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FUTURE OF CONSTRUCTION

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LONG-TERM INVESTMENT

Tech can drive out short-termism

The construction industry's traditional focus on the task at hand has restricted investment in digital technologies, but a drive to adopt cross-platform building information modelling may now be unstoppable

RUSS SWAN

Clients in the construction sector may not appreciate it, but they often get staggeringly good value from their projects. Contractors and sub-contractors, and architects and engineers, are in fierce competition for projects and, as a result, subsist on wafer-thin margins.

According to *The Construction Index*, the top 100 contractors operate on an average profit margin of just 1.5 per cent. Other assessments are even gloomier.

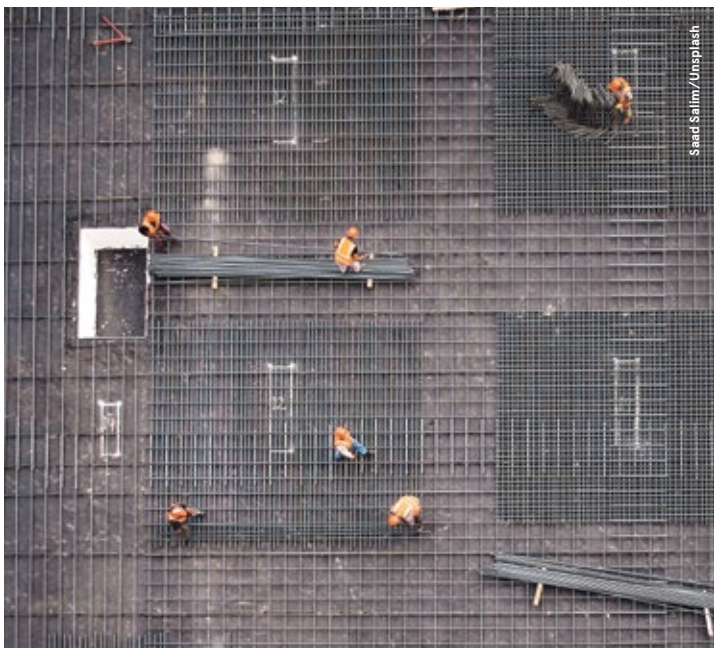
The industry has led this hand-to-mouth existence for decades, struggling to keep costs down in the face of inflationary pressures in wages, materials and services. This in turn feeds short-termism in management and procurement. Other industries have faced similar challenges and many have found at least a partial answer in digital technologies. Can digital improve margins and reduce short-termism in construction?

Many feel the answer lies with building information modelling (BIM). At its heart, this is a digital model of a project, encompassing not just the architectural and structural design, but also layers of information on the surrounding environment and infrastructure, surface finishes, and details such as fixtures and fittings.

BIM promises to eliminate the phenomenon, especially on complex projects, of each specialist working to their own set of drawings and proprietary specifications. BIM can be described as a fusion of old-fashioned computer-aided design with geographic information systems and advanced inventory management. It can even incorporate internet of things capabilities.

Adoption is certainly increasing, boosted by the 2011 UK Government Construction Strategy, which mandated that all centrally procured government projects must include BIM as part of the documentation process by 2016. The technology, in theory at least, improves workflows, increases transparency, and enables problems to be identified and remedied earlier in the process. All this should reduce risk, improve margins and, as a result, tackle the problem of short-termism.

For it to work, though, BIM requires buy-in from across the industry. It is of little benefit if the architect and structural engineer collaborate, but the electrical and heating installers revert to their own systems. Unsurprisingly, the professions are leading the adoption of BIM, while the trades need a little more persuasion.


Saad Salim/Unsplash

Glen Dimplex, which makes heating systems, recently commissioned independent research showing that almost three quarters of designers and architects are now using visualisation technology in the early stages of project development. The surprise may be that a quarter do not.

Kenny Ingram, global industry director at software vendor IFS, says the pressures on construction are growing and BIM is only part of the answer.

"Industry faces a skills shortage, and must embrace new technologies to deliver projects faster and more economically," he says. "BIM can help move the industry from document-driven to data-driven, but is so far really only understood by engineers and architects. Its complexity continues to be a source of debate. Companies should understand that BIM is mainly a tool enabling them to move quicker, plan better, be more accountable and execute more efficiently."

Paul Barton, operations director at BIM vendor Clearbox, says short-termism comes from low margins and addressing this requires fundamental change.

"Construction isn't geared to an asset life cycle; it just tries to protect its little profits on each aspect of the build. We need clients to invest in early-stage design, visualise the process and bring a collaborative method of delivery. Then the industry won't have to always force the lowest price."

The sentiment is echoed by Chris Hamilton, head of digital solutions at engineering firm Jacobs. He says: "BIM it is traditionally implemented at the point where decisions have been taken. Engineers design a solution to a project and then apply BIM, building their datasets to match. But a huge amount of data could be captured and analysed before the decision to design, which could help find better ways to achieve the desired outcome."

Agreement, then, that BIM is best applied as early in a project as possible. But what about the redevelopment of existing projects, where no digital models have ever existed?

The City of Paris is currently redeveloping a large area around the Eiffel Tower, which has been criticised for being unwelcoming. An early part of the project, timed for completion by the 2024 Olympics, is Autodesk's creation of a 3D model of the existing site to enable the visualisation and evaluation of proposals and designs.

On a rather less grand scale, engineering consultant Curtins has employed BIM along with inexpensive Google Cardboard VR (virtual reality) headsets as a means of stakeholder engagement on a school development. This enabled pupils, parents and staff to see it in virtual form, and showed that not all applications of digital technology carry significant cost.

Even so, resistance remains the Achilles' heel of BIM. While many in the industry are enthusiastic about it, some remain unconvinced.

Adrian Fowler, managing director of building services provider Midfix, says the government mandate may have had a negative effect on digital uptake.

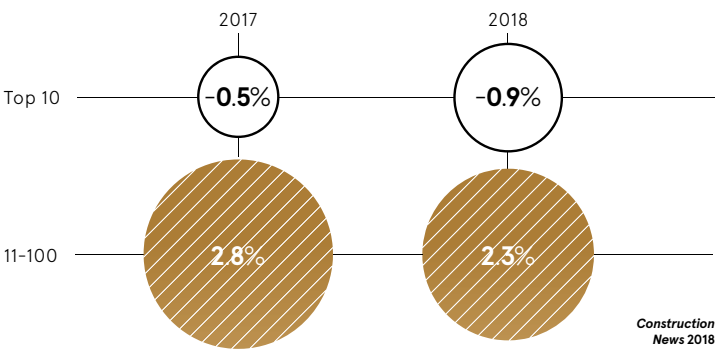
"It may sound counterintuitive: how can a digital initiative be a barrier? Simply focusing on just one area of digitisation inevitably causes others to suffer. With companies spending so much implementing BIM, there's little left over for other advances," he says.

Max Jones, corporates relationship director at Lloyds Bank, observes that barriers remain. "A combination of low margins, inertia and long project life cycles hold innovation back," he says. "Contractors are embracing technology, but transformation cannot happen overnight. Technology is a part of that, but workforces and cultures must change too."

Perhaps the biggest obstacle is a sense of déjà vu. Construction's notorious short-termism is partly because it has witnessed many previous initiatives come and go. It remains to be seen whether BIM will prove any longer lasting. ◆

Margin pressures could be stifling innovation

Average pre-tax margins of the UK's largest contractors by revenue



Construction News 2018

PREFABRICATION

Plant Prefab

01

‘Made off site’ creeps into the mainstream

Building with prefabricated and modular units made off site has the potential to provide good-quality homes and offices built for the mainstream market at speed

MARK WILDING

As a newly qualified architecture graduate in the mid-90s, James Pickard said goodbye to the UK and moved to Sweden. He found a job, enrolled at night school to learn Swedish and set out to immerse himself in the country’s design culture.

One day on his way to work, he noticed a house under construction. Mr Pickard grew increasingly incredulous as he saw the building take shape throughout the week. On the fifth day, the house was completed and he saw a family eating dinner inside. He knocked on the door and asked if he could take a look around.

The house had been built using prefabricated construction: manufactured in sections at a factory and then assembled on site. Once inside, Mr Pickard was taken aback. Back in the UK, prefab was still a byword for poor design quality. This house featured heated floors, triple glazing and insulation so efficient that the radiators were the size of small briefcases. “That was my first awakening to the benefits of off-site manufacturing,” he says.

Two years later, Mr Pickard was back in the UK and running his own practice. Cartwright Pickard had been in business for a month when Peabody, a large London housing association, announced it was seeking prefab designs for a project in Hackney. Drawing on Mr Pickard’s experience in Sweden, the practice submitted a proposal and won its first commission.

Murray Grove was completed in November 1999 and were the UK’s first modular apartment buildings. Thirty homes were completed in six months, around half the typical build time, and the project went on to win a series of design awards.

Nearly 20 years on, boundaries are still being broken in prefab construction: a deal was struck earlier this year to develop the world’s tallest modular towers in Croydon. But prefab is still nowhere near mainstream adoption in the housing market. Why? Mr Pickard believes architects, and their reluctance to embrace standardised construction methods, deserve a share of the blame. “Architects still believe that every building is a prototype, bespoke, one-off and, if it isn’t, we’re doing ourselves out of a job,” he says.

Simon Bayliss is managing partner at HTA Design, the architecture practice behind Apex House, a 29-storey student accommodation tower in Wembley, built using modular construction and completed last year. “There are probably some architects who slightly fear it and fear loss of control or creativity,” says Mr Bayliss. Those concerns are unfounded, he says.

However, prefab projects do require architects to think differently. For starters, design details need to be pinned down much earlier in the process. “You need to have decided what your taps and tiles are going to be at the same time as you’re sorting out your foundations,” says Mr Bayliss.

You’ll see architects creating far more interesting plan forms and giving people huge variety of choice

01
A Plant Prefab custom prefabricated home is craned in at Silverlake, Los Angeles

02
Installation of modular buildings by Cartwright Pickard at Birchwood High School in Bishop’s Stortford

David Birkbeck, chief executive at Design for Homes, says the role of the architect will be different on prefab housing projects. On traditional large-scale housing projects, Mr Birkbeck says architects are often limited to making cosmetic external changes. Prefab construction offers the potential to switch internal layouts. “That’s where, for the architect, in so many ways it’s far more interesting,” he says. “You’ll see architects creating far more interesting plan forms and giving people huge variety of choice.”

California house builder Plant Prefab, whose investors include Amazon, has partnered with a series of leading designers on its off-site construction projects. Chief executive Steve Glenn says architects have a key role to play in the firm’s attempts to persuade design-conscious clients to embrace prefab construction. “The formula was, and is, get world-class architects and use prefabrication to make the homes more efficiently,” he says.

Plant Prefab works with architects in two ways, hiring them to design bespoke homes using prefab construction methods, but also enlisting practices to draw up plans for its standard homes, which are customisable, but easily replicable, designs that then earn the architects royalties.

Kieran Timberlake is among Plant Prefab’s design partners. James Timberlake, founding partner at the Philadelphia-based practice, says he sees value in both business approaches. “I don’t think architects are going to get crowded out of the off-site delivery model,” he says.

Rogers Stirk Harbour + Partners is known for designing iconic buildings, including London’s Cheesegrater, more formally known as the Leadenhall Building, which was built using 80 per cent prefabricated materials. At the practice’s offices on the 14th floor, partners Ivan Harbour and Andrew Partridge recall how they began working on large residential projects around 15 years ago. Almost immediately, it became clear there were huge inefficiencies. “There was a lack of standardisation,” says Mr Partridge. “Every bathroom, every stairs were different.”

The firm began applying the lessons it had learnt on commercial buildings and went on to complete a series of innovative housing schemes using prefab construction. Homeshell was one such project, a three-and-a-half-storey home assembled outside the Royal Academy in just 24 hours in 2013. That prototype is now the basis of a partnership with engineering firm Aecom, which will see Homeshell brought to the mass housing market in the coming year.

“It’s standardising quality,” says Mr Harbour. “But it’s not standardising space. This isn’t about saying these things are all the same. That is absolutely critical.”

The two architects agree that architectural design will be crucial to Homeshell’s success, ensuring projects respond to their specific settings, and are of the quality and variety necessary to appeal to consumers. “You can’t just do an estate of 300 units all the same,” says Mr Partridge. So is prefab about to go mainstream? “We’ve been saying that for quite some time,” he says. “We travel hopefully and never give up.” ◆

Cartwright Pickard

02

Innovative software on course to transform the construction industry

In an age when cutting-edge technology is transforming countless sectors from banking to transportation, the construction industry has been relatively resistant to embracing new innovations

Builders have long been creating on-site reports and making use of information dashboards, but the traditional process of pen and paper, manual entries and the risk of rework was cumbersome, expensive and often required a third-party consultant.

In a bid to meet the changing tech climate and solve some of the industry's most pressing challenges of fragmented communication and workforces, complicated technical processes and the skilled labour shortage, practical construction software solutions are making headway with changing how construction businesses operate.

Builders are still at the beginning of their digital journey moving towards a workforce that is supported by popular tools, such as tablet devices and platforms such as Procore, a cloud-based construction management platform designed to bring together all vital project communications in a single dashboard to digitise their communications and enable collaboration.

Brandon Oliveri-O'Connor
Director of international sales

However, with an industry reluctant to shift, it is important to note that effective change management isn't just a top-down mandate. "It's about getting to a more proactive workforce, as opposed to staff being more reactive," says Brandon Oliveri-O'Connor, director of international sales at Procore.

"Construction firms should ask themselves 'How can we save time when carrying out day-to-day activities, like automating hyperlinks in drawings?' or 'How do we leverage the data we are collecting to make smarter business decisions?' Enabling customers to access real-time insights in a much more accessible way can dramatically change how a general construction professional works."

Despite working in a highly competitive industry, many construction companies have strong professional relationships with other builders. When one industry leader adopts a construction software solution, it doesn't take long for the benefits of the tool to catch the attention of partnered firms, playing a central role in boosting adoption.

In just a few short years, the awareness and adoption rates of construction software have increased rapidly. "It only takes one or two individuals within an organisation to drive change. It's really up to construction software providers to find the right people and support them through their evaluation which, if carried out correctly, can show robust return on investment," says Mr Oliveri-O'Connor.

"We're freeing up more time in the day that is typically spent on emails and calls to enable firms to focus on getting high-quality products built. In my experience, construction professionals spend more than half their time on either finding relevant information or trying to disseminate information out to their team."

With another key focus on labour, we've seen labour productivity levels rising in the majority of industries over the past two decades, but productivity in construction has flatlined. In fact, a recent McKinsey report found that 98 per cent of mega-projects experience cost overruns or delays, with the average cost increase totalling 80 per cent of the original project value. It's clear the industry is in urgent need of solutions that can improve organisation and communication, and ultimately reduce unnecessary delays.

"Efficiency is key," says Mr Oliveri-O'Connor. "Being able to take on more projects with fewer workers is becoming extremely important due to the skilled labour shortage. We're also seeing some firms take a step back and focus on delivering quality projects rather than prioritising growth."

> **"The widening efficiency gap between non-digitalised firms and those that fully embrace business enabling technologies will soon make it impossible for construction firms to ignore the potential of new software**

For builders who have already made some advances in the digital space, there is a growing trend of using virtual design and BIM (building information modelling) with a focus on getting ahead of the potential problems on a job site using software and digital visualisation tools. For construction firms that have already adopted collaboration systems, this is the next stage of investment.

Yet, there are still challenges to getting management buy-in for new technological tools. Mr Oliveri-O'Connor explains how the three different generations of construction professionals in the workforce all have a different understanding and comfort level with technology. Getting across the benefits of construction software to leaders that have a "if it's not broke, don't fix it" approach can be hard to overcome, at least in the short term.

"It all comes down to the individual company as for some, new software can be an extremely difficult sell and for others, it's a perfect fit immediately. For example, we recently signed on a new client where the manager had been working in the industry for over 40 years and he gave the green light immediately. If you have a great leader and someone who understands that the industry is changing, then it's easy to move past minor objections," says Mr Oliveri-O'Connor.

The widening efficiency gap between non-digitalised firms and those that fully embrace business enabling technologies will soon make it impossible for construction firms to ignore the potential of new software. Delivering a project on time and under budget is critical as the market gets even more competitive.

In leading the drive to create a more efficient and productive construction industry, Procore is actively tailoring its platform to the unique needs of various regions and doubling down in localised support by opening four global offices in Vancouver, Toronto, London and Sydney in the past 18 months. The software company is continuing to build out their platform to reach a global audience and help better service their customers in more than 150 countries.

"We've created an open platform that can cater to an unlimited number of users, and manage all communication and collaboration from both the field and in the office, all in a single system. This enables us to help builders reduce their administrative burden and free staff up to do what they need to, in order to deliver the highest quality product," Mr Oliveri-O'Connor concludes.

For more information please visit www.procore.com/en-gb

PROCORE®

SUSTAINABILITY

Closing the circularity gap with BAMB

Buildings constructed with reusable materials create added value in an industry where sustainability is increasingly in the spotlight


Bodo Schieren/Getty Images

JIM McCLELLAND

BAMB is on a mission. Begun in 2015 within the EU-funded Horizon 2020 programme, Buildings as Material Banks (BAMB) brings together fifteen partners from seven European countries. Its goal is a systemic shift in sustainable building.

As the name implies, BAMB reimagines a building as a dynamic repository of value, where tradable material assets can be deposited, data tracked, transferred and withdrawn.

In BAMB, whether an industry goes circular depends on value as worthless materials are waste, valuable materials are reused, recycled, recovered. More value, means less waste.

Moderating material flows, buildings can help slow the resource burn rate to meet the capacity of the planet.

Three major changes support the BAMB vision for circular transition: change in design culture away from linear thinking; change in value definition towards longer-term and multiple lifetimes; and change in collaboration.

To enable this shift, BAMB is developing and integrating tools, such as materials passports, reversible building design and circular building assessment.

Potential is vast, says project co-ordinator Molly Steinlage. "Pilot projects and prototyping have demonstrated BAMB tools and methodologies can prevent 75 per cent of all waste generated and raw materials used over several building transformations," she says.

As the sector currently accounts for 35 per cent of EU waste and 30 to 50 per cent of natural resources, action is critical.

"Building passports, where resources are logged and recorded for future reuse, have great potential and will help realise long-term value in built assets," says Susan Harris, technical director at Anthesis. She foresees more circular buildings being specified to align with corporate social responsibility in large, innovative clients.

> **The long term could see construction companies renting materials to owners**

Until now, policy has been the main driver of construction waste disposal in sustainable building, and the London Plan should move circular economy and whole-life carbon up the agenda. Any systemic shift, though, will be business led, argues Carol Lemmens, global management consulting leader at Arup. "The first steps need to be made in business, particularly development," she says. "Change will happen fastest, if there is a clear business case. Businesses that do not engage could lose market share, not only to incumbents, but also startups."

Cutting cost and climate risk are business-case benefits of BAMB, says project manager Caroline Henrotay. "Waste prevention, eco-design, reuse and similar measures could bring net savings of €600 billion, or 8 per cent of annual turnover, for businesses in the EU, while reducing emissions by 2 to 4 per cent," says Ms Henrotay.

Cost only remains a concern for traditional building methods, contends Ben Pritchard, consultant at Invennt. He says: "Instead of demolishing a building, why not take it apart and reuse the materials? The answer is simple: economics. All too often it isn't financially viable. With the advent of modular construction techniques, this is set to change."

Design for manufacturing and assembly, with flexibility and deconstruction built in, is the future, agrees Peter Kelly, head of sustainability at ISG. "Using off-site and digital construction techniques means buildings will be cheaper, quicker, higher quality, healthier and more productive," he says.

Such adaptability is an innovation hotspot, says David Symons, UK director of sustainability at WSP. "Flexible designs mean lower total cost of ownership and more efficient resource use," says Mr Symons. "The long term could see construction companies renting materials to owners; already quite common for fit-outs, with carpets, IT and desks."

Research undertaken with Nottingham University by the Supply Chain Sustainability School, however, raises industry-wide implementation issues, says chair of the school Shaun McCarthy. "It is possible to measure circularity of a product or material, but putting this into practice is challenging. From government, down to small sub-contractors, we suffer from a shocking lack of data. Traceability technology exists, but we understand little about our supply chains below tier 1," he says.

A whole-world view of circularity is the real reality check. At Davos in January, Circle Economy will launch its second *Circularity Gap Report*, developing sector-specific projections for a world only 9 per cent circular, explains director of strategic alliances Marc de Wit. "Translating the metric to the built environment in Europe and China shows the stark contrast between these world regions, and need to agree clear circularity pathways," he concludes.

Differing rates of ongoing urbanisation underpin dramatic divergence in material consumption forecasts for 2015 to 2050, with Europe up just 14 gigatonnes (Gt) to 124Gt, but China rocketing 136 per cent from 275Gt to 650Gt. Closing the circularity gap, calls for BAMB to go global, fast. ◆


Morgan Sindall

Case study

Pentrehafod School

An inner-city school in Swansea has just set new industry standards adhering to circular economy principles and achieving 99.87 per cent diversion from landfill.

The extension, refurbishment and remodelling of Pentrehafod School by Morgan Sindall, undertaken live with 1,000 students, is a Constructing Excellence in Wales exemplar project.

Saving the council £8 million over new build, plus 994 tons of demolition waste, refurbishment also significantly lowered the carbon footprint.

Some circular design choices are more visible than others. The reclaimed gymnasium floor, complete with court-line markings, has been repurposed to clad a new main-atrium staff pod. Whereas 210 tons of brick and block waste lies hidden as aggregate under the car park.

Materials and finishes allowing for deconstruction and reuse of multiple building layers also help future-proof for circularity.

"For progressive main contractors, innovation in sustainable construction has been a focus for years," says Sean Bowles, managing director of Morgan Sindall Construction & Infrastructure's central region. "But there's work to be done to change attitudes in the wider industry.

"Local authority customers and framework providers can drive this shift; in Wales they already do. Exemplar projects like Pentrehafod, which can evidence both cost and carbon-saving, will make the business case irrefutable."

Key challenges in shifting to a reusable/BAMB model

- Supply chains are complex and multifaceted, from commissioning to decommissioning
- Typically, buildings and infrastructure last for a long time and can have multiple ownership and occupation profiles over their life cycle
- General lack of standardisation of design and component use compared with other sectors
- Many priorities in delivering the built environment, including affordability, health and safety, and reducing energy consumption

Lars Marten Luscuere/Institute for Civil Engineers

Realising the UK's nuclear renaissance

In June the government reaffirmed its commitment to nuclear power, viewing it as the best way to reduce dependency on fossil fuels and meet surging energy demands. The nation's legacy infrastructure and inexperience with modern plant construction, however, makes this a considerable challenge. **Ken Robertson** of KBR discusses how best to deliver this nuclear renaissance

Ken Robertson
Director, infrastructure, KBR

As an innovation born of the 20th century, much of the UK's current nuclear infrastructure is now in need of urgent attention. Cold War haste and a desire to spearhead the nuclear revolution meant that little thought was put into how these facilities would one day be decommissioned. This has left the UK with a number of sites that demand a carefully considered approach to deconstruct and remove the remaining hazardous waste safely.

The nuclear challenge only becomes more complex when factoring in our 21st-century lifestyle expectations and energy needs. Many nations are now looking to phase out the use of fossil fuels permanently, yet energy demand surges due to population growth and increasing electrification. This has led the UK government to conclude that nuclear power should form part of the nation's future energy supply mix as it strives to reduce carbon emissions.

Through its Nuclear Sector Deal, the government seeks to achieve a 30 per cent reduction in the cost of new-build plants and 20 per cent savings in decommissioning costs compared with current estimates, all by 2030.

This ambitious nuclear renaissance, however, hinges on a sector with a reputation for overspending, poor scheduling and unnecessary complexity. These problems are compounded by the UK's generational gap in nuclear plant construction, with the last new build having been completed decades ago. This fallow period has reduced the nation's supply chain, furthering its inability to complete projects on time and on budget.

Yet there can be little doubt that nuclear energy provision is still incredibly complicated, even for nations and developers that have the benefit of hindsight. New-build plants in Europe and the United States are experiencing severe delays and cost overruns, with power now expected to be generated several years behind schedule.

Irrespective of this apparent global tussle with nuclear programmes, our collective need for nuclear power continues apace. As such, we must address the hugely complex risks associated with legacy infrastructure and, for the UK especially, improve our delivery of new-build construction to keep the lights on at a cost we can afford.

If the aim is to save time, money and gain parity on the international stage, as the Nuclear Sector Deal highlights, then there is an urgency for innovative management expertise and collaboration to secure a lasting shift in the reliability of domestic nuclear projects. But what does this look like in practice?

Eliminate over-engineering

As decommissioning programmes are growing in scale and complexity, a cultural shift is needed to recognise that methods and processes designed for long-term operations are inappropriate for short-term projects.

For some time now, the nuclear industry has tended to over-engineer bespoke solutions to every problem rather than draw on commercially available products. More than this, every component will be designed to the highest integrity levels irrespective of its purpose. A drainage pump, for example, will not just be designed to function within its set delivery period, but for decades after its intended life. This propensity to gold plate is not just time and resource intensive, but also entirely unnecessary.

Some will quite rightly point out that in an arena where safety is paramount, the need for meticulous detail can only be a good thing. While it's true that mitigating risk is always the top priority for nuclear, it's undeniable that our approach is often overly cautious, even for non-critical components that have no contact with radioactive material. Providing a device is capable of functioning safely, it makes little sense to pursue the perfect design for a job that has imperfect requirements. Using tools and devices that are fit for purpose, and not ones for every purpose, will ease pressure on the supply chain and help keep finances and deadlines in check.

Modernise processes

Far from being an obstacle to success, the UK's unfamiliarity with modern nuclear construction gives it an opportunity to update its processes and lead from the front. While each nuclear facility presents its own unique set of challenges, there is still much that can be learnt from commercial processes outside of the sector.

In constructing multiple oil and gas platforms in the Caspian Sea, and in constructing accommodation for the British Army throughout Aldershot and the Salisbury Plain, standardised designs and modularisation techniques have assured success on a large scale. In these multi-billion-pound programmes, manufacturers are engaged at the earliest stages to ensure that designs are realistic against the requirements, timeframe and budget set. In many cases, digital twins – computerised visualisations of physical assets and processes – are also used to assure certainty before arriving on site.

These designs are then frozen before construction starts, avoiding abortive work, and standard solutions mean that many activities and modular facilities can be replicated to reduce cost. This approach has driven double-digit percentage savings in the time taken to complete repeatable facilities.

Of course, these examples are not entirely comparable as nuclear is subject to highly rigorous regulation, but the general principles still apply. So long as safety is accounted for, programme management successes in other areas can be treated as solid guidelines for a more effective UK nuclear industry.

NUCLEAR POWER IN THE UK

15
UK reactors generate about 21 per cent of its electricity, but almost half of this capacity is to be retired by 2025

1st
of some 14 new-generation plants is expected to be online by 2025

GOVERNMENT'S NUCLEAR SECTOR DEAL SEEKS

30%
reduction in the cost of new-build projects by 2030

20%
saving in the cost of decommissioning compared with current estimates by 2030

40%
more women in nuclear by 2030

>2 bn
domestic and international contracts by 2030

Collaborate

Finally, it's critical to reaffirm the importance of a joined-up approach where all parties co-operate to manage project risk, share in the rewards, and combine talent to support supply chain growth and deliver economic benefit to local communities. An open book approach not only helps the numerous organisations involved in these large-scale projects to work more productively, but also reduces the tendency for companies to retreat behind contractual small print when things go awry.

The Nuclear Sector Deal stresses that time is very much of the essence. It's therefore essential for the sector to adopt a collaborative mindset as it re-establishes itself in the 21st century. The nuclear sector is an exciting place right now and by building on the lessons from other sectors, we have the potential for the UK to take a leading role in this global market.

For more information please visit www.kbruk.co.uk/nuclear

KBR

MIGRATION AND SKILLS IN CONSTRUCTION

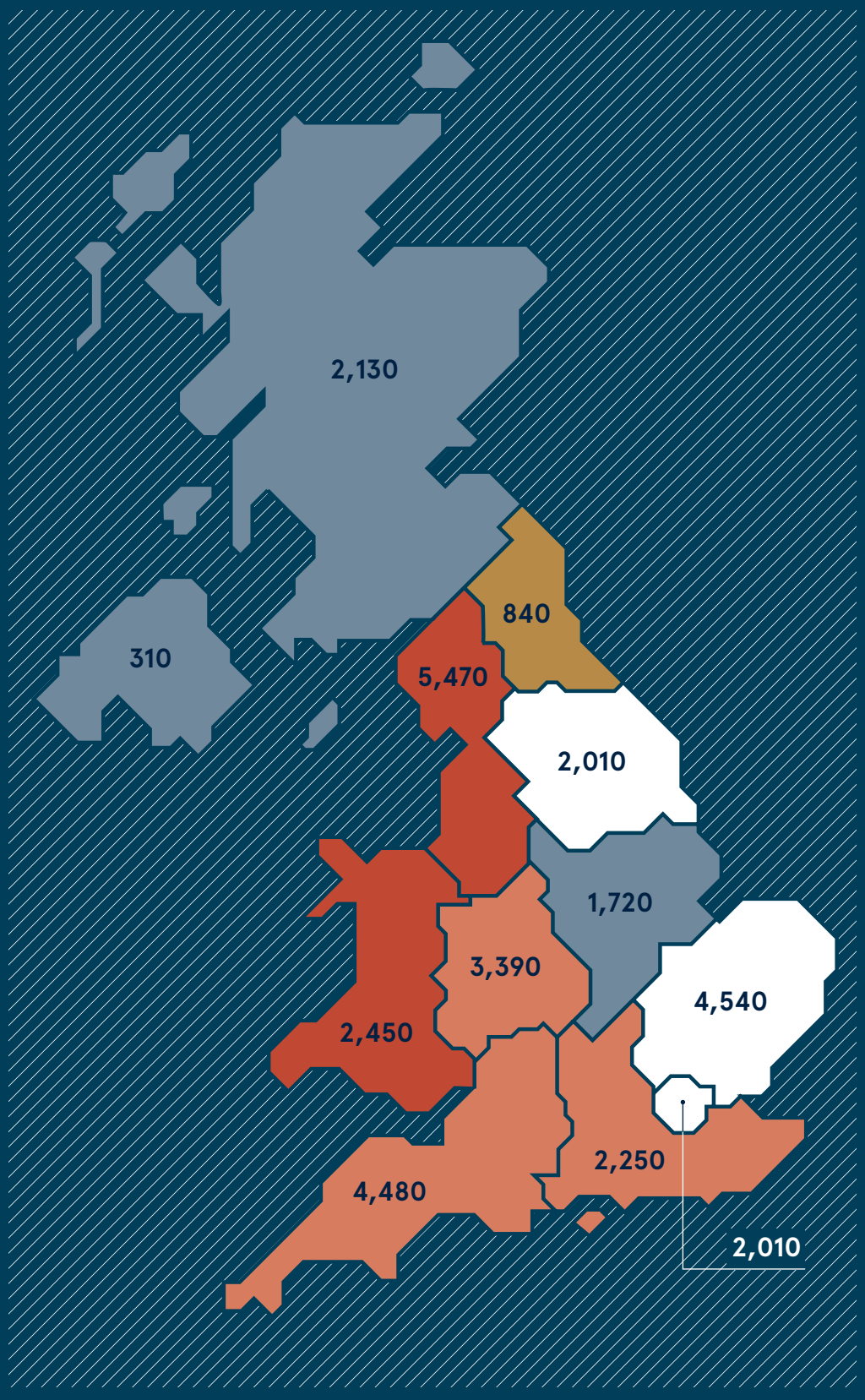
The construction sector is heavily reliant on migrant workers and imported skilled labour. Currently, 15 per cent of the UK construction workforce are non-UK workers, rising to over half in London (52 per cent). As Brexit approaches, what is the current reliance on international labour in the industry and how is this going to change?

CITB 2018

Total employment growth and number of new recruits required

Annually 2018-2022, by region

-8 to -4% -4 to 0% 0 to 4% 4 to 8% 8 to 12%



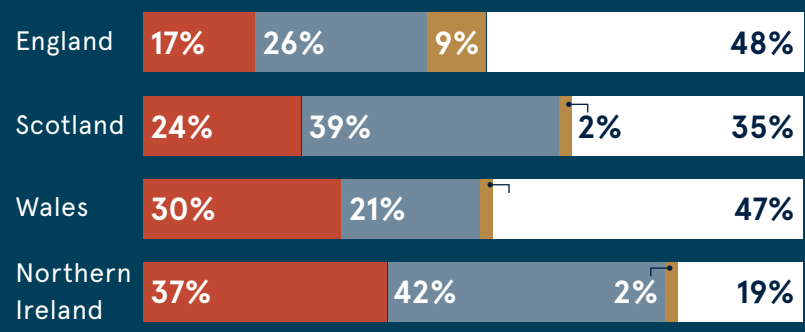
CITB 2018

The proportion of non-UK workers directly employed on a casual basis

ONS 2018

Constituent profile of non-UK-born construction workers in the UK by country of birth, 2011

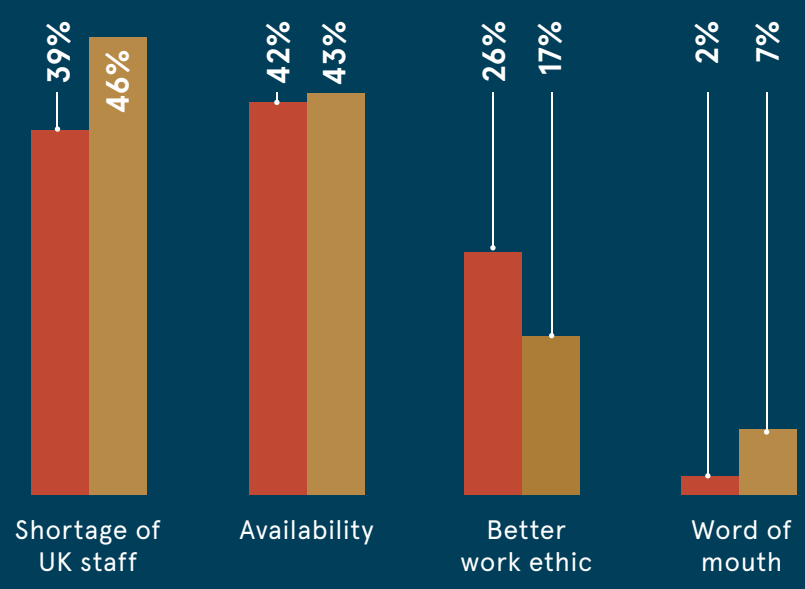
EU15 (excluding UK) EU8 EU2 Rest of world (including other parts of EU)



CITB 2018

Top reasons for construction employers to employ non-UK workers

2017 2018



Percentage of non-UK workers directly employed holding permanent, open-ended contracts

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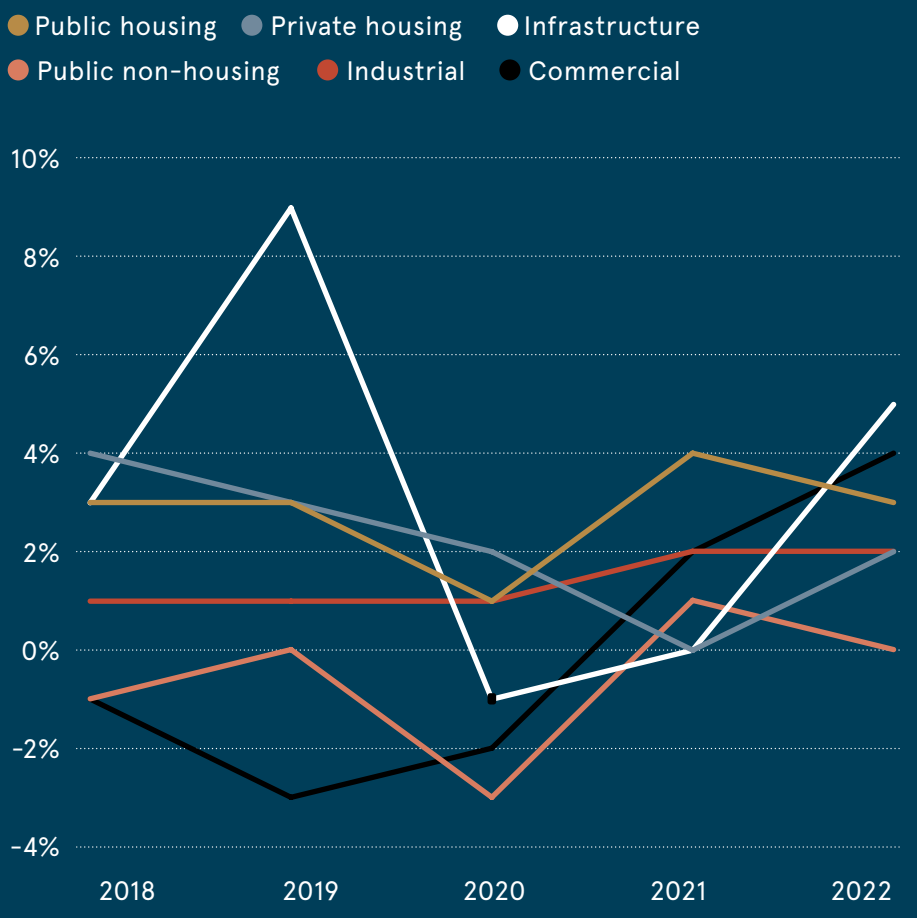
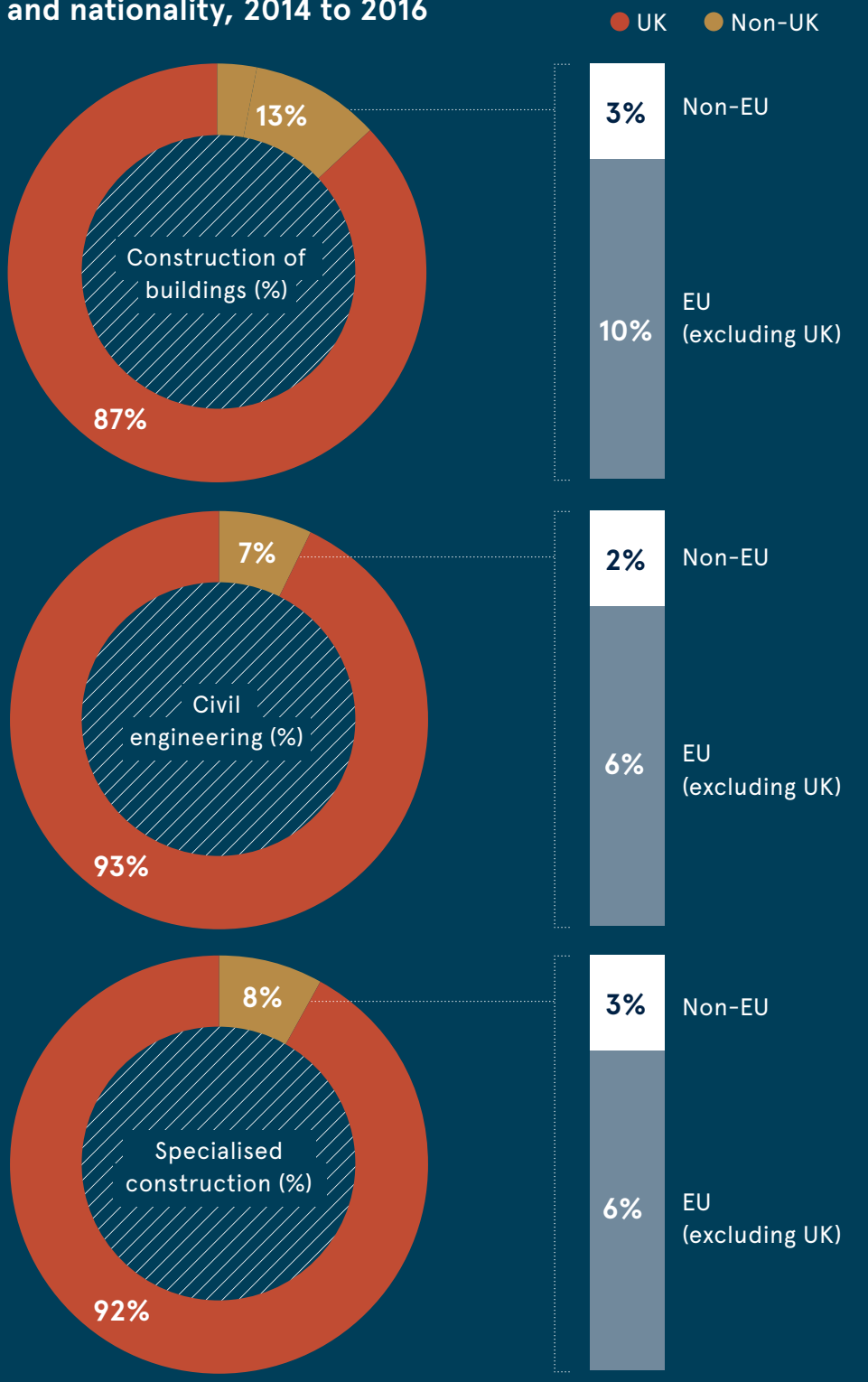
Annual average construction output in the UK (2018-2022)

Forecast annual percentage change



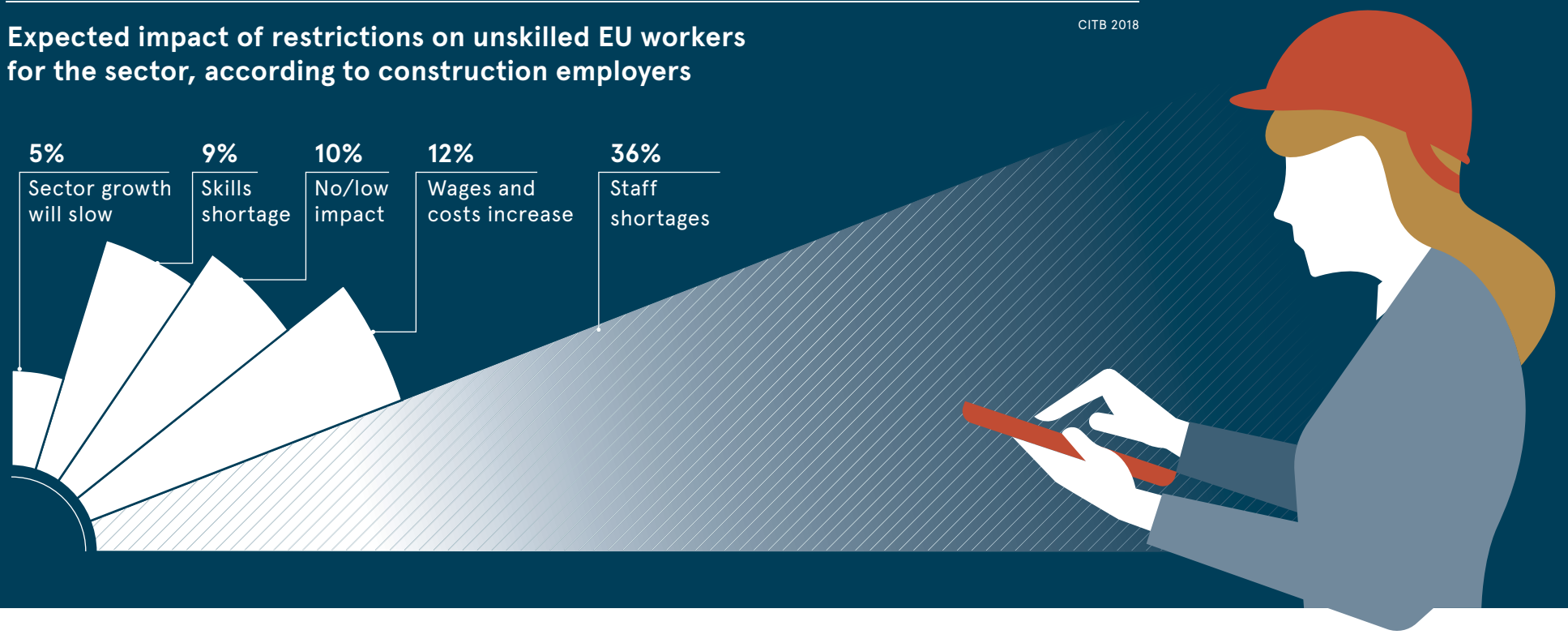
UK's construction workforce by sub-sector and nationality, 2014 to 2016

ONS 2018



Expected impact of restrictions on unskilled EU workers for the sector, according to construction employers

CITB 2018



Commercial feature

Tianjin Tianhe applied BIM methodologies to optimise bridge construction across the main channel of Ningbo Zhoushan Port

Tianjin Tianhe

The industrial evolution: construction 4.0

Automation and data exchange – the fourth industrial revolution – have transformed industries ranging from manufacturing to retail. Construction, decentralised between design, construction and operation, has lagged behind. New technologies, however, are revolutionising the speed and efficiency of infrastructure projects

Digital data has allowed contractors to create 3D models of projects in advance to phase and co-ordinate the physical elements and timing of a project. Now digital twins, or a live model of assets, processes, people and places, as well as systems and devices, enable real-time feedback during design, construction and operation, which takes project development into a new era.

"As construction moves from phase to phase, handover can often mean that data and project insights are lost," says Noah Eckhouse, senior vice president of project delivery with Bentley Systems. "The use of a digital-twin approach allows contractors across the supply chain to harvest existing project data, add to it and make it actionable for later stages of the project delivery process."

Bentley Systems has been at the forefront of this evolution and this year launched a Going Digital campaign to achieve the industrialisation of construction. Going Digital is intended to industrialise project delivery, leverage digital DNA and accelerate a user's digital advancement. Bentley also announced the integration of a range of technologies, acquisitions and partnerships to achieve this, signalling the mainstreaming of the digital twin.

Noah Eckhouse
Senior vice president of project delivery, Bentley Systems

This integration consists of cloud computing with Siemens, through the iTwin project, city planning and web-based 3D visualisation through Bentley's Agency9, workflow management with Microsoft Flow, as well as a partnership with Atos. Leveraging ProjectWise, with AssetWise, MicroStation, PlantSight, iModel and more, Bentley is bringing the digital twin to all.

There are three steps to going fully digital. First is the automation of BIM (building information modelling) processes, making them consistent, repeatable and scalable. Second is the leveraging of digital DNA and this means integrating information that exists, but is not accessible. This could be engineering and physical, even geological, data.

Third, by accelerating digital advancement for all project participants, project development and operations can be transformed. During the building of China's Tianjin Bridge, digital management of information resolved 120 issues and prevented 624 collisions, resulting in around 5 per cent savings in project costs and a 10 per cent reduction in construction time. When cost and time are the key issues in a construction project, the ability to manage these elements provides a strong competitive edge.

This is why infrastructure asset owners and their teams have recognised the potential of digital advancements. To realise the potential though, more than just digital representation is required. A digital twin must also have practical solutions for their synchronisation to changing actual conditions in the real world and be able to synchronise an asset's physical reality with engineering or virtual data.

Historically engineering information has often been unavailable or out of date. It can be an assortment of effectively inaccessible dark data in either opaque engineering files or unintelligent document formats.

Bentley has now surmounted these challenges, with the confluence of its reality modelling, iModelHub, Connected Data Environment and web-visibility technologies. By bringing another dimension into play, predictive analytics and operations over time, the construction industry really becomes 4.0.

Once construction meets technology, even the shape of the industry will change, with a focus on service rather than assets. The potential for infrastructure as a service is the next logical step.

Perhaps the best way to think about the impact of digital on construction comes from Peter Ruff, head of BIM for the Skanska Costain Strabag JV (SCS), responsible for HS2 main works lots 1 and 2. Using Bentley Systems' ProjectWise platform, the team say they could analyse key designs in 75 per cent less time and change the design itself in 50 per cent less time, with the changes synchronised everywhere. Mr Ruff says of ProjectWise: "You wouldn't do a project now without it. It would be absolute chaos."

For more information please visit www.bentley.com

Bentley® *Advancing* Infrastructure

OPINION COLUMN

'We have a higher standard of regulation for commercial property than in high-rise residential buildings and that can't be right'

Not for the first time, the UK construction industry faces a perfect storm: a combination of unfortunate events and circumstances that are both self-inflicted and the impact of externalities beyond the industry's control.

The latter includes the unknown impact of Brexit and the former has sustained many open wounds, including the liquidation of Carillion, the abject mismanagement of supply chains and the refurbishment of Grenfell Tower, which made the building so combustible that 72 lives were lost in the tragic consequences of a kitchen fire.

The construction industry has not prioritised the life safety of those residing in or otherwise occupying its buildings, and the same is true of those commissioning, owning, managing, regulating, inspecting and occupying higher-risk residential buildings.

We have a higher standard of regulation for commercial property than there is in high-rise residential buildings and that can't be right. The old adage of "an Englishman's home is his castle" has a lot to answer for beyond its obvious diversity failing.

The UK construction industry has faced many storms before, not least through 154 deaths on construction sites in 1989-90. Killing three people a week was more redolent of the days of the workhouse than in a modern industry.

Thankfully, partly due to the personal intervention of the then deputy prime minister John Prescott, a systemic culture change was brought about. Construction companies made workforce safety a top priority with board-level champions and a commitment to improved safety management and reporting.

In 2001, Mr Prescott set a target for the industry to reduce fatalities by 60 per cent before 2010, ironically, also to be the year Labour fell from government. Work-related deaths in construction fell to 52 by that year, a 66 per cent reduction from the 1990 peak, and they have continued to fall, with 38 fatalities in 2016-17, down 75 per cent.

Any death at work is one too many, but culture change has had a significant effect in reducing fatalities on construction sites. Change has occurred in a variety of ways, mostly industry led, but with the motivational imperative of regulation, in this case, the Construction (Design and Management) Regulations, commonly known as CDM, last amended in 2015.

These regulations aim to improve the overall health, safety and welfare of those working in construction, creating accountable dutyholders during the design and construction phases of a project. However, CDM ceases to bite once the construction work has finished, having no remit for the health, safety and welfare of those who will occupy the completed building. This is wrong and has to change.

Industry and government are giving significant attention to enhancing existing dutyholder roles and developing parallel responsibilities for a dutyholder throughout the life of a higher-risk residential building. This includes the appointment of a building safety co-ordinator for every such building, hopefully with a view to legislation coming before parliament next year.

Five sectors – construction, the professions, fire safety, building owners/managers and the relevant enforcement agencies – have come together to enhance competencies of all those engaged in designing, constructing, maintaining and managing higher-risk residential buildings. Much is happening to bring about industry leadership for systemic change.

The construction industry is huge, representing hundreds of thousands of businesses in an elongated supply chain, mostly smaller businesses and sole traders, and wholesale change is difficult because of this fragmentation. But, if UK construction can achieve such significant culture change in enhancing the safety of its workers, then it must be able to work with the fire-safety sector, property owners and the government to make the same culture change happen for the life safety of those who inhabit the buildings that it constructs.

Graham Watts
Chief executive
Construction Industry Council

Taking on the crime gangs infiltrating sites

Tales of mobsters running building sites are a staple of pop culture, but what threats do organised crime gangs pose to the construction industry and how can technology help overcome them?

GEORGE RICHARDS

MARCO BERTORELLO / Getty Images

When a 200-metre section of the A10 motorway flyover, known as Italy's Brooklyn Bridge, collapsed in August, killing 43 people, it didn't take long for people to suspect mafia involvement. Italy bears scars from the infiltration of organised crime in construction during the 60s, when mafia families managed to win building contracts during a boom period.

In areas of Italy where there is a heavy mafia and organised crime presence, scores of bridges and tunnels are under investigation concerning the use of unfortified concrete. This material contains higher amounts of sand and water, and a lower proportion of concrete, than regular cement and as such poses a risk to the integrity of the infrastructure projects involved.

While some activities concerning organised crime in construction include using cheaper, less safe materials to reap bigger profits, many focus on the less well publicised industry of modern-day slavery, which exploits migrant workers.

Organised crime in construction is not solely a problem for Italy and the building industry in the UK is far from squeaky clean, where human trafficking is a real concern. A report in April from charity Focus on Labour Exploitation, or FLEX, found that 50 per cent of migrant workers from eastern Europe had no written contract, with 36 per cent saying they hadn't been paid for work completed or didn't understand all the deductions on their payslips.

These workers are often lacking necessary skills and competences that make them safe to work in construction environments. Abuse of systems requiring qualifications and training is, of course, partly how organised crime makes its money.

Ian Sidney, fraud investigator for the Construction Industry Training Board, says organised crime gangs try to produce fake qualifications, or even infiltrate the testing process, to get illegal and/or trafficked workers issued with the documents needed to be allowed on to construction sites.

"Organised crime groups are trying to infiltrate the testing and training of candidates," he says. "It ranges from people doing tests on behalf of other people, right through to people paying [for fake cards]."

Mr Sidney says workers arriving illegally will often have to pay criminals for a package that includes ID, such as fake passports and competence cards, on arrival to the UK, which feeds the problems of modern trafficking, human slavery and the debt bondage.

In February, a gang of seven men were jailed for a combined total of 16 years after being found guilty of the widespread distribution of fake British passports, residence permits and Construction Skills Certification Scheme (CSCS) cards.

"It's quite a lucrative and relatively low-risk area for these fraudsters because it's not as high profile as other organised crime," says Mr Sidney. The men at the centre of this investigation were found to have charged £200 for CSCS cards and £900 for passports.

> **"It's quite a lucrative and relatively low-risk area for these fraudsters because it's not as high profile as other organised crime**

Other issues around corruption and organised crime also pose problems. David Barnes, public affairs manager for the Chartered Institute of Building, says half of all respondents in a survey reported that corruption in the construction industry was common.

"Corruption in construction is listed as one of the biggest industries that the National Crime Agency wants to tackle in terms of organised crime," says Mr Barnes. "It's such a big industry. I don't think people realise its not just people working on site; it's a lot of the project management stuff that goes on."

Luckily for the construction industry, technology has advanced to a point where men on the gate now have some useful tools to help check that people are who they say they are.

"Some of the tactics we would use would be smart cards and chip and PIN so employers can use card readers and card checkers to first see if they are genuine," says Mr Sidney. He explains that some bigger sites use document-scanning and face-recognition technology to make sure the person presenting the ID is genuine.

"We saw it done with identical twins and they presented each other's passports," he says. In this instance, the documents were scanned and shown to be genuine, but the faces, while similar enough to pass a check by the naked eye, were not good enough to fool the technology.

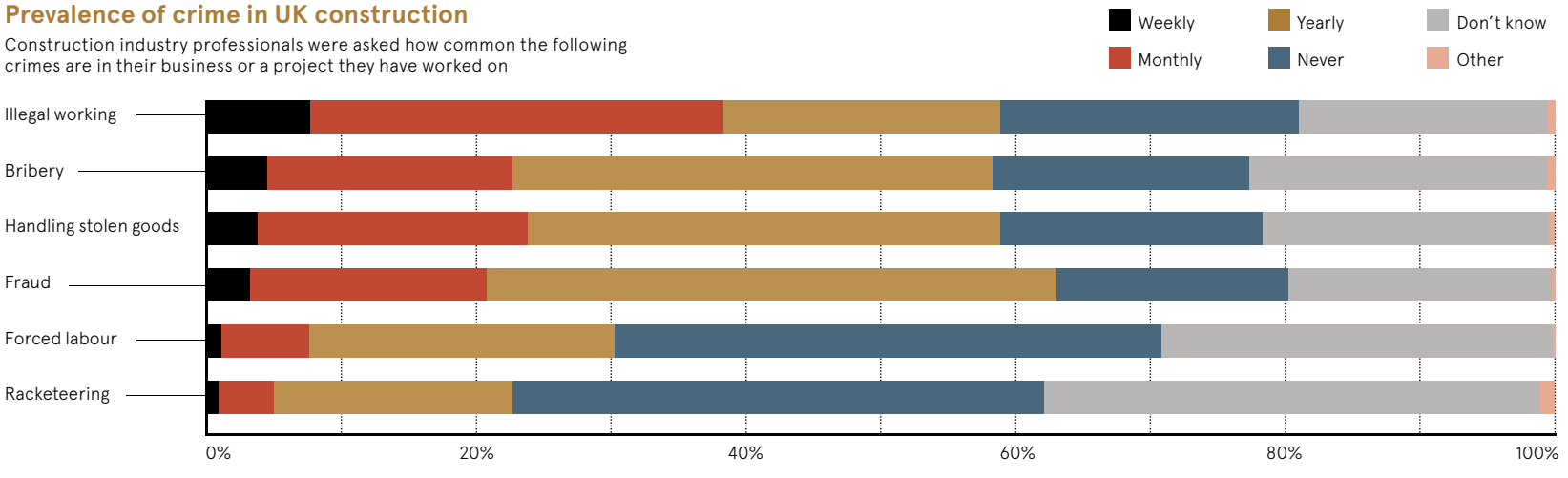
Biometric identification isn't the only tech helping to keep construction sites secure. Drones are useful for aerial surveillance, using regular and infrared cameras, while advanced GPS services can be used to track movement on a work site. However, while technology is helping companies bolster their resistance to organised crime in construction, experts say it is incumbent on firms to address internal issues too.

"I believe more businesses in the construction sector need to be vocal about ethical challenges [the industry] faces, whether that's bribery, corruption, health and safety or modern slavery," says Mr Barnes.

In a post-Grenfell Tower world, where the construction industry is accused of allegedly cutting corners with disastrous consequences, the industry must face its problems head on. "We are witnessing an appetite for change," Mr Barnes confirms. ◆

Prevalence of crime in UK construction

Construction industry professionals were asked how common the following crimes are in their business or a project they have worked on

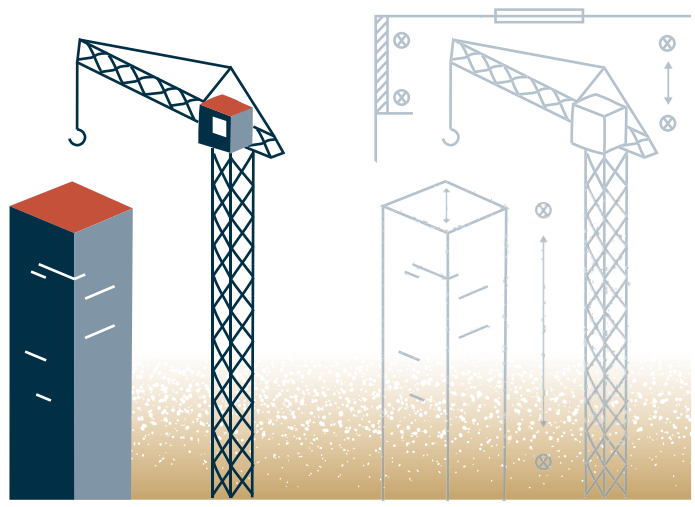


Chartered Institute of Building 2016

Seven top ideas for best building

At every level, from conceptual design, new materials and construction to maintenance, innovative digital devices, applications and methodologies are making their mark in the building industry

FELICIA JACKSON



01 Digital twins

Construction remains a decentralised industry, with overlapping and inefficient interfaces between design, construction and operation. A digital twin provides a virtual representation of physical assets and/or projects, including all the information from design through construction to operation. By connecting plans, engineering, geographical and other data, these separate data silos can be managed in an integrated way, transforming construction.

The digital twin can analyse all the incoming data and use it for continuous improvement in delivery. This can provide big benefits in terms of responding to changes, improving operations and adding value. They can be used for construction, buildings and plant management, even smart cities deployment.

In the UK, a digital twin was implemented for Thames Estuary flood management, which had 70 years of historical data in a variety of formats. By ensuring seamless access to previously hidden information for thirty offices across ten organisations, the project achieved 25 per cent faster data retrieval, and transformed the way different agencies, developers and designers work together.

02 Drones

Unmanned aerial vehicles, or drones, have wide applications in construction pre, during and post-build. Ground surveys are a common reason for delays, when undetected geological elements are discovered on site. As Nick Sacke, at Comms365, says: “Light detection and ranging (lidar), combined with ground-penetrating radar and GPS positioning, provides additional data allowing for more detailed surveying of above and below groundwork before construction begins.”

In addition, drone use can impact workforce safety. During construction, it is far safer to access hard-to-reach or dangerous areas without the corresponding health and safety risks of inspection by an individual. They can also be used to map changes in the project, keeping track of any real-time errors in construction, which can be fed back into a digital twin.

Best of all, they can be built into ongoing operations and maintenance. For example, with the King Abdullah Financial District Metro Hub in Riyadh, Saudi Arabia, Newtecnic engineered the project so inspection, monitoring and precise measurement of normally concealed areas, behind panels and within the completed building’s fabric, are executed by small flying lidar and camera-equipped drones and robots.

03 DfMA

The idea of engineering a project to enable drone-based maintenance leads us on to design for manufacture and assembly or DfMA. While many industries have adopted technology to increase personalisation and customisation to drive markets, this is a relatively new development in construction.

What DfMA requires is that the design process results in objects and/or materials that are easy to both manufacture or assemble. This can be modular design, the use of 3D printing or even local construction labs, enabling parts and replacements to be manufactured to specification on site.

As Andrew Watts, chief executive of Newtenic, says: “The introduction of digital technology makes construction as efficient as any advanced manufacturing process where precise component quantities are made to order. Because these have assured quality and exacting specifications, based on the as-built construction, they are guaranteed to match the structure and have predictable performance over a pre-determined life cycle. Additional value is produced because, as in a modern mass-customisation car factory, every part is accounted for and there is no waste.”

04 Augmented reality

The thing about augmented reality (AR) is that it means a partially rendered environment, not a fully virtual one. While a virtual reality experience may be useful to show potential investors what something might look like in the future, AR provides an overlay to views of the real world. This means information on detailing tasks, safety alerts and other support can be provided to what workers are seeing on tablets or through smartglasses and even hard hats.

As Mr Sacke, of Comms365, points out: "AR could be used to position holographic markings displaying warnings and awareness of an electrical conduit, which is positioned behind a wall, to caution and inform engineers who would be accessing this area of the building in the future."

It's not just on-site safety and management though. As James Woodall, co-founder and chief technology officer at Intoware, says: "Away from the site, data-visualisation tools can use this wealth of information to identify bottlenecks and problems that simply can't be captured on paper. From a business point of view, the use of wearable digital work instruction products improves speed, accuracy and convenience, which all ultimately contribute to the bottom line."

05 New materials

Development of new materials is a necessity for many industries, with increasing demand for low-carbon and sustainable operations. A Nasa offshoot, PURETi, is transforming the building façade sintered stone market through its partnership with Neolith. PURETi has developed a photocatalytic surface which eats pollution; it literally cleans the air around it.

Using a liquid form of titanium dioxide and its natural reaction to ultraviolet light, the material can remove free radicals and other pollutants from surfaces, air and water. This means it transforms Neolith sintered stone façades into self-cleaning air purifiers, consequently reversing pollution, dramatically improving air quality and enabling the slabs to stay cleaner for longer.

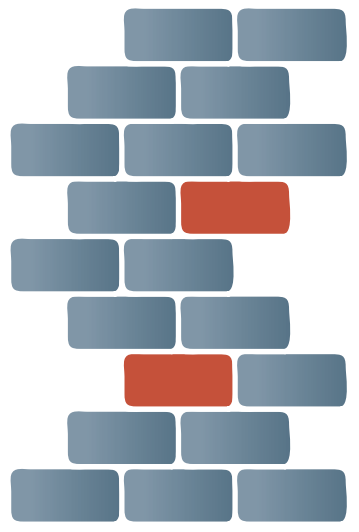
While this is a huge societal benefit, it also means that treated sections of the façade keep surfaces clean, an extra benefit for the building owner. As Lauren Underwood, senior research scientist at Stennis Space Center, Mississippi, who worked on the original Nasa project says: "It's exciting that there is a non-toxic mechanism to keep buildings clean and at the same time reduce maintenance, energy costs and the use of harsh chemicals."

06 Back to basics

When we talk about innovation, the assumption is often that we're talking computing-based breakthroughs, imagined in sterile, clean laboratories with little connection to the natural world. Yet one of the most exciting recent breakthroughs in construction is the discovery that bricks can be made of human urine.

Researchers in South Africa at the University of Cape Town have developed a zero-waste building material made with urine, as an alternative to kiln-fired bricks. Regular bricks are fired at temperatures around 400C and produce vast quantities of carbon dioxide, while bio-bricks are made in moulds at room temperature.

To create the bricks, urine, loose sand and a bacteria that produces the enzyme urease are combined in a brick-shaped mould. The urease triggers a chemical reaction, breaking down the urea in urine, while producing calcium carbonate, also known as limestone, the main component of cement. The bio-brick process creates nitrogen and potassium, useful for fertiliser, as by-products and means the process is ultimately zero waste with 100 per cent of the urine converted into something useful.



07 Robots

For many of us, robotics are a thing of fiction and film, as when Ripley used a robot exoskeleton to fight the xenomorph queen in *Aliens*. They are already in use today though, in a range of sizes and niches. Willmot Dixon is currently trialling Eksovest, a robotic exoskeleton vest to help protect the human form. The idea is that it should assist in lifting items and performing repetitive overhead tasks.

Advanced Construction Robotics is using its TyBot to tie steel reinforcement bars for building projects, while the small Q-Bot is helping to retrofit buildings through applying insulating materials in the spaces between floorboards and foundations.

But the next big thing is swarm robotics. Spain's Institute for Advanced Architecture of Catalonia is creating its own swarm of structure building robots. These "mini-builders" are like small 3D printers depositing material in layers, connected to a central vat. While the swarm model is very new, it is developing fast. Assistant Professor Pham Quang Cuong, at Nanyang Technological University, Singapore, is already working on the next stage, developing better mobility planning to enable the swarms to operate in rougher environments, which is exactly what construction needs. ◆

TECHNOLOGY

Investors wake up to tech opportunities

Construction technology is on the cusp of transforming the industry into a digital-first enterprise


Raquel Gisbert Gil / Getty Images

FINBARR TOESLAND

The story of innovative startups disrupting traditional companies is well known. Few sectors from transportation to banking have been left untouched by cutting-edge digital solutions, but the construction industry has been slow to embrace transformative technologies, until now.

Contech, or construction technology, startup companies are beginning to change the industry and are making investors take note. According to a recent report by commercial real estate firm JLL, contech firms received $1.05 billion in investment from venture capitalists in the first six months of 2018, 30 per cent up on the total raised in 2017.

Construction companies and investors alike are hoping these startups will help address pressing issues in the industry, especially around the relatively low levels of productivity found throughout the sector. As other industries have seen productivity levels shoot up over the past two decades, productivity in construction has been mostly flat, which is particularly troubling due to the difficulty in hiring skilled labour.

"Contech is all about finding new ways to do more with less. If a new technology can ease collaboration across firms, reduce errors and miscommunication, or get more productivity from a limited pool of skilled workers, it has a good chance of finding demand, even in an increasingly crowded market," says Henry D'Esposito, senior research analyst, project and development services, at JLL.

Charlotte McCarthy, director of marketing and partnerships at FUTURE:Proptech, a leading property technology event firm, believes contech can support companies in everything from post-construction building management to timely admin and reporting, but there are still barriers that are set to limit the widespread adoption of these novel solutions.

"It is hard to change people's minds and get them used to new ways of doing things, especially in traditional sectors like construction and real estate. The cost of these new solutions is not always cheap and therefore there is normally quite a lot of sign-off required to integrate unproven solutions. This will be the biggest barrier to adoption," says Ms McCarthy.

Transforming from one of the least digitised industries to a leader in utilising innovative technology is clearly not going to happen overnight. Construction companies themselves often lack the necessary resources to introduce contech products and solutions into their systems effectively, delaying the time it takes to see the benefits of the technology on an industry-wide scale.

There is also concern over possible glitches in the new tech. Leading construction companies are holding back before fully embracing contech solutions until the ecosystem matures, as it's simply too difficult to pick a winner this early.

The current crop of contech startups are being led by firms offering solutions that are speeding up the construction process and improving collaboration between disparate workers. Startups that fabricate building components off site are able to improve customer supply chains, as entire buildings can be constructed quickly when the components are received.

"One of the hottest sectors right now is off-site construction. For example, this year alone, we have seen Katerra raise nearly $1 billion in funding. Off-site construction is reaching new heights, with an 11-storey multi-family building in Denver and 13-storey property in Atlanta, both showcasing the benefits and potential scale of the technology," says Mr D'Esposito.

There have been a number of prominent examples of industry adoption of contech solutions, including firms that have been able to eliminate the need for paper files by adopting smartphone platforms or have gained in-depth insight into operations through advanced data analytics.

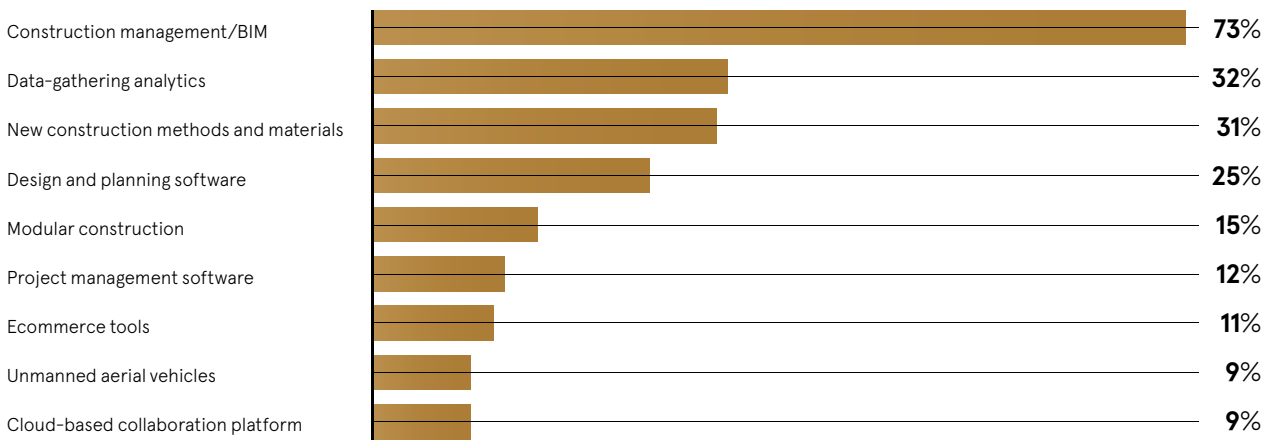
Big data and solutions backed by artificial intelligence are on course to become increasingly beneficial for construction businesses of all sizes. Internet of things devices are in use throughout the sector, but proliferation of this data collection is set to become a true game-changer as it provides actionable insights for firms.

Now is an exciting time for forward-thinking companies in this sector. The value added by incorporating contech products in normal, everyday operations can make a tangible difference to the entire building process and play a central part in preparing construction firms for a digital-first future.

"Construction companies should start thinking about employing a dedicated innovation director to assist with these decisions and to stay on trend. Marketing teams should be sharing information on innovation implementation on site, so they are remaining relevant, on-trend and winning through technology adoption," Ms McCarthy concludes. ◆

Hottest areas for construction tech investment

Number of investment deals in construction tech startups in 2017



Swiss Re/CB Insights 2018


kuzma photo on Shutterstock

Insight

Five top contech startups

01 Katerra

Since its founding in 2015, Katerra has become one of the most disruptive contech startups in the world. The company received an $865-million investment from SoftBank's Vision Fund in early-2018 and is now valued at more than $3 billion, thanks to its wide-ranging ambition to become a pre-eminent end-to-end provider of building services. By focusing on constructing prefabricated structures on a large scale, Katerra hopes to streamline the entire design, manufacturing and construction process.

02 Uptake

Four-year-old machine-learning firm Uptake is leading the charge for digitisation in the construction industry. As internet of things devices become commonplace in industrial environments, a huge amount of data can be collected by Uptake to track how machines are performing. Application of predictive analytics to construction equipment will give unprecedented insight into the operations of these devices, and enable companies to understand why failure happens and improve reliability.

03 Procore

Construction projects are often large, multi-faceted endeavours that require a significant amount of management expertise. Leading cloud-based construction management software provider Procore is working to improve accountability and efficiency during operations by changing how different stakeholders collaborate, and share data and documents. Enabling easy access to drawings, contracts and planning schedules enables workflows to be optimised and tight profit margins to be maximised.

04 Blu Homes

California-based Blu Homes is transforming how homes are made. Buyers can select from a range of customisable, prefabricated modular homes in an extremely simple process that is quicker than conventional customer constructions. Blu Homes manufacture the structures off site and ship them to consumers, who can then have them assembled in as little as three months. These homes are more environmentally friendly than traditional properties and cut operating costs by up to 50 per cent.

05 Rhumbix

Digitalisation has had little impact on many construction sites across the world. But now Rhumbix, a mobile platform, is designed to improve the productivity levels of field operations. It enables foremen to go paperless, and quickly view data on budgets, attendance, productivity, and health and safety. Gaining this level of insight into projects gives builders greater visibility of what is working, or not, on the site.

How big data will boost productivity

Plugging the gap in the many disparate data sources on construction sites will unlock the actionable insights needed to overcome the industry's productivity challenges

It's no secret that the construction industry has a productivity problem. Over the last 20 years, its global average value-added per hour has been largely flat. No other industry has fared worse, according to consulting firm McKinsey, which said last year that meeting global infrastructure needs will be a challenge if this doesn't improve.

The productivity problem breeds a vicious cycle. As construction firms pursue cost-cutting to counter their dwindling profit margins, long-term investment in innovation is sacrificed. The result is an industry drastically lagging in digitisation and technology transformation programmes, which further limits its ability to boost productivity.

"Construction companies are still building structures like they did decades, if not centuries, ago; nothing's changed," says Adrian Butt, managing director at DataScope Systems, a provider of remote data systems.

"The industry has never taken the time to make those processes any smarter. They still rely on folders of paper, while other industries have heavily invested in technology; they've digitised and reaped the benefits, both competitively and from a margins perspective.

Adrian Butt
Managing director, DataScope Systems

"If construction companies don't innovate now, their survival is very much at stake. Also, from a UK economy perspective, we'll get left behind. Other countries, including in emerging regions like the Middle East, are desperate to embrace technologies such as augmented reality, artificial intelligence (AI) and machine-learning. They will get there, undoubtedly, and then not only move past us, but also take our trade resources."

A major barrier facing the large construction players is the difficultly to embrace change quickly. With numerous divisions across different sectors, their operations can easily become disparate and cumbersome. Adopting new innovation often requires an agility that can be difficult to find in these firms, so DataScope recommends starting small.

Demonstrating the value of utilising a series of systems into a datacentre, for example, provides a best practice model that can be used on the next phase of the datacentre project or even in another part of the business. DataScope also advises having an internal champion of the technology on site to advocate the systems as they're built.

The software firm is built on four areas crucial to running a successful construction project: people, logistics, assets and planning. The main contractor on a project can easily lose track when managing dozens of sub-contractors, each providing hundreds of operatives, who must collaborate to ensure everything runs on time. Integrating all project elements through DataScope's digital systems can drive vast efficiencies.

"Things fall down when the main contractor is not capable of managing those sub-contractor relationships," says Mr Butt. "By managing those four cornerstones with the data derived from our systems, the main contractor can make sure there are very few clashes. When there are clashes, they are highlighted so the main contractor can flatten any spikes and create genuine earned value management on those projects."

At the heart of these sophisticated systems are automation capabilities powered by technologies such as AI and machine-learning. However, these capabilities can only be truly utilised if they have useful data in the right format to digest. Large construction firms have thousands of unintegrated spreadsheets, word documents and manual processes.

Connecting and digitising these data sources will be vital to embracing the innovation that can finally enhance productivity for the construction industry and enable projects, which are more likely to be completed on time and on budget. Main contractors can also adopt a strong and consistent approach to collaborative planning with their sub-contractors via DataScope's systems.

"Whether companies are using paper-based systems or standalone computer systems, we digitise everything on our format, which is all sat on top of big data," says Mr Butt. "When customers get access to data like this, they can see things they couldn't see when it was on hundreds of bits of paper in dozens of different files. All of a sudden, they start to use that data in a different way and soon the productivity will be unlocked."

For more information please visit datascopesystems.com

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