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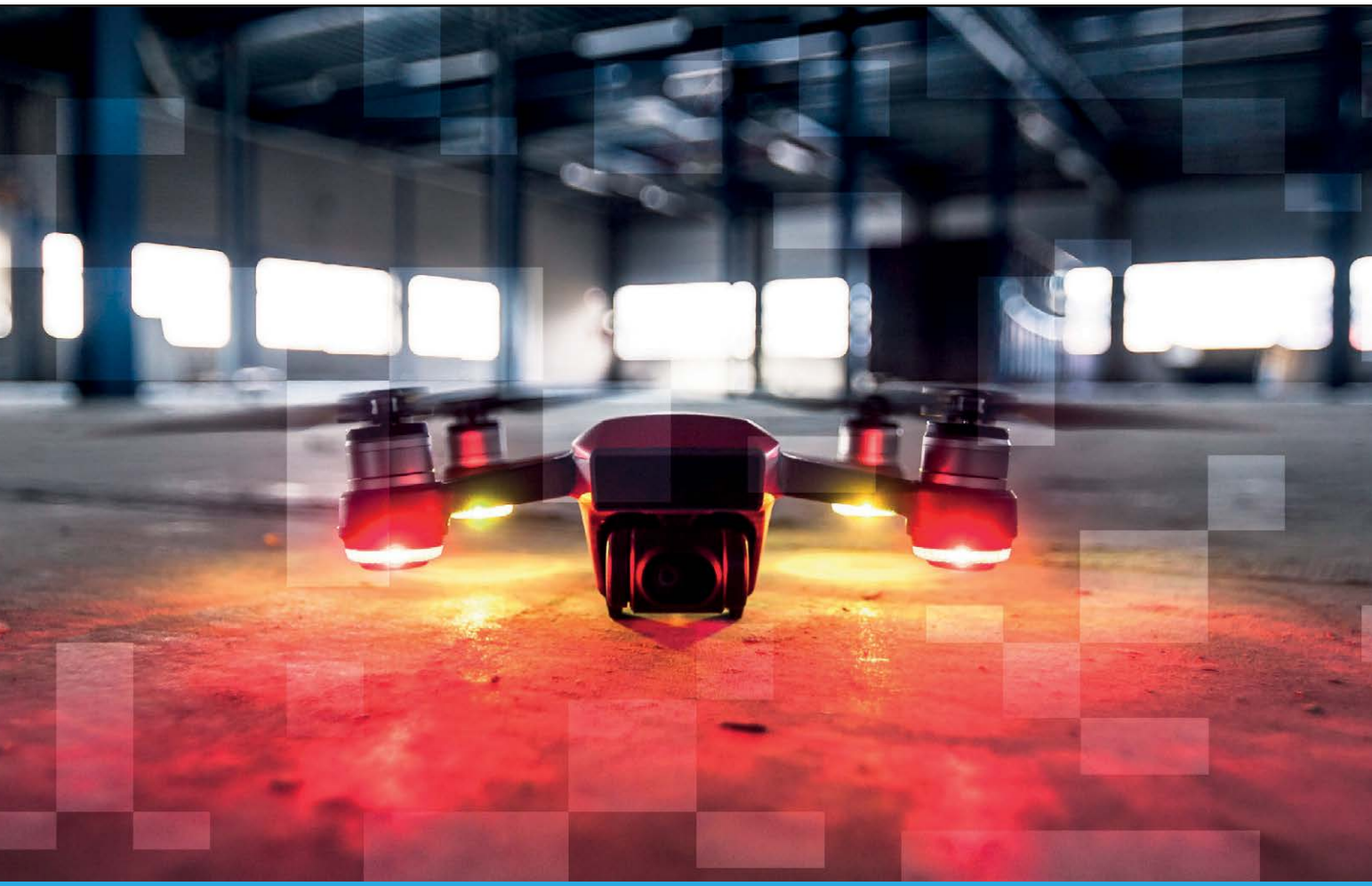

March of the machines

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Construction focus

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Adequately insuring construction projects under such erratic conditions can be likened to trying to hit a moving target. With so much change occurring in so many different places, new risks emerge quickly and from unexpected quarters. It takes a seasoned insurer to help identify and manage them.

By anticipating change in the industry, QBE is perfectly placed to underwrite complex risk even on the largest construction projects. Here, our team gives you the insight you need to understand the implications of technological change at each stage of the construction cycle.

A challenging start

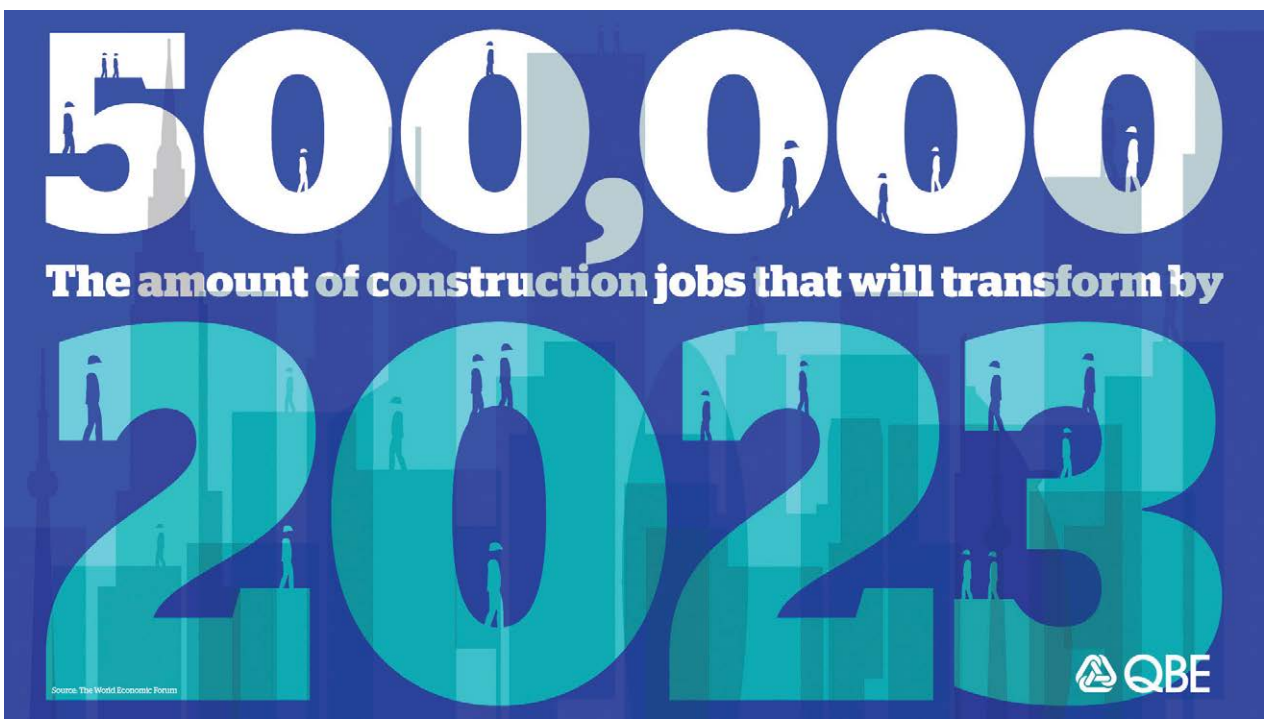
Opinions about Building Information Modelling (BIM) differ among contractors, but, like it or not, it is pervasive. This is not simply because of UK Government mandates. Joint ventures and partnerships are on the rise as the cost of bidding increases, and that requires coordination of teams and designs right from the outset.

"While it has its problems, firms recognise that with such complex projects to deliver and extensive supply chains to manage, information sharing and visualisation through BIM are crucial to the effective delivery of projects of any size," says Andy Kane, Portfolio Manager Construction for Europe at QBE.

"What that means for the future is that as the programs mature beyond the ability to store and share common file formats and libraries, these models will start to absorb other elements of a project."

New possibilities for BIM

BIM-controlled materials sequencing and ordering is on the horizon. Onsite engineers will be able to feed job status notes into a system that automatically orders new materials for the next stage for just-in-time delivery



from prefabricators. "That would be a huge help to project managers – particularly on tight urban sites with little lay-down space," says Kane.

But this multiplies risks already inherent to the BIM collaboration system. As each new party dials in, it creates a possible new entry point for criminals.

"Where there is one project manager or large engineer hosting the BIM, there is one point of failure," says David Warr, TMT & Cyber Underwriter at QBE. "You have to be sure that the other parties in your project hold themselves up to the same security standards that you are."

With the possibility that every onsite digital system could eventually connect to a BIM – where the model begins to physically control machines and people onsite – it is critical that businesses start to protect themselves against cyber-risk now, rather than leave it to the point of catastrophic failure.

Prefabrication is transforming the supply chain

Advances in offsite fabrication in particular are where construction firms and contractors see an opportunity. With so much wastage on a building site and the potential for materials and equipment to be stolen, broken or damaged, pre-fabrication in a factory environment can look like a place to make savings. Indeed McKinsey estimates that construction firms can expect to boost productivity between five and ten times by moving to a manufacturing-style production system.

For their part, manufacturers are increasingly looking at better ways to supply ever more complex pre-fabricated products to construction sites, as well as design them for quick assembly onsite, right from the outset.

The integration of electrics into offsite fabrication is one area experiencing significant interest. Large scale wiring and ducting is making way for the much simpler connection of pre-installed systems by the time a unit reaches a site.

There are a series of issues that need to be addressed to make this work well. These include longer lead times; new transportation costs, space constraints and site access problems, as well as special lifting equipment for large modules. But something more profound is occurring – the changing nature of liability.

Liability is moving too

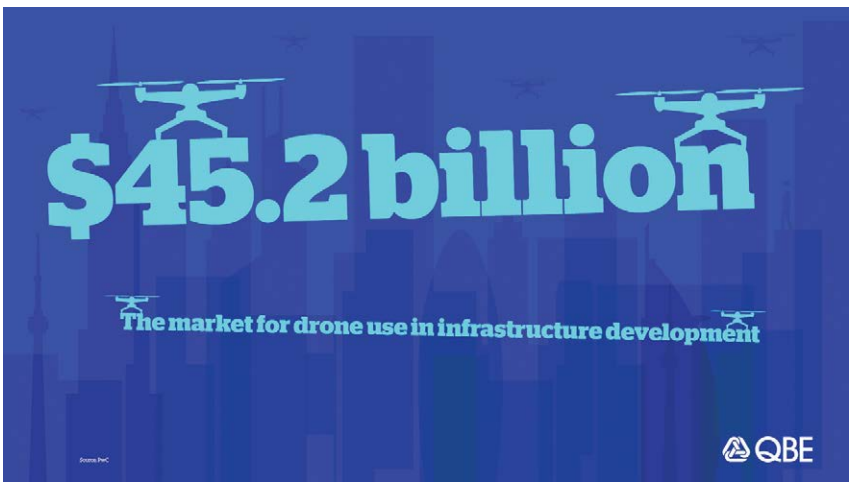
There is a subtle shift of liability from construction firms to manufacturers and logistics firms, says Tim Bluck, Casualty Portfolio Manager at QBE. "If a contractor orders a bathroom pod, built by somebody else, they are buying a product, like you buy bricks or any other construction material. If that product fails or is defective, the contractor could pursue for recovery of damages caused down the supply chain. That is something that you wouldn't necessarily have seen before, but you will start to see now. There is a clearer line of sight as to who is responsible for what than there was 10 years ago."

"Customers are asking more questions about the offsite element of their projects than ever before," adds Kane. "They are asking 'what cover is there for these items' because pre-fabrication has become much more time critical. If you are prefabricating rooms for a modular hotel, for example, and there is a fire in that manufacturing facility, your project stops. Clients are now thinking much more about where their risk is moving to.

"Offsite risk has always been there for large infrastructure projects because of specialist equipment coming from overseas," Kane continues. "But now it's a potential risk for regular buildings. Our risk solutions team now include on-site inspections for fire protections and quality control at third parties factories. It's quite a development in the field."

Site-prep is taking to the skies

Construction sites are messy places. To date, robots have found mess difficult to deal with, both from an object-recognition and a movement perspective. But there are rapidly widening areas in the industry where machines are already taking over tasks.



Drones are perhaps the most obvious advance in onsite robotics, becoming an increasingly common sight. Construction giant Komatsu is using semi-autonomous quadcopter technology on as many as 10,000 sites across Japan. They are being used for the aerial surveyance of sites and stockpiles to improve materials wastage and just-in-time efficiencies. These machines can generate maps within five-centimetre accuracy and can survey a site in minutes rather than the days required by land-based lasers.

Market opportunity

According to a recent report by PwC, the total, global, addressable market for drone-use in business is US$127 billion. Of this, infrastructure development represents a staggering US$45.2 billion across a wide range of applications.

These include monitoring sites for criminal activity, for example. PwC cites an investor saving approximately US$2.5 million in claims settlement litigation thanks to unparalleled evidence of wrongdoing. Then there is safety. PwC's Drone Powered Solutions unit has calculated that the number of life threating accidents on an average construction site monitored by drones has decreased by 91 per cent.

Next step for site automation

Similar effects can be expected from the now inevitable filtering down of automated vehicles to the building site. Firms like John Deere and Caterpillar are taking advances in the automation of vehicles in the transportation, agricultural and mining sectors – using technologies like telemetry, mapping and visual processing technology – and applying them to heavy earthmoving equipment in construction.

These different applications of similar technology are combining to form new machine eco-systems. Traditional companies and start-ups like Built Robotics are plugging three-dimensional terrain modelling into their heavy equipment and allowing them to work semi-independently onsite. Komatsu says it will soon use data generated by its drones to assist in the operation of the autonomous construction vehicles that is has in development.

The implications of these innovations could be truly profound. McKinsey estimates that productivity in the construction sector has remained static since 1945. Yet there has been a 1,500 per cent boost in productivity in agriculture, manufacturing and retail in that time – largely due to automation. As construction adopts technologies like autonomous vehicles, the industry could improve productivity by 50 to 60 per cent.

New hardware, new risk

But new machines create new dangers, the use of drones being a case in point. As it stands, Civil Aviation Authority (CAA) regulations split drones into three different weight categories: 20kg or less, 20kg to 150kg, and above 150kg (for the lightest tier, a CAA certificate or permit isn't required). As these machines begin to do more complex tasks, so their weight will increase, and their potential to do serious damage if they malfunction or are misdirected.

"If something that weighs 40kg drops out the sky, that will be a problem," says Bluck. "We are alert to these new kinds of risks, and we are constantly observing what our clients are using new technology for so we can support them. With the advent of genuinely autonomous machines onsite, that understanding will be even more critical to crafting the right cover for our clients."

But workers can be safer

One field with an enormous amount of potential to make sites safer and reduce risk is the integration of personal protective clothing (PPE) with worker wearables, networked communication, and augmented reality overlay (AR, also known as 'mixed reality').

It started in the factory. Google Glass augmented reality headsets proved a massive flop with the general public when they ceased sales in 2015 – just a year after launch. But several

savvy small businesses began buying up the technology so they could customise it for deployment in factory settings.

The success of these early adopters has led to an explosion in Glass-like technology, because it is actually useful. By giving shop floor workers access to diagrams, assembly instructions and workflow charts right in front of them as they go about their business, both skilled and semi-skilled factory workers and managers are able to improve accuracy and efficiency very quickly. Company data scientists are also able to extract meaningful information from the systems to apply to new workflows and management tools.

The construction industry should take note. AR wearables are being deployed on sites around the country by large firms already. This will inevitably spread to smaller companies as costs fall and utility rises – as the 'network effect' increases.

Vancouver based wearable tech pioneer Fatigue Science has been supporting construction firms for over 10 years. Their 'Readiband' product reports sleep and fatigue data from the user in real-time, scoring it using an app and helping the organisation prevent injuries resulting from fatigue before they happen. Morgan Sindall has been successfully using the bands for over a year to tackle a problem that is estimated to cause 207,204 lost working days in the UK each year, at a cost to the economy of £40bn.

Joining the debate

Two recent examples of similar transformations in construction roles come in the shape of work by US GPS expert Trimble, and German augmented automation and intelligent robot manufacturer, Essert.

Trimble recently introduced a new AR adaptation for hard hats.

"AR wearables are being deployed on sites around the country by large firms already. This will inevitably spread to smaller companies as costs fall and utility rises – as the 'network effect' increases"

The Trimble Connect for HoloLens mixed-reality solution combines digital models from different contractors like structural, mechanical and electrical trade partners. The system creates 'precise alignment of holographic data on a 1:1 scale on the job site', allowing workers mobile access to information previously only available from a laptop, or more likely, in an office.

Essert offers the scenario of its AR in tunnel construction, with boring machines going offline, and a site office worker fixing them problem "without any detailed knowledge of the system or documentation but with a toolbox and a helmet… that is equipped with smart glasses for augmented reality support."

Crossrail is an example of a mega-project that has successfully trialled the usage of BIM integrated AR and remote-sensor tech. Field Managers overseen by the project's dedicated BIM working group at Custom House utilised tablets loaded with augmented reality software to view 3D plans overlaid on the actual site via camera.

All of this has significant implications for the debate about employment. While institutions like the World Economic Forum forecast 500,000 global construction job losses in the next five years, a large swathe of the construction workforce may instead need limited retraining for more generalist roles. Tools like AR wearables could complement existing skill sets, or substitute them entirely, allowing workers to become more adapted to different tasks at different stages of the construction cycle. There are some jobs, however, that will almost certainly disappear from construction sites for good. Basic, repetitive manual labour will begin to be supplanted by machines in a variety of areas.

Re-training is inevitable

Whether the real figure will be 40,000, 300,000 or 600,000, the mass re-training of construction workers in the UK is inevitable in the next two decades. High cost, high risk jobs will go first as automation takes hold. But repetitive tasks will also be performed by machines. New jobs will be created as a result: a fresh requirement for the software engineers, information management specialists, machine controllers and generalist technicians that new technology will bring.

This will make sites safer, and more profitable. And as the industry changes, QBE will help manage the new risks that these changes bring.

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Robotics, drones, prefabrication

Construction sites are changing. 500,000+ industry roles could also transform within 20 years.

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