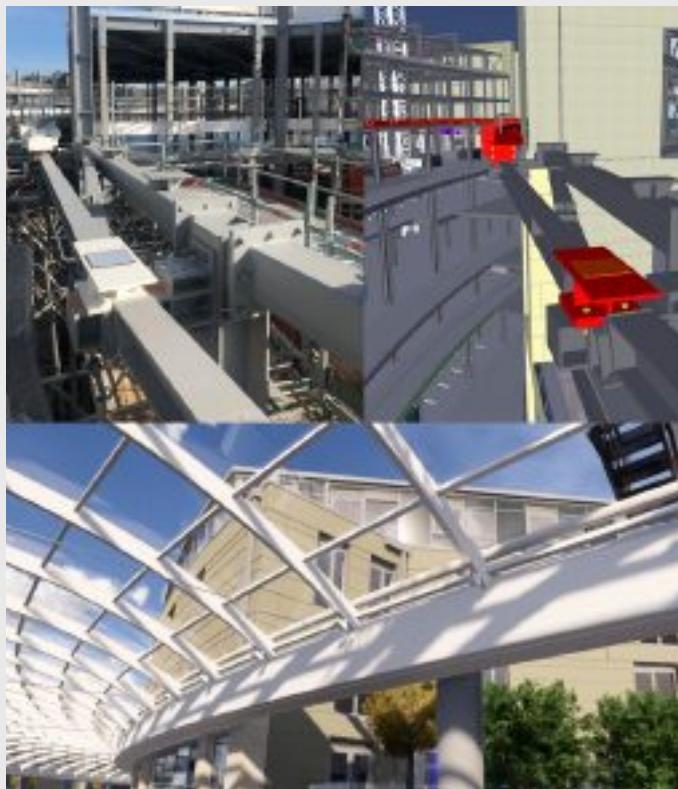
tools, and the use of Building Information Modelling (BIM) has never been more necessary. Integrated virtual design and construction solutions are also being developed to be used end-to-end, from project concept through to project commissioning on what is arguably the most complex building project underway in Scotland at present.

A collaborative working environment

BDP Glasgow Studio is the lead consultant and technical architect for the design of Edinburgh St James, Nuveen Real Estate's iconic development, and is delivering the masterplan as part of the Laing O'Rourke construction team.

Chris Hughes, architect associate at BDP Glasgow Studio, has worked on large projects using BIM over the last eight years, during which time there has been a noticeable development in the size, scale and complexity of projects, and their adoption of digital tools.

"BDP's BIM working practices had been progressively refined over a series of projects gradually increasing in scale and complexity. Silverburn shopping centre phase 3



in Glasgow, completed in 2015, was the final step in refining this process and validated that a large-scale shopping experience for the 21st century could be designed and delivered using the fully integrated BIM environment," he said.

"This focus on a collaborative working environment with all information being shared digitally was the perfect experience needed for the larger and more complex project at Edinburgh St James and ultimately led to BDP being the first architectural practice in Scotland to gain BIM Level 2 certification.

"The great strides made over the last decade to refine working practices in a BIM environment are ideally suited to how we now need to work to within the socially distanced protocols."

The use of twinning

Edinburgh St James is in the final stages of delivery. A mature supply chain is in place and fully engaged, and construction is progressing across all areas of the development.

The way BIM is being used is part of a process that allows all the parties involved in the project to collaborate. The 3D model of the site is being used in real time. Architects,

engineers, client and contractor are all sharing a digital process and using the model as a virtual representation of the physical complex of buildings to validate construction processes, sequencing and assemblies long before materials arrive on site.

"The Edinburgh St James team has created a virtual simulation of the site, fusing Design for Manufacture and Assembly-grade model contributions, design intent models and point cloud survey data to create a virtual representation that contains as retained, as built, as fabricated and as proposed information," Hughes said.

"This virtual representation is reviewed remotely by all parties thus allowing emerging proposals to be interrogated and tested in three dimensions before further fabrication takes place. We have clear process and guidance, giving confidence in the resilience of the digital strategies we have in place. The virtual representation also facilitates virtual inspections, thus avoiding the need to physically visit the site. The project employs a cloud-based virtual reality capturing system, similar to the one used in Google Maps. This allows users to interrogate the sequence of construction works.

"We can all sit at home with our kids doing virtual lessons and the cat snoozing in the background and understand and track elements through a time sequence, from seeing a stone panel at the factory for inspection, seeing it delivered to site and its final position. We can also look at plans that show the detailed instructions used by the contractor on how it is assembled and installed if we need to."

Stakeholder engagement

Engagement with all the stakeholders is an important part of the BDP approach. The team has stayed laser-focused and replaced site and face-to-face briefings with regular video conference updates and constant working on the model. Each of the team is responsible for one area of the building and this means they have a complete knowledge and area of expertise. This one point of contact is helpful for the contractor and main client.

Laing O'Rourke has an in-house DfMA-based supply chain and BIM capabilities which use fabrication data from the model to drive an offsite manufacturing process. The model allows the creation of design intent to develop into worked up design proposals to specialist subcontractors. This process also includes close collaboration between the UK team and elements of the



Chris Hughes

supply chain based overseas. The systems are all in place from an early stage to enable detailed design and coordination to be undertaken remotely.

Hughes said: "I am an architect who enjoys designing with a digital model. But the model is only as good as the input. The beauty of BIM is that is simply a template for all types of styles of working. It allows for those who prefer drawing to have their ideas included within the model. On virtual calls, we can all comment on the model and add comments and each time it is updated in real time. The design intent is intact, and any errors can be viewed and changed."

"At Edinburgh St James, while on-site works ceased, design, coordination and elements of offsite manufacturing continued. The timeline for delivery can be established and order of works created. In the meantime, the client can use the model to view the progress of the design remotely and offer other suppliers or end users the opportunity to use virtual reality to walk around the space and determine their own plans for the fit out and completion."

"Virtual design and construction models by the completion of a project can be used as a tool to allow you to know the story of the building and you can then use this knowledge to predict outcomes for energy efficiency, for example. We are extending its use to relate works on site to the design progression. The regular cloud point surveys from site and supply chain models of fabricated

materials can all be connected back to the twin digital model. For instance, at the key interfaces between the retained parts of the scheme and the new build, we fuse point cloud surveys with DfMA information from the precast panels installed. We also consider CADCAM information from the glazing supply chain, fabricated but not yet installed, to refine design intent solutions.

"The great strides made over the last decade to refine working practices in a BIM environment are ideally suited to how we now need to work to within the socially distanced protocols."

"In a new world of construction where remote working is necessary, the virtual building model becomes the one the designers and main contractor use to develop solutions such as design quality, precision and durability, at the same time seeking to minimise the impact on elements that are existing, fabricated and already in place."

"In the current climate of social distancing, with the protocols we have adopted, there is less need for designers to visit a site. However, this will still be necessary from time to time. Although I am committed to the model, I am an architect and there is a need to see the building that you have dreamed about, particularly if you have invested so much time in its aesthetic and you can see the impact it will have on future generations."

"What we do know from working on Edinburgh St James remotely is, we are not hanging up our hard hats yet as there is always a place for us on site, but we recognise we have established real collaboration and progress using digital platforms and this will play have a key role to place in the new world order."

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Digital construction technology goes mobile at Center Parcs

John Sisk & Sons deployed Site Progress Mobile from Elecosoft to deliver woodland cabins for Center Parcs

In late 2017, John Sisk & Son (Sisk) was awarded the contract to build the guest lodges and central leisure buildings at the hotly anticipated €233m Center Parcs at Longford Forest near Ballymahon in Ireland. It would accommodate up to 2,500 guests in nearly 470 lodges, distributed across the 400 acres of beautiful woodland.

With 466 individual lodges to build over 68 weeks across a huge site, Sisk knew that sustaining the pace of work, keeping abreast of progress and deploying its resources effectively would be paramount.

Powerproject is Sisk's planning software of choice, and its project managers are very familiar with it. When the Center Parcs project was confirmed, Sisk decided to take up Elecosoft's offer to trial the companion mobile app, Site Progress Mobile, hoping that it would help them keep a closer eye on activities, resources and progress across this large area. Project leader Cormac Fitzpatrick and lead planner Damien Gallagher explained how Site Progress Mobile was put to work and how it helped them to successfully manage progress on the Center Parcs build.

Immediate value

With a vast area of ground to cover, the logistics of keeping track of people, materials and progress was a huge challenge. Sisk equipped around seven field users with the Site Progress Mobile app on their company smartphones.

"Immediately we could see the value to the project team in terms of the ease of progressing. It increased their awareness of the programme and made work clearer, because it allowed them to see at a glance only the tasks that they were assigned to," said Gallagher.

"As the planner, having Site Progress Mobile meant quicker data entry. Straight away there was a lot less paperwork involved, and we were more efficient about progress updates. Preparing client progress reports was quicker and easier, because the data was being captured directly from site. As data is captured live on site, it is sent back to the master programme – as soon as the Powerproject user checks the incoming data it updates the schedule almost immediately with just a few clicks."



Time efficiencies all around

The time savings were quick to compound. Before receiving live progress updates from site through the app, Gallagher estimated it would take a full day each week simply to update the programme.

"Digital construction is changing how we deliver and how we manage projects, and that's a good thing."

"We would bring in each of the managers to go through the bar chart then have to go through their marked-up drawings showing when tasks had started or finished. Understanding mark-ups and going back over information repeatedly took up a lot of time," he said.

The difference after starting to use the app was quite clear. Gallagher continued: "Carrying out that same activity in terms of progressing the bar chart was reduced considerably to about three hours instead of a full day. Now, once you log into Powerproject and go to the Site Progress Mobile function within it, you see the information being received from each of the app users. As soon as they have completed updates at site level via



the app, progress data goes up into the cloud and is available for the planner to download and review and check the information, before integrating it into the overall progress update.

"The biggest time saving is on data entry, because it removes the time that used to be spent updating spreadsheets inputting text, dates and percentages. Instead, we can now use that time to review the impact of progress and use our experience and judgement to make decisions."

Users on site are benefiting from time efficiencies also, as Fitzpatrick added: "To gather all the mark-ups and



progress updates ready to give to the planner would have taken those field users a full day of exercise each – now with the app they can continuously gather and update information as they go. There is really no additional task involved in delivering progress updates anymore.”

Task visibility

It is possible that there has never been a truer example of difficulty seeing the wood for the trees on a construction project as at Longford Forest. One of the major benefits of using Site Progress Mobile was maintaining visibility of exactly what tasks had to be done, by whom, and where on this substantial site.

At the peak, there were 400 workers active on the site plus up to 40 suppliers and subcontractors. Most of these were present throughout the entire duration. Planning the timely deployment and progression of resources from cabin to cabin and ensuring that every resource and subcontractor team was appropriately and fully utilised at all times could have been very difficult.

Gallagher recalled: “There were times when we wouldn’t see some of our guys in person for days on end. On construction sites there are always issues arising that stop progress on certain things, and you need to find an alternative task for those resources to do instead. With Site Progress Mobile checklists, managers knew all the

tasks that had to be completed over the period of the week, so could reassign resources on to activities they knew would be meaningful, rather than just finding some task close at hand to keep people busy. It kept the sequence moving.”

Fitzpatrick added: “Because with Site Progress Mobile each manager had specific programme visibility on their mobile device, if there was an issue with one task they could easily see what the next critical task was – it helped to keep people focused on things that supported the overall critical path.”

Linear pace and dependency

Each of the 466 lodges were pretty much the same, so required the same trades and specialists to work on them in turn. That meant keeping everybody moving along at the right pace was vital if they were to complete the necessary three lodges per week.

Fitzpatrick explained: “The challenge was that everybody was completely dependent on the trade working just ahead of them – everybody had to move along smoothly. Every person had to complete meaningful tasks every day to keep it going. We were using Powerproject to resource each activity carefully in terms of assigning the right people. It gave us visibility of the sequence for each trade, and we assigned codes to activities so we could filter and



view the programme in terms of those codes when needed. Each lodge had around 30 critical tasks, so we had around 14,000 line items to handle. Powerproject allowed us to filter those tasks so we could clearly understand the sequence and the target outputs of those tasks. We also used the Line of Balance function to understand those outputs."

The Line of Balance also helped them guarantee the meaningful work for all subcontractors, which reassured the subcontractor to commit the right level of resources to the job in the knowledge that they would be fully occupied throughout the full week, every week.

Engaging field users

Some initial suspicion was voiced by managers when asked to use Site Progress Mobile.

"Some people weren't keen on more digital technology or felt as if Big Brother might be watching – perhaps fearing that they might lose some control," Gallagher said.

"But after a couple of weeks, they could see the benefit overall to the project, that there was better data entry, improved accuracy of progress updates, that they all bought into it. Their updated schedules were being returned to them much faster too, because the workload for the following two weeks could

quickly be reissued as soon as the progress was updated in the main schedule."

The project finished on time to everyone's satisfaction, and the centre opened in July 2019 to rave online reviews. Having proven the value of Site Progress Mobile, Sisk quickly purchased a number of licences for use across the company and it has been put to use on several further projects.

Gallagher said: "We can already see how it can help us on other types of project – Site Progress Mobile is particularly suited to jobs such as a multi-storey developments because there are settings in the app to allow you to set up for repetitive tasks. It is flexible: on the Center Parcs project we wanted to gather full information from our managers, such as actual start and finish data for key tasks. But you can also set it up so that all users have to do is tick off a checklist."

"Digital construction is changing how we deliver and how we manage projects, and that's a good thing. Tools like the Site Progress Mobile app help us to take people out from behind desks, marking up progress on drawings or schedules, to instead managing the work on site – which is exactly where we want them."

Finally, Fitzpatrick reflected on how apps like this are benefiting planners: "One of the benefits of new technologies coming on stream so far is that correct information is now fed out and reaches sites. The Site Progress Mobile app is probably the first example I have seen where we are also getting correct and timely information back from the site itself. It means that the planner gets real visibility and can, instead of spending time inputting information, assess incoming information, query it, validate it, then have time to think and make the right decisions around it."

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JPW leverages computational design to deliver Australia's largest sustainable commercial tower

3D BIM modelling and a digital twin are supporting the delivery of 6-8 Parramatta Square, part of one of the biggest sustainable urban revitalisation projects in Australia

Location: Sydney, New South Wales, Australia.

Architect: Johnson Pilton Walker (JPW)

Completion: 2022

As part of Western Sydney's urban renewal initiative, the redevelopment of Parramatta Square will revitalise Australia's second-oldest city centre to create a vibrant, cosmopolitan precinct. The area will span three hectares and offer 290,000 sq m of premium office space and residential, retail and civic facilities.

At the heart of this urbanisation effort are 6 & 8 Parramatta Square, with 8 Parramatta Square set to be Australia's largest commercial tower at 55 storeys and 243m in height. The A\$600m iconic project will broaden the city skyline and incorporate cutting-edge, sustainable, world-class design, reflecting the highest standards of global architecture. Award-winning architectural firm Johnson Pilton Walker (JPW) is the lead design firm collaborating with multiple engineering disciplines and consultants.

Located directly adjacent to a major railway station with limited road access, as well as situated in a flood zone



close to the Parramatta River, the project required careful infrastructure planning and design to ensure that building and public domain were seamlessly integrated.

In addition, local authorities imposed strict guidelines to address heritage context, solar access, energy efficiency, sustainability, flexible workspace and pedestrian permeability. The large-scale building form, combined with an expedited timeline, presented a range of design and delivery challenges. To overcome these challenges and meet all project objectives, JPW implemented digital BIM solutions to streamline workflows and optimise design.

Advancing BIM through computational design

From the conceptual design stage, JPW relied on

OpenBuildings Designer to model the basement, podium and core according to traditional BIM principles. With much of the conceptual design already completed, the team realised the necessity and benefit of integrating computational design for the geometrically driven design aspects - including the façade, tower structure and ceilings - to advance BIM and workflow efficiencies.

"Typically, computational design is embedded into the project from the concept stage. However, there are still huge efficiencies to be gained by introducing GenerativeComponents later in the documentation process," explained Sarah Yap, computational design expert at JPW.

To resolve differences between engineering and architectural workflows, JPW relied on the interoperability of Bentley's OpenBuildings Designer's built-in GenerativeComponents feature.

When developing the tower structure design, the interoperability of GenerativeComponents with Excel allowed interaction with the tabular structural engineering data for the floors, beams and columns. The team could then use the conditional formatting features in Excel to load, check and generate computational design models for the tower structure. Bentley's computational design model could be driven by Excel to customise an accelerated and automated workflow for generative and coordination purposes.

All the Excel data for the column height and beams was pulled and imported into OpenBuildings Designer to generate visual 3D models. For the floor slabs, JPW developed a recursive script in OpenBuildings Designer to individually model them, level by level, correctly identifying the placement of services as solids and colour-coding them according to their respective discipline. The result was an automated output of a structural model for each floor comprised of the columns, beams and slabs with all the correct service penetrations.

"The façade was another ideal area to incorporate the GenerativeComponents feature in OpenBuildings Designer," said Yap.

To determine the best balance between new architecture, the surrounding heritage and environment, JPW required iterative flexibility. The team generated multiple variations of the unique panels and fins, accommodating the



changing panel radius and varying fin depths. The team used OpenBuildings Designer to generate a unique script that established a polygonal grid as an envelope. The grid encompassed the building where each polygon was parametrically modelled to simplify modification, as well as represented a panel type in the façade system. By creating an Excel spreadsheet that tied back to the OpenBuildings Designer script, JPW iterated over 8,000 panels across the façade. The team took each of the panels and applied them to the polygon envelope based on colour, automating and accelerating the generation of a complete façade model.

This seamless compatibility made it realistic for JPW to model the ceilings to LOD 300, including the lighting fixtures and fittings.

"Typically, modelling the ceilings to this level of detail on a project of this scale would be nearly impossible and certainly unusual. GenerativeComponents [in OpenBuildings Designer] made it realistic for us to fulfill this documentation requirement," said Yap.

The team used existing data for the façade boundary, columns and core, subtracting them from the ceiling region to generate a script for the ceilings. Team members then sliced the ceiling model into tiles that corresponded to an Excel spreadsheet containing the lighting data. JPW used the colour-coding method to reference the ceiling lighting layout for the multiple floors. A similar process was used to layout the HVAC diffusers, provided by the mechanical engineer through an IFC model.

"At the heart of this urbanisation effort are 6 & 8 Parramatta Square, with 8 Parramatta Square set to be Australia's largest commercial tower at 55 storeys and 243m in height. The A\$600m iconic project will broaden the city skyline and incorporate cutting-edge, sustainable, world-class design..."

Leveraging Generative Components drives efficiencies

Leveraging the algorithm-driven features of OpenBuildings Designer enabled JPW to maximise data potential, developing scripts and performing parametric modelling to automate previously manual processes. The solution streamlined workflows for the tower structure, façade and ceilings, enabling two people to design and generate data for more than 1,400 tower columns, 8,000 façade panels and 179,000 ceiling tiles.

Checking and updating the tower columns previously took one person one week; with OpenBuildings Designer, it was completed in one hour. JPW modelled all the façade panels in less than one hour, compared with two weeks using traditional methods; and one person updated and integrated changes to the façade model in one day, compared with two people taking an entire week.

Through iterative and automated scripting, the team quickly explored numerous options for shading and solar access to deliver an elegant, energy-efficient façade and comfortable indoor working environments.

Computational design methodologies have been integral to the detailed design development and documentation process of 6 & 8 Parramatta Square. Combining parametric and rule-based design optimised digital workflows while maintaining flexibility and rigour across

the project. Bentley's integrated design solution facilitated accurate building design, including input and changes from contractors.

Modelling the objects familiarised JPW with the spatial implications that are important to architectural design. By integrating colour-coding for visual differentiation and scripting failure mechanisms into the data flow, JPW automated design verification, replacing manual methods of error-checking and eliminating the risk of human error. Over the entire project period, JPW achieved significant time and cost savings, as well as optimised design outcomes to meet all planning and sustainability goals. The building will be efficient in terms of energy, waste, materials, indoor environment and water. The building will have usable and inviting civic spaces, showcasing the next generation of green buildings of this size and scale.

Digital twin facilitates design coordination

JPW used OpenBuildings Designer to establish a connected data environment to facilitate integrated design by implementing a digital twin. Creating a digital twin was fundamental to understanding the project's design and development. JPW relied heavily on digital data provided from all services and structural engineering consultants. Therefore, it needed to ensure that these models and their documentation methodology were aligned with the architecture. Using the digital twin as an architectural control model to reference multidiscipline data, JPW tested design alternatives to determine the architectural impact that enabled the resolution of complex spatial parameters and clashes. Working with the integrated 3D model allowed the architects to identify and timely resolve inconsistencies, mitigating any negative financial and architectural impact, and avoiding rework.

The digital twin helped JPW seamlessly and timely exchange data and models in formats accessible to all project participants. Bentley's 3D digital application facilitated the generation of 2D drawings and documentation directly from the model, streamlining both office workflows and coordination processes between architects, contractors and consultants. Using the digital twin from conceptual design through construction defined the collaborative methodology, helping arrive at a design solution that celebrates the architectural vision while meeting client requirements and the project's ecologically sustainable goals.

"Without the digital twin, the project would not be able to be delivered," said Victor Au, architect with JPW.

Shifting perspective on architectural design

Architects often spend a disproportionate amount of time trying to represent solutions rather than actually designing them. Computational design allowed JPW to focus on resolving problems and finding better design solutions to deliver 6 & 8 Parramatta Square. While scripting in OpenBuildings Designer was a time investment, within only eight months JPW realised the rewards, saving countless hours and significant costs. In the past, it would have been inconceivable to design from an Excel spreadsheet. However, the success of this project has shifted the perspective on design, encouraging JPW to adapt this solution on future projects, reaping the benefits and optimising delivery.

"Computational design empowers us to rethink our approach and, ultimately, the way that we design our architecture, shifting the way our studio thinks about our practice in the future," said Yap.

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