Data, robots & wearables:

How technology is reshaping the construction industry

CHECK POINT

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Introduction

In the words of McKinsey and Company in their 2017 report **The new age of engineering and construction technology**, the construction industry is on the cusp of a new era. Both technology startups and established industry players are busy creating new applications and tools that are transforming how companies design, plan and execute projects.

From mobile apps and big data, to smart clothes, wearables and automated construction equipment, both HR professionals and project managers now have an array of choices at their fingertips to help improve communication between project managers and site workers, streamline construction processes, and boost job-site productivity.

This eBook looks at five areas where new technologies are profoundly reshaping the future of the construction industry, and the management of its workforce.

Apps and digital platforms

Whether in the office or on the job, the digitisation of processes and workflows is having a massively positive impact on the construction sector. It is helping employees and site managers keep track of paperwork, better manage HR and safety data, and stay updated and connected to their projects. Here's where technology is making the biggest splash.

Safety and compliance

The strict safety regulations of the construction industry can generate a labyrinth of paperwork for site supervisors – making it the perfect candidate for digitisation. A good example is the **Safety Meeting mobile/ PC app**, which allows users to create incident reports, access safety checklists and training data, and record meetings from any location on the fly.

Apps and digital platforms

Communication and teamwork

A construction project can quickly spiral out of control if its stakeholders are constantly playing phone tag or acting on outdated information. **The Fieldlens app** reduces confusion and cost overruns by keeping everyone connected in real-time via their devices. Plans, progress, equipment, manpower and even on-site weather conditions can be recorded, updated and shared through the app.

Building information modelling (BIM)

BIM refers to the use of powerful software to create 3D virtual representations of buildings and infrastructure. It can be applied throughout the building life cycle, from the architecture and design phase to construction management and operations, helping to improve collaboration, building performance, productivity and profitability. The latest BIM systems also integrate technologies such as the Internet of Things (IoT), big data and artificial intelligence (AI) to help builders and facility managers proactively avoid problems, and achieve even greater efficiencies.

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Image courtesy Autodesk

Automated equipment

When it comes to autonomous vehicles, most people immediately think of self-driving cars.

Various technical and regulatory challenges are likely to keep them off public roads until at least 2020, however automated construction is already on our doorstep.

A glimpse of the future can be found at **Rio Tinto's** Pilbara mines in Western Australia, where a fleet of driverless dump trucks use GPS technology to move iron ore. The company has also deployed an automated multi-site drilling system that requires only one operator, and a driverless freight train is also being developed.

In Western Australia's Pilbara region Rio Tinto already uses a fleet of driverless dump trucks fitted with GPS technology to move iron ore.

Image © Rio Tinto

Automated equipment

In the same way that automation is making mining easier and safer, autonomous bulldozers, trucks, cranes and excavators will yield big benefits for construction.

Various heavy equipment manufacturers, including **Komatsu**, **Caterpillar** and **Volvo** have already released autonomous and semi-autonomous vehicles. For builders, the technology has the potential to improve quality, cut costs and enable the design of more attractive and sustainable structures.

Autonomous machinery will yield big benefits for construction. These include:

Productivity
Fully autonomous equipment could operate overnight and during weekends or public holidays.

Labour costs
Instead of a whole work crew, only one person may be required to operate a fleet of machines.

Efficiency
Automation could reduce errors and rework, optimise fuel consumption and extend equipment life.

Safety
Fewer people on-site means reduced worksite injuries and health problems caused by long-term exposure to vibration, dust and shock.

On the job site

Every construction job site has its own unique challenges, from monitoring job progress and site security to choosing the optimal equipment mix and transportation routes.

Here are some of the ways technology is being used to help building professionals work smarter, not harder.
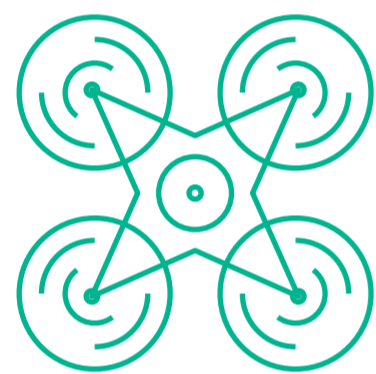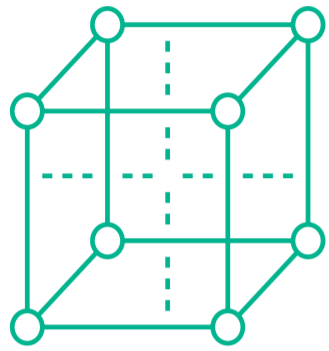
Construction drones

Can't afford a helicopter? Construction drones allow builders to conduct high-resolution aerial surveys on the cheap. During a recent **sports arena construction project** in the US, drone footage of the site was converted into 3D images that were used to keep tabs on workers' progress. Drones can also be used to inspect tall or inaccessible structures (**Australian UAV**, for example, specialises in services such as professional aerial mapping, survey and site inspections, all using drones), reducing maintenance costs and improving safety.

On the job site

3D printing

The construction industry is at the nucleus of a 3D printing revolution. The technology allows far greater flexibility of design while vastly simplifying construction and prototyping – making it no surprise that demand for the technology is surging. The 3D printing technique known as '**contour crafting**' allows builders to construct an entire building in mere days using a computer-controlled crane or gantry, with structural components such as plumbing and wiring **added along the way**.
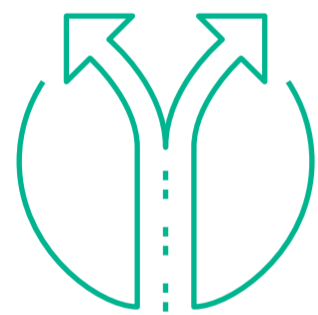
Smart highways

A road is just a road – or is it? Our future highways are set to be more than simple transport corridors. Technologies **under development** include smart lighting that gets brighter when vehicles pass, lanes that use magnetic induction to charge electric cars, and roads paved with solar panels that can melt snow and power the grid. For transportation-heavy construction projects, these advances could revolutionise worker safety and efficiency.

Protective equipment and wearables

According to Safe Work Australia, <u>nearly one in five</u> worker fatalities in Australia in 2016 were in the construction industry, compared with an average of 15 percent in 2007. New advances in personal protective equipment (PPE) may help to reverse this trend, while also improving productivity and efficiency with wearable and VR/AR technology playing a key role.

Smart PPE and wearables

Smart and wearable technologies are entering the PPE market with the promise of improving productivity, safety and cost savings through active prevention of accidents, according to a <u>**March 2016 report**</u> from Frost & Sullivan.
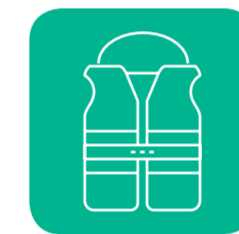
These technologies include 'smart' vests, hard hats, gloves, safety glasses and more – all utilising advanced materials and devices to protect worker safety and gather useful telemetry data. US firm Human Condition is leading this field, having **developed safety clothes** that include:

Impact and motion sensors.	RFID and GPS technology for real-time location information.	Airbag collars for fall protection.	Vital sign monitoring that can alert emergency personnel.

Complementing smart clothing is the latest wave of wearables. Devices such as smart eyewear and smartwatches enable construction staff to take photos, dictate messages, make phone calls and more, without leaving the site or risking safety.

1/5 Nearly 1 in 5 worker fatalities in Australia in 2016 were in the construction industry.

Protective equipment and wearables

VR and AR

Another force reshaping construction is the emergence of virtual reality (VR) and augmented reality (AR). Construction and engineering firm Bechtel **announced in 2016** that it would use VR immersion in its training programs, allowing workers to safely rehearse dangerous tasks. Bentley Systems has **investigated using AR** to help close the mental gap between 2D plans and 3D designs.

VR immersion allows workers to safely rehearse dangerous tasks.
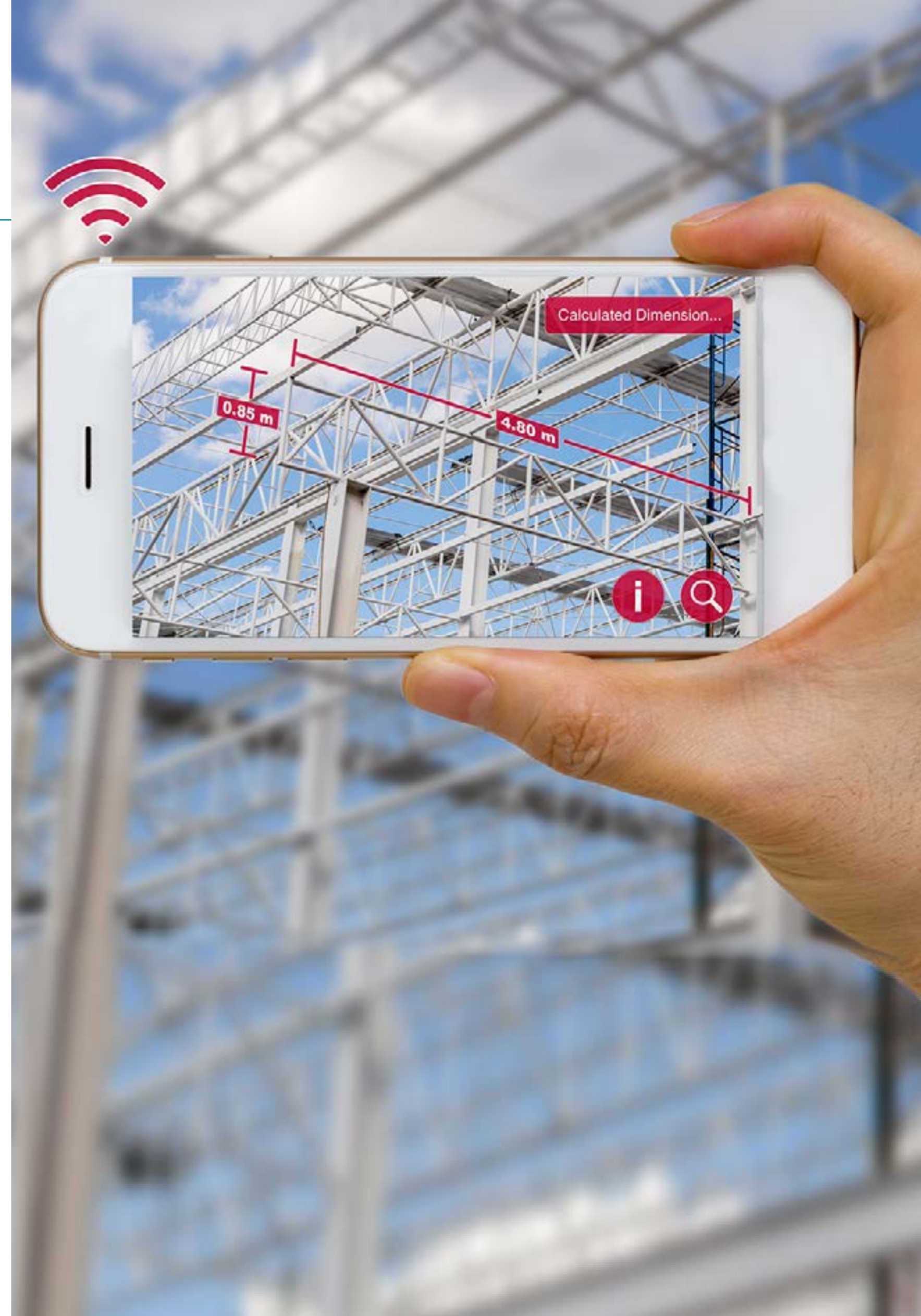
Big data

The construction industry works with huge quantities of information coming from people, computers, digital sensors and other data-generating systems. But until recently, not much of it could be crunched in real-time for the purpose of gaining useful insights. Big data analytics has changed that.

Big data offers benefits for:

Design Design schematics can be considered along with real estate market trends, environmental data, stakeholder discussions, demographic data and more, to better analyse the risks and benefits of going ahead with a construction project.

Construction Data gathered in real-time from weather, traffic, local communities and business activity can help builders better plan their day-to-day construction activities. Historical data can be leveraged for better forecasting, ultimately helping to reduce waste, employee downtime and other costs.

Operations and maintenance Sensors embedded in buildings, bridges and other structures make it possible to gather a wide variety of performance metrics. Energy efficiency could be tracked in an office building, for example, or chemical levels in a factory, with specific thresholds being set to detect any out of bounds events.

Big data

The Internet of Things (IoT, meaning everyday objects embedded with electronics, software, sensors, and network connectivity), and cloud computing will be key enablers of the big data revolution.

For example, wearable devices and smart clothing can display workers' tasks and constantly monitor the environment, helping to improve worker safety and wellbeing, and enhance efficiency. Meanwhile, this technology gathers personal data insights from the wearer – big data.

This vast amount of data gathered by the IoT puts huge pressure on internet infrastructure, but by transferring it to a cloud computing service, companies are able to relieve the pressure on internal servers, access data quickly and securely, and then perform big data analysis to improve the organisation's overall productivity profitability.

By leveraging big data to recognise patterns and trends, construction companies will be more capable of delivering large-scale projects on time and within budget.

The Internet of Things and cloud computing will be key enablers of the big data revolution.

Summary

Many of the tools and technologies presently sending waves through the construction industry are likely to evolve rapidly over the next five to 10 years. **McKinsey expects** that use cases related to field and performance management will be especially dominant, with companies that do not invest in the right tools, at risk of being left behind. Here are some tips on how to stay ahead of the tech curve.

Research: Make a habit of scouring the web and industry publications for articles, videos and breaking news about the latest productivity and construction tools. Seek out use cases similar to your own, but also look to other industries – such as mining and transportation – for potentially useful innovations.

Experiment: There will be no shortage of ways in which you can bring digital transformation to your company without having to spend a bundle. For example, app stores have thousands of productivity apps that are easy to learn and cheap to download. The cost of entry to big data and cloud computing is falling every year. Look for ways to incentivise innovative thinking by your employees that leads to gains in productivity, waste reduction or other key success metrics.

> Seek out use cases similar to your own, but also look to other industries – such as mining and transportation – for potentially useful innovations.

Invest: If there is a tool or technology that you're reasonably confident will give your workforce and company a real advantage in the marketplace, don't hesitate to invest in it. It may help you achieve real market differentiation, along with a competitive edge that no amount of manual effort can replicate. Like all big investments, it's a good idea to trial the new tech on a small project, or within a small organisational department to iron out any issues before rolling it out company-wide.

Sources

https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights/the-new-age-of-engineering-and-construction-technology

https://www.autodesk.com/solutions/bim

https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights/the-new-age-of-engineering-and-construction-technology

https://safetymeetingapp.com/

https://fieldlens.com/

https://www.autodesk.com/solutions/bim

https://www.autodesk.com/redshift/autonomous-vehicle-technology-in-construction/

http://www.komatsu.com.au/AboutKomatsu/Technology/Pages/AHS.aspx

https://www.caterpillar.com/en/company/innovation/customer-solutions/autonomous-operations.html

http://www.volvogroup.com/en-en/news/2016/sep/news-2297091.html

https://www.technologyreview.com/s/540836/new-boss-on-construction-sites-is-a-drone/

https://www.auav.com.au/

http://contourcrafting.com

http://www.digitalinnovation.pwc.com.au/3d-printing-revolutionise-construction/

http://fire.nist.gov/bfrlpubs/build02/PDF/b02105.pdf

https://www.hongkiat.com/blog/smart-road-technologies/

https://www.safeworkaustralia.gov.au/statistics-and-research/statistics/fatalities/fatality-statistics

https://www.reportbuyer.com/product/3714198/wearables-and-smart-technologies-for-industrial-environment-a-ppe-perspective.html

http://blog.prochoice.com.au/personal-protective-equipment/smart-ppe-wearable-tech/

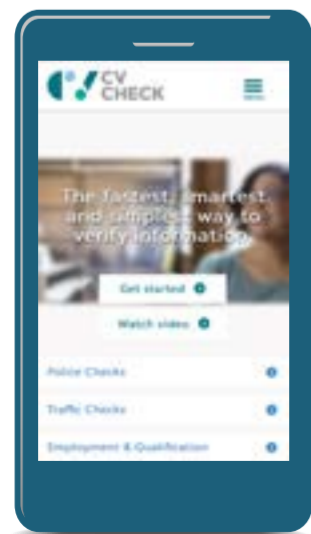https://fieldlens.com/blog/building-better/wearable-technology-on-the-jobsite/

https://www.prnewswire.com/news-releases/human-condition-safety-brings-the-safescan-virtual-reality-training-to-leading-engineering-and-construction-firm-bechtel-300329560.html

https://communities.bentley.com/other/old_site_member_blogs/bentley_employees/b/stephanecotes_blog/posts/using-augmented-reality-tool-for-facilitating-the-interpretation-of-2d-construction-drawings

https://www.thebalance.com/how-the-construction-industry-is-using-big-data-845322

https://ia.acs.org.au/article/2017/Building-IoT--data--predictive-analytics-into-construction.html

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