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# Digital Construction Review

A report on the current and projected  
adoption of digital technologies and  
practices in the construction industry  
**March 2016**



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# Foreword

The potential for digital technologies to improve productivity in the construction industry has been repeatedly highlighted by government officials and industry professionals alike over the past five years.

In 2011, the government linked digitising the industry to its own public procurement strategy, by announcing that the use of building information modelling (BIM) – the practice of modelling construction in a digital environment – would be a requirement of all central government construction contracts by 2016. Proponents of BIM see this as an important first step towards creating an industry that uses BIM throughout not just the construction stage, but also in relation to the management of buildings, improving their operation, maintenance and energy efficiency.

However, the fragmented nature of the construction supply chain has historically acted as a barrier to achieving the widespread digitisation of working practices, compared with other large sectors such as manufacturing. And this fragmentation – despite government pressure – continues to undermine the process of BIM adoption.

To better understand the current levels of investment in, and adoption of, BIM and other digital technologies in the industry, Building has carried out this research exercise, in partnership with Ecobuild and BD.

The research includes findings of two surveys carried out with 250 construction professionals from across the supply chain. The first assesses which digital technologies firms have invested in over the past two years; which they are intending to invest in over the next two years; how digital technologies are currently impacting on construction businesses and practices; and how firms expect them to in future.

The second survey looks in detail at levels of BIM adoption across the sector ahead of the April deadline for use of Level 2 BIM, and barriers to its use. With the deadline now just a month away, this research finds that only 32% of companies in the sector are using BIM to that level.

This review also includes highlights from a call for papers from industry about the potential for digital technologies and working practices to impact on the sector and the built environment; looking at areas including BIM, smart buildings and procurement.

This research was carried out between September 2015 and January 2016.

**Sarah Richardson, editor, Building**

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**“With the Level 2 deadline now just a month away, this research finds that only 32% of companies in the sector are using BIM to that level”**

While mobile devices have transformed the way the construction industry works, the adoption of BIM is still patchy and on-site robotics seem a long way off.

**Roxane McMeeken** reports on the findings of Building's digital construction surveys

## What the survey found

You probably haven't rubbed shoulders with a robot on site but you may well be reading this on a company smartphone. The technology revolution in construction is underway, but how much further is there to go on the road to becoming a truly digital industry? Building, in partnership with Ecobuild and Building Design, undertook research to establish the current prevalence of digital technology in construction and what the future holds.

### Status update

We carried out two revealing surveys. One, for which we polled just under 250 people across the range of construction roles (architects, clients/occupiers, consultants, engineers, main contractors, manufacturers and specialist contractors) looked at the key ways in which the sector uses all things digital in general. This showed that most respondents (70%) felt that mobile communication devices, such as smartphones and tablets, had "significantly changed" the way their company does business in the past two years.

Phil Power, senior project manager at Paragon, Interserve's fit-out business, is among those that say mobile devices have transformed working life. He is particularly evangelical about Interserve's Construction Delivery

Application, which sits on a phone or tablet and allows you to record issues identified on site. Power says: "You find a design query or defect, type the details into the app, add a photo and then share it with the relevant people, such as the client or architect. You can even scroll through the bank of drawings, place a red dot to highlight an area on a drawing and attach it to the message." He believes this saves "days" of work: "Before, you'd have to take notes on site, write up emails back in the office, dig out images and drawings and attach them. The app is a joy to use!"

Our general survey found that the second most game-changing technology is building information modelling, with 49% saying it had a significant impact. This is the case for designers above all, with 77% of architects and 61% of engineers feeling that the technology had significantly altered the way their organisation does business over the two-year period. Indeed, large engineering firms such as Buro Happold say that they now do all projects in BIM.

This is predictable, perhaps, since modelling is a design-based tool. But the approach is intended to allow all disciplines to collaborate and deliver efficiencies through working together. So the fact that

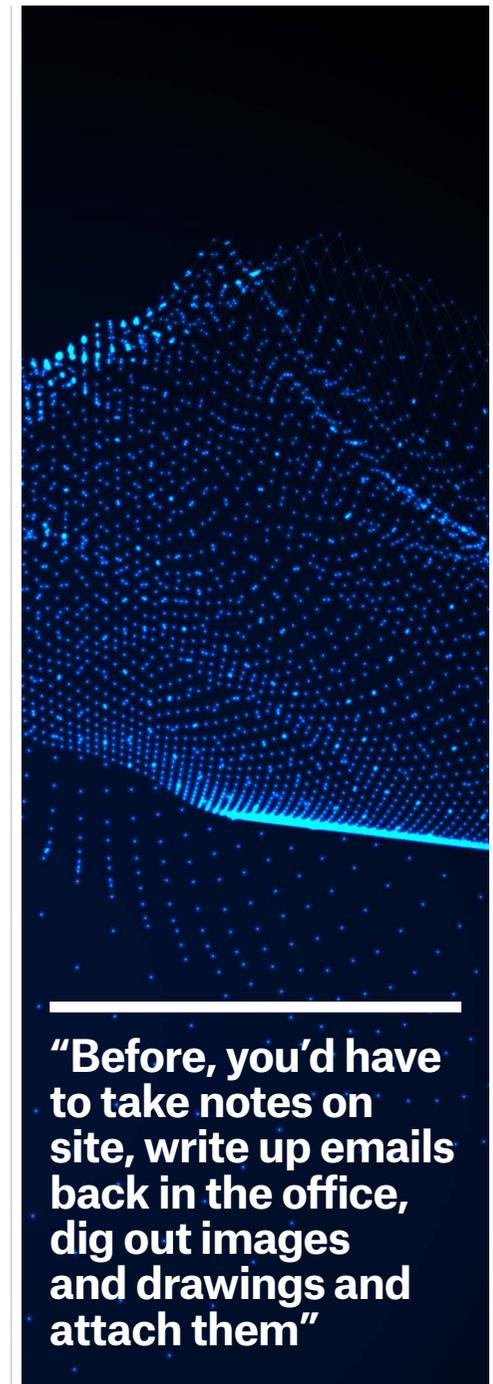
not all agree on BIM's impact suggests that the technology is not being adopted evenly in all areas of the industry and hence not being used as effectively as it could be.

Other digital technologies and practices appear to have had less of an impact. Digital payment processes have changed business significantly for 24% of respondents – with specialists most likely to answer that this technology has had an impact, which likely reflects the more transactional nature of their business. However, off-site manufacture, which has long been discussed within the industry as a solution that could benefit most disciplines, was selected by only 22.5%, with main contractors affected the most. Meanwhile, a mere 6.5% reported a significant impact from on-site technologies, such as robotics and drones, which again – according to many commentators – could be widely beneficial.

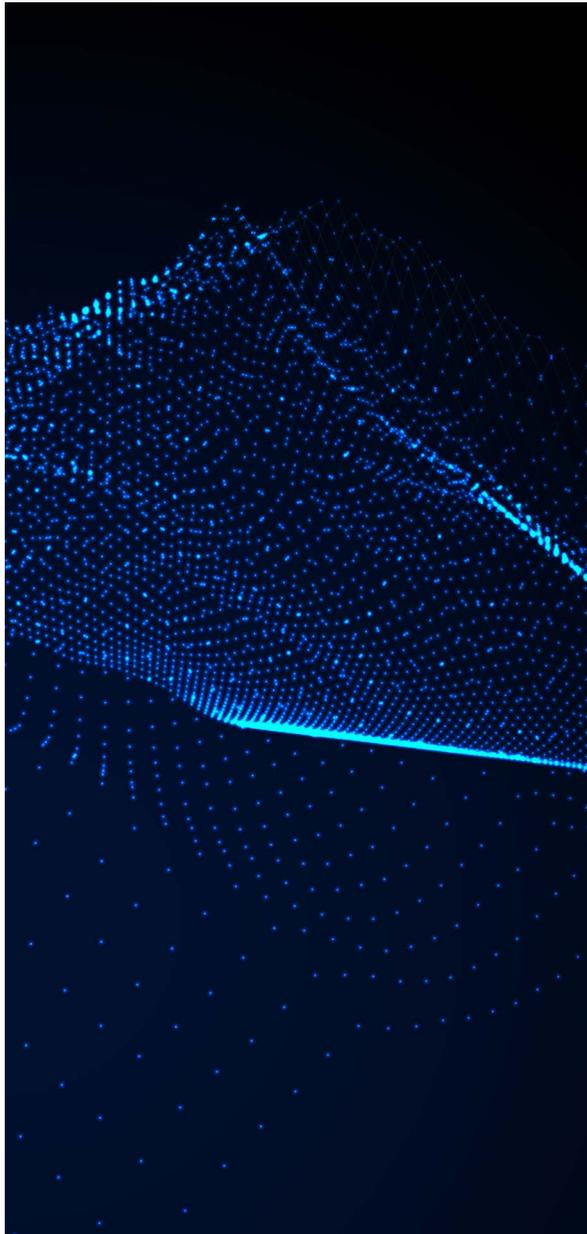
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So why is take-up of some technologies, and particularly on-site innovations such as robots, lagging behind other digital trends in the sector? As far back as 2011, the government's then chief construction adviser Paul Morrell advocated adopting technology-driven construction methods widely. In fact, he said that the industry's very survival depended on implementing the efficiency that they could bring.

When asked to identify the single largest barrier to the adoption of digital technologies in construction, there was little agreement among our survey respondents. Varying levels of



**"Before, you'd have to take notes on site, write up emails back in the office, dig out images and drawings and attach them"**



take-up was the most popular reason selected but it was chosen by less than a third, followed by fairly equal numbers clicking cost of implementation, lack of awareness or availability of skills.

Despite almost half the respondents saying that BIM had had an impact on their business in the past two years, our other survey, which looked in more detail at BIM, revealed less positive trends. The recent survey of 190 people across disciplines found that only 32% of firms use Level 2 BIM. Even more disappointingly, this figure was a mere percentage point higher than the results of the same poll a year before.

This reveals a worryingly large swath of the industry is not up to speed. Not only does the government require all centrally procured projects to be delivered using Level 2 BIM from 4 April 2016 but growing numbers of private sector clients expect it – not least because occupiers are increasingly keen on inheriting a BIM model to inform their facilities management operations. Indeed, our research found that 58% of clients/occupiers believe that BIM is the one digital technology that will have the most impact on the way they do business in the next two years.

More encouragingly perhaps, the survey found that 66% had used BIM of some kind, up from 52% the previous year. Sarah Davidson, head of research and development at Gleeds, says, though, that a further issue for the sector is whether those using BIM are doing so effectively: “BIM is more than creating models – you need to understand how to manipulate the data in the model.” Investment

might therefore be needed in additional systems besides BIM software such as Revit. Cost consultants working with BIM, for example, need systems that interface with the model to ensure that design changes that affect costs are recorded and prices updated accordingly.

Yet levels of investment in BIM vary across the disciplines, our general survey found. Overall 58% are investing in BIM, but breaking down the numbers reveals that some 74% of architects are investing in the approach, followed by 62.5% of manufacturers, 62% of main contractors and 58% of specialists. In contrast, a rather limited half of engineers said they are investing, followed by 42% of client/occupiers and just 41% of consultants.

This patchy pattern of investment seems to support our respondents’ view that one of the principle barriers to the wider take-up of BIM is the very fact that not everyone is using it. BIM being a collaboration tool, there is less point to using it if the rest of the project team is still using 2D drawings and emails.

#### The next stage

Respondents to our general digital survey felt that BIM would have greater impact in future however. When they were asked which technologies and practices would change the way they do business in the next two years, BIM got the biggest vote, cited by around 50%. A quarter of respondents also said that mobile communications would continue to change working life – so we can probably expect to see more clever, time and labour-saving apps.

On the question of which technologies their company is investing in, some 58% of client/occupiers said that they were putting money into sustainable technologies. In addition, presumably in line with this demand, so are 50% of manufacturers. Half of clients/occupiers are also investing in smart building technologies. This suggests that sustainability – or at least saving energy – remains a priority for clients, despite some commentators claiming otherwise.

In contrast, only a third of engineers and 31% of consultants said they were investing in sustainable technologies. Even fewer are investing in smart buildings. So engineers and consultants may need to refocus research and development to better align with clients’ agendas.

Perhaps more discouragingly, the survey found little evidence of plans to step up investment in processes designed to build for lower cost. Only 21% overall will invest in off-site manufacture and just 16.5% in on-site technologies. David Philp, chair of the CIOB Digital Working Group, said that this is because the industry is digitising in two stages. Investment in BIM, mobile devices and data sharing is the initial stage, driven by clients, he said, and gets “the sector on the technology ramp”. Automation will follow: “These scalable initiatives provide a solid foundation and confidence to move towards a paradigm shift [involving] unlocking the benefits of automation, especially additive manufacture [such as 3D printing] which is starting to upscale. The reality is, if it can be automated ultimately it will.”

For now, though, respondents’ views on the outcome of current digital investment tallied with where they said spending would focus. They said the biggest benefit for the built environment is delivering the ability to operate and maintain buildings more cost-effectively. Some 75% of clients/occupiers chose this as the top benefit, followed by 62.5% of manufacturers and 50% of main contractors. These results raise the question of why there hasn’t been greater investment in BIM so far, considering that it is intended to make facilities management more efficient. Conversely, relatively few respondents thought the other options presented – reducing the environmental footprint of buildings and ability to build for lower cost – were the number one benefit.

So our research paints a picture of an industry that has some way to go before it can call itself truly digital. The sector appears to be making effective use of mobile devices and moving towards maximising the potential benefits of data-sharing and sustainable technologies. But there is less progress underway with automation, both on site and in the factory. If Philp is right, this will happen in time, but it would be worth pressing ahead sooner rather than later. As wacky as bricklaying robots may sound, such technology could lower construction costs and speed up programmes – which would be particularly useful in the current market, where low fees and high workloads mean the industry is under pressure to become more efficient.

Smart technologies will have a dramatic effect on the way we construct and use buildings over the next decade. Make sure you don't get left behind, warns **Saint-Gobain's Stacey Temprell**

## Smart buildings

"The future is already here, it's just not yet evenly distributed," the futurist author William Gibson once wrote. While digital technology is making an impact on every stage in a building's lifecycle, emerging techniques are still not widespread on UK construction sites. But if we look around the world, we can see a growing number of experiments and projects that suggest digital technologies will become transformative, creating disruptive rather than incremental change in building and construction in the next decade.

Partly this is due to the reducing costs of computer processing power and connectivity, which makes it more viable to embed technology in products and structures. The "internet of things" is now becoming a reality and buildings are created and controlled from many "things".

If we think about the issue of urbanisation, which is one of the most important trends globally, then the embedding of technology into the infrastructure – streaming data on energy use, weather conditions, population movements and many other trends – will provide a rich source of big data for analysis to inform future planning and development.

When it comes to building

design, Britain is at the forefront of the adoption of building information modelling (BIM). The government's 2016 deadlines for all public sector buildings to use BIM Level 2 and the adoption of the Government Soft Landings protocol will help to ensure that data is collated and used during the early years of occupancy.

This starts to create the virtuous circle where the BIM model initially helps with the advance planning of maintenance and repair but then the "real life" experience and data from the facilities management team, and other users, is captured and fed back into the Soft Landings model. This has the potential to create real learning, informing future design and planning, as well as making lifecycle analysis and whole-life costing models much more accurate and valuable.

Digital technologies are also making an impact on the way buildings are constructed. On the one hand, the rich data and models emerging from BIM could lead to acceleration in the adoption of off-site manufacturing as the economies and efficiencies become irresistible. On the other hand, 3D-printing technologies may mean some products are manufactured or printed on site and customised precisely to the specific structure.

However, it is in the occupancy phase of a building's lifecycle that we can foresee the most impact from digital technologies over the next decade. The best commercial buildings already include advanced building information and control systems, helping them to learn and adapt. The reducing costs of technology and the emergence of app/cloud-based computing mean that a similar level of information and control will soon make economic sense for every building.

We can already see this in the smart home market, which has been much talked about for two to three decades, but is now a reality – attracting the interest of technology giants such as Google and Apple. Smart systems in buildings that track, learn, predict and measure user behaviour will go a long way to simplifying the increasingly technology-based building operating systems. At Saint-Gobain, this reflects the thinking behind our Multi-Comfort building standard, which takes a holistic approach to thermal comfort, indoor air quality, acoustics and lighting in terms of build and operating costs, as well as improving the comfort, health and wellbeing of occupants.

Brits purchased 3 million fitness bands and smartwatches last year – up 118% on 2014, according to data from Mintel. YouGov data indicates 14% of the population in the UK has a wearable device. Communities have established themselves around these devices where discussions take place about one's resting heart rate, amount of exercise done and the calories burned. With the launch of internal environment monitoring devices, it doesn't take

a vivid imagination to visualise similar conversations taking place about the performance of our buildings in the near future.

Finally, digital technologies will help with the end-of-life stage when the building is either remodelled or demolished. The availability of good data about the components and materials in the building will make recycling and waste management much more predictable, with real benefits in terms of resource efficiency.

None of the above uses of digital technology is truly future gazing; they are all reasonably foreseeable. It is not the digital technology per se that will make the difference. It is the attitude and open-mindedness of the leaders in developers, planners, architects, contractors and manufacturers, as well as clients. If there is a commitment to, and a real understanding of, the vital importance of innovation, then these technologies will have a significant impact within the next decade. If the mindset is "business as usual", then don't be surprised to find your organisation disrupted and potentially dislocated by a competitor from a completely different market.

**Stacey Temprell is marketing director for Saint-Gobain, UK and Ireland**

**"None of these uses of digital technology is truly future gazing; they are all reasonably foreseeable. It is not the digital technology per se that will make the difference"**

The growth of digital design tools is a chance for the construction sector to clean up its act and build better relationships with the communities in which it builds, writes the **BESA's David Frise**

## BIM and the 'social contract'

Building clients regularly argue that we should offer the same level of service and performance guarantees they receive with their new cars. They are mystified by the "performance gap" that leads to buildings – including many brand new ones – using more than double the energy they should ... and being too hot, or too cold, or too stuffy. We also deliver most of our projects late, over budget and they don't perform to the specification. We sell clients a Bentley, but deliver a Skoda. We are also a terrible neighbour.

The car industry is focused on the finished product, but also on ongoing performance through service contracts and after-sales support; it turned its approach around using digital design tools; and it only builds something once it is fully designed and tested. Could we do something similar in buildings – a far more complex and multi-faceted product?

At a recent Collaboration in Construction Forum hosted by the RIBA, all the architects in the room agreed that the specialist contractor – the person who understands detail and, therefore, ultimately performance – is involved too late in the design process. Andy Sneyd, engineering director of the Portakabin Group, said there were good relationships out there and lots of examples of

successful collaboration, but the whole process was undermined by the way "we contract with each other". In other words, the structure of how we deliver projects is all wrong.

So how do we put it right? We need to create a new form of "social" contract between the developer and the people ultimately affected by what they want to build. Not just the owner and occupier, but also the local community. We have to acknowledge a seldom spoken truth that it isn't the construction industry that runs construction – it is the property industry.

When a developer puts in a planning application it is, in effect, making a promise to the community to deliver the building that is designed. It should not be able to break that promise because it has signed a "social contract" with local residents/taxpayers. However, with a few notable exceptions, most developers are not concerned about the final outcome because they are not picking up the energy bills and, whatever they do, the value of their saleable asset increases. Their primary focus is on delivering the product to budget and on time.

As a result, the initial vision has little to do with what ultimately

gets built. Contractors start work on site with precious little design information because the project is being "value-engineered", which is another term for buying products at the cheapest possible price and then putting them together in something that approximates the original design. If you put a car together like that, it probably won't be drivable.

That's bad enough, but as Sneyd said, the way we contract with each other makes things even worse. We are an activity-based industry, generally triggered by the payment system, which means we get people and materials to site as fast as possible. As a result, we stumble into a "build and design" pattern that means the people on site make things up as they go along, and make lots of mistakes.

### BIM and the planning process

However, a combination of BIM and the planning process can break this inefficient cycle and put local communities in control of what is "being done to them" by creating a new form of social contract. It works like this:

- The local authority grants planning approval to the developer on the proviso that no work can start on site until a very large proportion of the design is complete and signed off – say 75%. The developer still has security of knowing the project can progress, but this compels them to ensure the project is properly designed first.

- The developer pays for an independent professional to certify the design work is complete and that there is a coherent programme of works in place – if that is not followed,

financial penalties will be incurred.

- Penalties are significant enough to deter corner-cutting and to keep the project to schedule, which has the added bonus of reducing disruption and distress to surrounding homes and businesses. The local authority audits a percentage of projects.

BIM is the obvious tool that makes this new form of contract possible because it allows for early and low cost verification of designs as well as transparency of the process. It would allow the local planning department to operate more like the Civil Aviation Authority. Can you imagine Boeing starting to build an aircraft before it was fully designed? Would such a craft ever get off the ground?

A project that is fully designed from the start leads to a better building with less disruption to its neighbours and a more profitable and harmonious supply chain. An industry that works along these lines would quickly improve its image; making it easier to attract a higher calibre of new entrant. It would be reinvented – rather like the car industry.

**David Frise is head of sustainability at the Building Engineering Services Association (BESA)**

**"A combination of BIM and the planning process can break this inefficient cycle and put local communities in control of what is 'being done to them'"**

We are on the verge of a global digital revolution. UK firms need to make the most of our competitive advantage and embrace the support that's on offer, says **Richard Waterhouse** of **NBS** and **RIBA Enterprises**

## BIM for export

Make no mistake, digital construction is coming. You only have to look at other sectors, from finance to music, from tourism to book publishing, to understand the truth of this and to see how major industries can, and do, change. These, and many other sectors, have been transformed over the last decade by advances in digital technology.

To date, construction has been immune to the digital disruption seen in other sectors. However, the combined drivers of building information modelling (BIM), global information standards, 3D printing as well as off-site construction and assembly will challenge the inertia. Adaptability will be critical to ensure survival through this change, and managing knowledge and information, combined with exceptional service delivery, will be the key to future competitive advantage. Adopt and adapt.

If you're not convinced, look at how technology has changed banking from a local, branch-based system to a global, technology-driven service. Without technology we wouldn't be able to use a single debit or credit card to make payments or draw out money anywhere in a world where 24-hour helplines are now the norm. That doesn't mean that there's no room for

new entrants: Metro Bank has launched and is expanding, made possible by the ability to offer online services alongside a presence on the high street.

One consequence of digitisation and the acceptance of international standards is the emergence of large, global "super companies". We can see the "rise of the big four" in other sectors, including banking, law, accountancy and management consultancy, where a few big players increasingly take the majority of global market share. At the same time, however, we see the creation of fast-moving, tech-savvy SMEs that can adapt to the changing market conditions far faster than the large elite. We're beginning to see this in construction too, with mergers and acquisitions creating some serious global players.

Digital disruption is already changing the industry and this trend isn't going to go into reverse. The UK industry needs to prepare itself for the future by realising the very real benefits to be had by adopting the digital processes that are increasingly in demand.

What we've found when working with architects and other consultants in the UK, including many "early adopters" of digital technology, and BIM in particular,

is that this translates into a number of positives for individual firms. Lower costs, higher profitability and the ability to take on larger projects are just some of the benefits that UK companies of all scales are experiencing.

I currently spend a considerable amount of time promoting the UK's expertise to governments and institutions across the world. What is very clear is that we are hugely admired – our architects and engineers have a fantastic reputation. We are also seen as being at the forefront of technology and, in particular, the adoption of BIM. This is likely to be a short-term advantage, however, as other countries are making huge leaps forward, so we need to capitalise on it now. To do this, we need to consider what the future of our industry will look like.

I believe it will be underpinned by four key features: standardised provision of services will level the playing field for international service delivery; outsourcing to low-cost economies (which is already taking place) will accelerate; 24-hour working on large-scale projects will become commonplace; and small, agile businesses will find that they can reap the benefits alongside the large, global firms.

Construction is already global, albeit with many 20th-century processes. Any given project is made up of products and services sourced from all over the world. It is, however, the last major industry to become truly digital.

In the future we have to have information at our fingertips. When we need bricks or doors or insulation, we will be able

to log on to our computer, tablet or smartphone and get access to prices, delivery times, specifications, all aggregated into a single source, so we can compare and order quickly – just like booking a holiday. The scale of the change will leave an element of chaos in its wake. It's happened to publishing, music and banking and still is – look at the introduction of Apple Pay.

What we do have is the support of the UK government which, as demonstrated by its 2016 Level 2 BIM mandate, has recognised the importance of the construction industry to the UK economy and is determined to help make it fit for the 21st century. We also have the help of UK Trade & Investment, which supports UK businesses, from one-off activities to developing a global ambition.

Again, this support won't last forever and, as we move forward with the ever closer collaborative working that is the ultimate aim of the digital revolution, we will increasingly have to help ourselves. If we don't, we run the very real risk of being leapfrogged and left behind by countries that see the scale of the opportunity to adopt, adapt and excel.

**Richard Waterhouse is chief executive of NBS and RIBA Enterprises**

**“The scale of the change will leave an element of chaos in its wake. It's happened to publishing, music and banking and still is – look at the introduction of Apple Pay”**

6D BIM has the potential to transform the fit-out industry, writes **Overbury's Neil Pike**, but it's up to contractors to make sure the whole supply chain is on board

## BIM for fit-out

Building information modelling (BIM) is clearly making a big impact across the construction industry, becoming more widely used across all areas of mainstream contracting, fit out and facilities management. However, as with the adoption of all new technologies, it is imperative that we have a basic understanding of how best to use the tool depending on the project. One size does not fit all when implementing BIM.

In Overbury's case, as a fit-out business, it's important for us to define where the differences lie between mainstream construction and the fit-out sector. When it comes to new-build, everything is under control – you're starting from scratch so have better foresight of potential hurdles. Fit-out is a different beast. It's not common to start in a never-used space and when you're refurbishing a building that may have been around for some time, or has been refurbished many times before, you will face an entirely new set of challenges.

There are also different dimensions of BIM and this is a key consideration from the very outset: 4D and 5D focus on programme and cost respectively – something which is much more relevant to a general construction project. In terms of how we

operate in fit-out, it is 3D and 6D that potentially bring more value. Clash detection and coordination (3D) minimises inaccuracies in the model and should ensure that the job is done right first time without revisions, while asset management (6D) offers a holistic view to help synchronise building management systems (BMSs).

### A paradigm shift

BIM is a very different method of working and its wholehearted adoption by the fit-out industry will require a paradigm shift, with the main contractor providing the vital link between the client, professional team, subcontractors and even manufacturers. The entire chain will now need to be in total alignment from the outset, and, of course, early engagement in the design stage is vital, with each party supplying information as and when it is needed.

In a typical Overbury project, we act as the main fit-out contractor and so, while we need a thorough understanding of BIM to ensure everything is progressing on time and to budget, each package of work is ultimately carried out by a subcontractor. For this reason, BIM education and training is part and parcel of our overall offering; in some cases, we even provide the hardware for our subcontractors to access relevant BIM models.

This brings us back to a similar transition in the late 1980s when we moved from tracing paper and ink pens to AutoCAD and electronic drawings. As we expected at the time, it was still faster to draw by hand – even for early adopters of electronic 2D and 3D drawing software – but over time this changed. The same will be true when it comes to creating BIM models flexible enough to support fit-out projects, where some level of uncertainty is standard. It will take time, and on-the-job training is essential – which is why we have built a BIM estimating toolkit that helps our supply chain to understand and implement the process. The key benefit of this approach is that the entire project team is engaged in using BIM, rather than an office-based support team who are removed from what is actually happening on site.

### Wide-ranging benefits

As with mainstream construction, there are several key benefits that BIM provides including cost and programme. By creating an accurate model, we have found massive improvement on site, especially concerning the installation and construction sequence. For example, on one of our recent projects, we were three weeks ahead of programme thanks to the prefabricated elements that were planned in full and built off-site even before fit-out works started. Health and safety and sustainability teams also reap benefits – with everything meticulously planned beforehand, there is less manpower and less waste on site, enabling BREEAM or SKA projects to be managed more easily.

However, the biggest opportunity for the fit-out industry is in asset management, and this is where our clients will see significant advantages. Before the existence of BIM, there was never really an appropriate way to link the work we do to BMSs. Now, we can link the model to a client's BMS and tap into essential information about services from air-quality controls and air-conditioning to electrics. Not only is this useful in planning and construction, it also ensures that the post-project performance of the refurbished building can be monitored and appropriately maintained throughout its lifetime.

Education is critical, and at the very top of a project's hierarchy – the client – there needs to be a really solid understanding of long-term benefits for both the asset and end-users. At the moment, the expertise is mostly at the bottom of this hierarchy, with professional teams and consultants taking the most interest. We need to push that understanding upwards – and this is where we, as contractors, have a major responsibility to communicate back up to our clients.

### Neil Pike is head of business improvement at Overbury

**“Now, we can link the model to a client's BMS and tap into essential information about services from air-quality controls and air-conditioning to electrics”**

Investing in new technologies is always a difficult decision for SMEs, writes **Steve Hale** of **Crofton Design**. But becoming completely proficient in BIM has definitely been good for his business

## BIM for SMEs

As an industry, construction's one of the last bastions of analogue technology and the way we have gone about doing our business has not really changed in 100 years, down to the way the trades work, contractual relationships work and the fact that we can still make costly errors in design.

The realisation that the construction industry was using antiquated construction practices was vividly highlighted almost a century ago in *The Honeywood Files – An Adventure in Building*, written by Harry Creswell and published in 1929. This novel parodies the members of the construction team building a mansion, in the form of letters to and from an architect, and shows how little construction has progressed.

But we are now at the stage where the UK industry simply must change – or the rest of the world, which is changing and investing in technology, will appear on our shores and show us how to do it.

In fact, that may not be a bad thing; it happened in the car industry and we now have one of the world's leading car manufacturing industries, with a highly skilled workforce, despite making cars on behalf of foreign-owned companies.

In Australia, as a result of automation techniques developed in the mining and aggregates industry, there is a firm that has invented the robotic bricklayer, which can lay about 1,000 bricks an hour and can build a four-storey house in two days. If manual trades think digital technology is irrelevant, they won't survive over the next 10 years – much in the same way as the music industry has been taken over by the likes of Apple, Google and Spotify.

It is a relief then that a whole group of technical innovations are now coming together, led by building information modelling (BIM), which is just scratching the surface of digitisation in the construction industry. In future BIM will enable us to plan our work more effectively, to better plan our logistics and, via off-site methods, to automate our construction processes more efficiently.

So far, we've not even thought about BIM being linked with logistics, which will speed up and influence the supply chain construction process. Further, with all the data that's gathered, it allows the building owner to manage the building over its lifecycle.

Even though we are a small

building services design firm, we know that if we want to survive and improve we have to embrace technology. Our first step has been to become totally BIM proficient. We have invested in Revit as a platform, trained all our engineers on its use, and integrated BIM fully into our workflows so that now every one of our schemes is designed using the technology.

Psychologically, that means we are ready for BIM Level 2, so that when the government's "D-Day" for all centrally procured public sector projects being undertaken in BIM arrives in April, we know we can compete with the big boys.

From a business point of view it's allowed us to begin to think about our processes and to build in greater efficiencies. As one small example, when we were working traditionally and our designers printed out drawings as PDFs to send to a client, that could take two hours for a set of 200-drawings, which is wasted time. In the digital world, automating that process through Revit allows us to produce the same output in five minutes. We've then got those two hours for extra earning power. If you think that the average engineer does 37.5 hours per week, that's about 5% of his productivity.

It allows us to improve our margin because we are more efficient and it allows the engineers to spend more of their time on the project. If our efficiency goes up by 10%, we'll allow our margin to go up by 5%, putting 5% back in to the project. This means we give it more "design thinking" time to deliver a better quality product for

the same input, leading to happier clients and repeat business, and improving our business performance at the same time.

We are the first to admit that investing in BIM technology has been a big decision for an SME, and we have heard of many similar-sized organisations that are not prepared to make the investment. Clearly, all businesses have to assess the level of risk they can live with and there are plenty of examples of companies that have toolled up only to hit the market in a downturn.

However, there is now an unstoppable digital sea change running globally through the industry. Remember Steve Jobs in 2007 holding up the first iPhone and saying, "This will change everything"? And it did.

The construction industry may be behind the pack but digital technology will be coming to a project near you very soon. We think it has been worth the investment.

**Steve Hale is director of Crofton Design**

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