



A NEW LEVEL

Building information modelling Levels 2 and 3 are saving construction from a legacy of inefficiencies, writes **MATT PACKER**

► Builders the world over had every reason to feel sheepish with the publication of McKinsey's *Imagining Construction's Digital Future* in June 2016. A clarion call for the industry to embrace digitisation, the research paper set out some alarming facts about the sluggish pace of technological development in the bricks-and-mortar realm: "R&D spending in construction runs well behind that of other industries: less than one per cent of revenues, versus 3.5 per cent to

4.5 per cent for the auto and aerospace sectors." IT spending, it noted, was similarly meagre. In a digital-adoption chart ranking 22 sectors, McKinsey placed construction second to last – ahead of only agriculture. The takeaway image of the industry was pretty grim: stale, staid and dustier than a driller's boots. But the ground had already been prepared for the rise of construction's saviour: building information modelling (BIM).

Not so much a singular tool or method (like 3D printing), but more a confluence of different disciplines, BIM was on the UK government's radar long before McKinsey's paper. In 2011, the Cabinet Office published a comprehensive *Government Construction Strategy*, which called for a dramatic reduction in the sector's inefficiencies, blamed on poor procurement. At a stroke, the strategy placed public-works projects on the tip of the spear. To address the fact

that around 40 per cent of the sector's £110bn annual expenditure was devoted to costly, state-funded builds, the strategy ordered government departments to use BIM Level 2 (see box above) across all their construction schemes by 2016. That shrewd foresight immediately positioned the UK as a hothouse for BIM's evolution.

REHEARSING ANGLES

At this point, it seems fitting to explain how BIM's DNA came together in the first place. Most illustrative attempts to convey the gist of BIM tend to dwell on the attractive computer wireframes of a structure's intended shape that typically twirl on a BIM system's screen. But, as veteran project manager Franco Pittoni, head of APM's BIM Working Group, notes: "BIM is, in fact, an all-encompassing term that includes cost, logistics, time and all other necessary project information."

In other words, the model is but the icing on the cake. Supporting it is a mass of structured data on every conceivable facet of the building's use of resources – whether material, temporal, financial or human. This bespoke reservoir of information is pooled from the input of every project partner and held in one virtual location, accessible to all parties via a common platform. Changes to the data are recorded in real time and will even register in the 3D model.

Yes, the use of a model enables architects and designers to effectively 'rehearse' the building before a stone is laid, adjusting angles, internal daylight coverage and so on – but numerous other logistical variables can be similarly tested and tweaked.

IN BRIEF

How does BIM work?

BIM's evolutionary phases are:

- ▶ Level 0: use of traditional, 2D elevations on paper.
- ▶ Level 1: use of 2D paper designs in conjunction with 3D computer models.
- ▶ Level 2: software-based sharing of comprehensive data and 3D models relating to every part of the project.
- ▶ Level 3: data-driven reimagining of construction through deep analysis of building use.

How did efforts to enforce Level 2 across the UK public sector by 2016 work out?

"Broadly, departments have met the target," says Mark Bew, head of the government's BIM Task Group. "Everyone is still on a learning curve, which is fine – they've been doing this stuff a certain way for about 500 years, so we couldn't expect them to change in 10 minutes. But the Cabinet Office announced capex savings in its latest round of spending performance reviews, and that's great."

For more information on BIM, go to www.bimtaskgroup.org and www.bim-level2.org/en/standards

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Importantly, Pittoni points out, the BIM process does not end when a local dignitary snips a red ribbon at the building's front door; it is a whole life-cycle solution: "It should run from conceptual design and delivery all the way through to operation and maintenance – and, ultimately, disposal."

So, what inefficiencies does Level 2 seek to eliminate?

"Historically, certain stakeholders, disciplines and functions have not communicated with each other on a sufficiently effective or regular level," Pittoni explains. "In some cases, they haven't communicated at all. For example, certain legal or contractual departments may fail to exchange details or opinions with operators and maintainers. The latter are rarely consulted at the early stage, when critical technical decisions are made. But those choices may affect the building's

operational expenditure for years, or even decades, to come."

In Pittoni's view, therefore, it is essential to:

- have a full understanding of what all your building information really means;
- incorporate every type of information in a continuous, holistic manner;
- be aware of the data's value; and
- manage it in the most collaborative, intelligent ways.

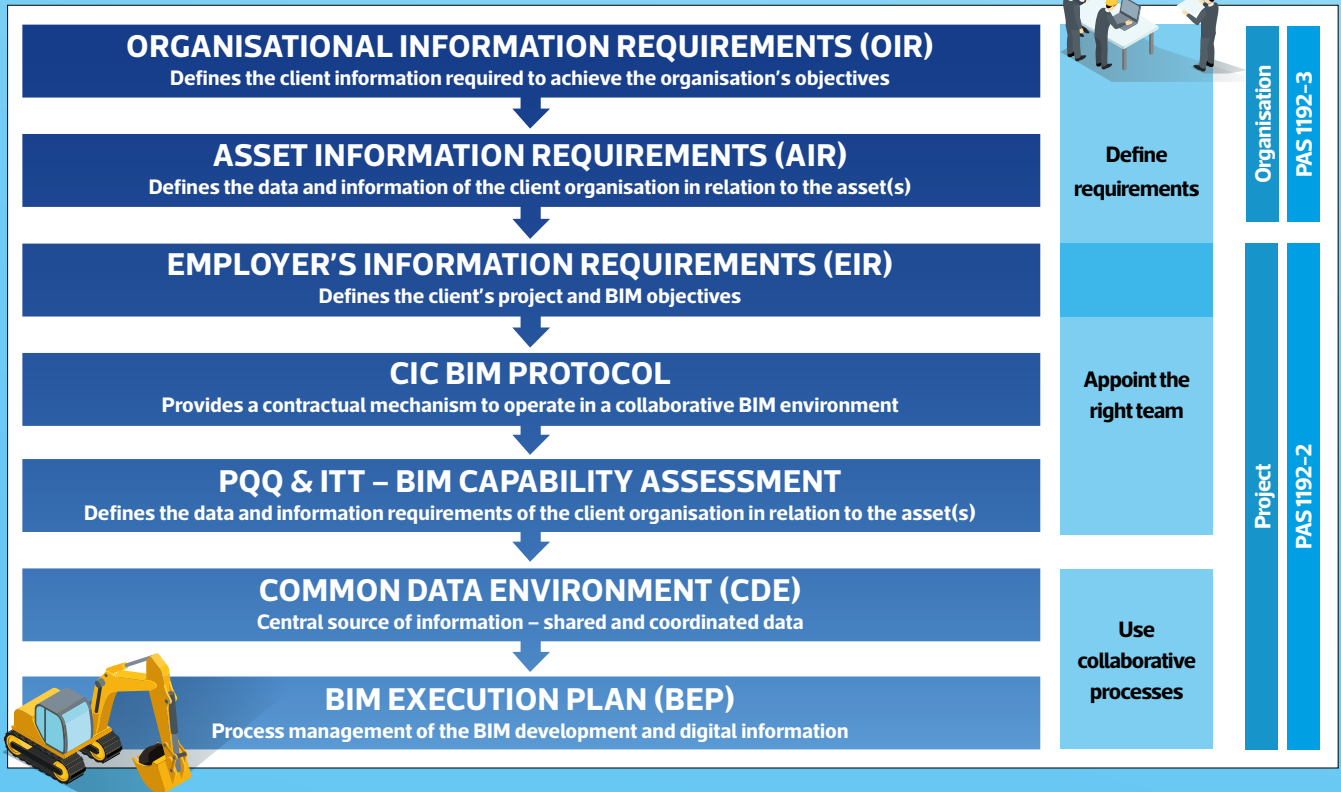
WALL OF DATA

For Natacha Redon – associate/BIM lead at Newcastle-based project management firm Identity Consult – the "game changing" scrutiny that BIM demands automatically urges stakeholders to focus their minds in far greater detail than in the past.

"You can't just draw a rectangle and decide later that it will be a wall," she says. "You have to begin by thinking that you want a wall, and even which type of wall, before you draw. You need to think about how to name it, so that everyone on the team can use your data efficiently. You need to think about how to split that wall – for example, according to floor height – so the contractor can sequence the build correctly. That all requires a lot of thought at the start of any scheme, which is really the essence of the best practices that Level 2 has promoted among project managers. It prevents a lot of rework further down the line, which, on average, has been costed at about 12 per cent of the project budget."

In Redon's view, the primary approaches that project managers should take to guarantee the smooth running of a Level 2 process are:

BIM PROCESS FLOWCHART



- plan ahead, with the desired outcome firmly in mind;
- involve all the correct stakeholders from the start, including operations and maintenance;
- make BIM-novice team members comfortable with a new way of working;
- use clear language, steering clear of jargon and excessive use of acronyms wherever possible; and
- create an environment driven by incremental goals.

BUILDING BRIDGES

For insight on BIM's current shape and exciting future, *Project* spoke to Mark Bew MBE, chair of digital-construction adviser PCSG and head of the government's dedicated BIM Task Group. Bew co-drafted the pivotal strategy alongside former government chief construction adviser Paul Morrell. As the task group's leader, he has encouraged Level 2 uptake through "a blend of pull and push", enhancing demand from public-sector clients and supply from digital vendors.


From Bew's perspective, the task group's presence has put the UK at the forefront of global BIM development. One of its most vital actions was to formalise BIM best practices as a set of British Standards Institute documents – the 1192 series – which were released as free downloads.

"As a result," Bew says, "I believe there are now more metro and rail projects around the world being delivered using 1192 than aren't. That includes the Kuala Lumpur to Singapore link, Crossrail and Crossrail 2, HS2 and HS3, plus metro projects in Melbourne, Sydney and New York. That gives APM members a massive opportunity to go out to different territories already up to speed on those standards."

Now, Bew has set his sights on driving BIM Level 3, which effectively turns Level 2 on its head: "In fast-moving markets, such as retail and technology, by the time you've built the building, the market has moved. So what do you do now – tear it down and start all over again? How do you build a building that stays flexible?"

"We're putting sensors in buildings, and using their data to glean new insights. Harvesting that data allows us to see how people are using buildings, which gives us real clues as to how they could be improved – or replaced with more optimal ones. The Oyster card is a classic precursor: the performance of London's transport network is being monitored via six million tabs per day. That's a big data challenge in terms of interpreting what's going on inside that network. Are passengers getting the most out of its services?"

For Bew, as Level 3 grows, project managers are "the people who are going to make it all work", so they will need to keep their digital training fully up to date.

"Despite talk of some professions being demoted through artificial intelligence," he says, "project managers have an edge. They're not industry specific, but manage a defined process that requires interpretation. And data interpretation is one of the skills they must enhance." 

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