Innovation Insight
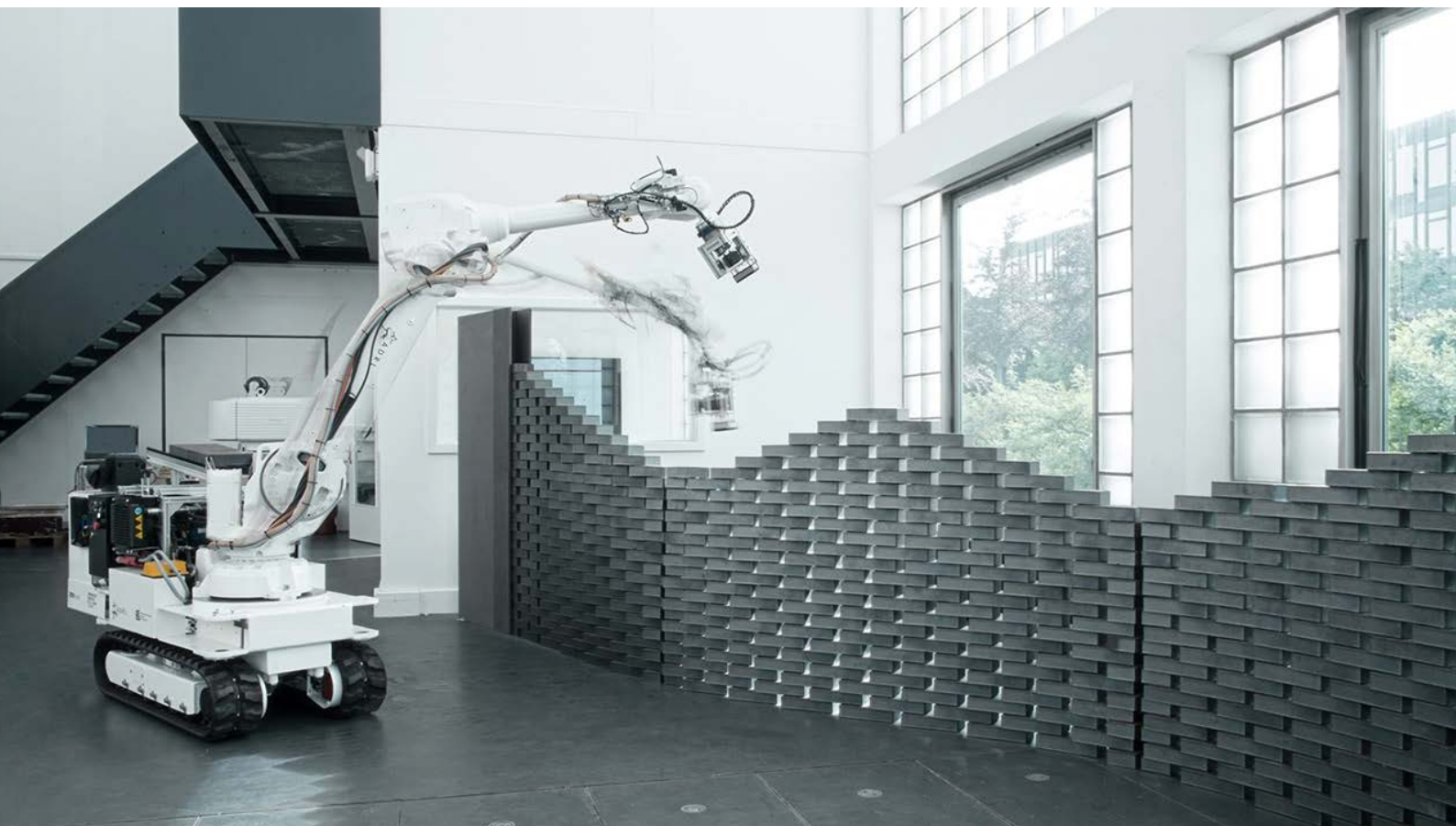
No 8.1/18   October 2018

The impact of emerging technologies on small and medium building contractors

Selected recent trends

The impact of emerging technologies on small and medium building contractors: Selected recent trends (circa October 2018)

This report contains a selected number of references to recent trends and news articles of relevance to small and medium sized building contractors. This report does not contain any comprehensive analysis or interpretation, although this can be included in enhanced reports for clients.

Entries in the report are listed once, even though they may be relevant to different categories. Clicking on the "*[Return comment]*" links will open a pre-formatted email page that enables clients to send comments back to DeltaHedron.

Note

Views in the articles referenced are those of the authors (or as stated in the articles), and are not necessarily supported by DeltaHedron. References are to open source articles, generally excluding peer-reviewed and academic journals. The content of this document is for general information purposes only and should not be used as a substitute for consultation with professional advisors. Reasonable professional care has been taken in collecting and reporting of the information, but the information in the articles has not been independently verified, validated or audited to verify accuracy or completeness. Mention of specific companies, products or brands does not in any way indicate endorsement. None of the vendors were contacted, nor did any contribute financially or otherwise to this report.

This document is intended for and is best viewed electronically when downloaded into a pdf reader on a computer, tablet or smartphone, which enables the hyperlinks to be clicked to gain access to the references and to navigate different sections in the document.

Entries in the report are listed only once, even though they may be relevant to more than one category. The sources cited in this report were active on the date of compilation (October 2018).

Please visit DeltaHedron®'s website at: www.deltahedron.co.uk

DeltaHedron®'s public e-journals can be viewed at:
- Innovation Impact (**bit.ly/Innovation_Impact**)
- Smart Cities Innovation (**bit.ly/Innovation_Smart_Cities**)

Private e-journals for clients can be generated in this format as well as the format of this report.

DeltaHedron®'s *Executive Innovation Insight* is described on our website at:

www.deltahedron.co.uk/executive-innovation-insight/

DeltaHedron®'s publications can be downloaded from:

www.deltahedron.co.uk/publications/

The impact of emerging technologies on small and medium building contractors: Selected recent trends (circa October 2018)

Executive Summary

This report provides references to recent news alerts pertaining to a number of emerging technologies relevant to the construction industry and built environment. Although the individual news alerts are interesting and useful, it is also important to consider their contribution to the bigger picture and to identify broader trends as well as the longer term impact of combinations of interacting technologies. We are searching for 'signals' which can help us to anticipate the future and inform the decisions we need to take now, so that we can be 'future-makers' rather than 'future-takers'.

A number of emerging technologies will continue to have a significant business impact on the construction industry, including on small and medium enterprise (SME) building contractors. Many of these technologies can enable contractors to improve their current services – 'faster, better and cheaper'. However, several emerging technologies also have the potential to significantly disrupt the industry completely by making current processes, tools and equipment obsolete. They will be replaced entirely new technologies, probably utilised by new companies and new types of companies. An understanding and adoption of appropriate emerging technologies can provide competitive advantages for those who adopt and adapt them, but at the same time also business threats to those who don't – either way, they present strategic risks which need to be managed.

3D printing is rapidly being adopted in many industries, including the construction industry. There are numerous reports of buildings, including residential homes, being constructed with 3D printing technology, some of which are completed within days. Concrete is widely used as a printing material ('ink') for these 3D printed structures, although there are also significant advances in the use of other materials, including plastics, metal, ceramics and glass. 3D printing is not only used for new structures, but can also create one-off bespoke pieces that can be used in refurbishments.

The trend in modular off-site manufacturing in the construction industry is growing. This should be read in conjunction with advances in robotics, which are not only being used in the off-site manufacturing plants but also on construction sites. Robots intended for use on building sites include bricklaying robots, robots used for clearing rubble and site scanning. Simultaneously, there is also an increase in the use of drones in the construction industry, including applications in surveying, recording of construction progress, tracking of assets and inspection.

Advances in several building materials have been reported, including concrete and steel. It is interesting to note the trends in 'self-healing' and 'memory' materials. At the same time, a number of news alerts also refer new types of timber products and their use in high-rise buildings in the US and elsewhere.

The trend in smart buildings (including smart homes, smart offices and smart factories) is growing rapidly, alongside a growth in interest in smart cities across the globe. The increasing use of digital tools in the construction industry and built environment, such as Building Information Management (BIM), is fuelling this trend. As in the case of 3D printing, it is important to note that 'smart' features can also be retro-fitted to existing buildings, which opens a significant market. Virtual reality (VR) and augmented reality (AR) complement these technologies and have found many applications in the built environment.

A number of emerging wearable technologies offer benefits to building contractors, including their applications to improve health and safety. The use of exoskeletons, in particular, is an interesting trend to monitor.

Broader environmental trends are impacting significantly on the construction industry. Environmentally friendly, 'green' and energy efficient structures, processes and materials are becoming increasingly important to owners and operators of buildings and facilities. This in turn is spurring interest in environmental certification and renewable energy sources (including those applicable to individual buildings).

Quicklinks

3D printing	**Innovation**
Artificial Intelligence (AI)	**Internet of Things (IoT) and sensors**
Building Information Management (BIM)	**Logistics and procurment**
Construction materials and equipment	**Modular and offsite manufacturing**
Digital disruption	**Robotics and automation**
Drones	**Smart homes and buildings**
	SME support and contractors
Emerging technologies and trends	**Virtual Reality (VR) and Augmented Reality (AR)**
Green technologies and renewable energy	**Wearables**

3D printing   [Back to Quick links]

● **Researchers Evaluate 3D Printability of Different Types of Concrete** (Source: 3D Print, Oct 2018) *[Return comment]*

> To 3D print concrete, several parameters must be met. It must be able to be extruded through a nozzle, hold its shape once deposited, and also be able to hold up under the weight of successive layers.

● **Will 3D printing solve the affordable housing crisis?** (Source: Impact Lab, Oct 2018) *[Return comment]*

> Owning one's own house has been sometimes more, sometimes less affordable. Currently, we're in one of the less affordable phases.

● **3D-printing swarm robots pave the way for new construction possibilities** (Source: Create Digital, Oct 2018) *[Return comment]*

> A new method that allows robots to work concurrently on 3D printing concrete structures could bring on-demand design to construction sites. The method known as 'swarm printing' enables robots to simultaneously 3D print concrete designs not attainable through traditional methods.

● **2 robots in tandem create 3D printed building components** (Source: Construction Dive, 17 Oct 2018) *[Return comment]*

> Scientists at Nanyan Technological University in Singapore have developed two robots that can work in unison to 3D print a concrete structure, according to news release, paving the way for collaborative 3D printing on a larger scale in the future.

● **3D homes that take 24 hours and less than $4,000 to print** (Source: UK Business Insider) *[Return comment]*

● **3D Printhead announces new company dedicated to construction 3D printing** (Source: 3D Print) *[Return comment]*

● **3D Printing in Residential Construction: Today's Potential (**Source: 3D Print) *[Return comment]*

• **Beetle inspired 3D printed cement paste gets stronger when it cracks** (Source: 3Ders) *[Return comment]*

• **Historic Russian fountain restored with concrete 3D printing** (Source: 3D Printing Industry) *[Return comment]*

• **How economically viable is 3D printing concrete for construction?** (Source: 3D Print) *[Return Comment]*

• **Mobile Construction Robot 3D Prints a Temporary Architectural Installation Out of Loose Stones and Twine** (Source: 3D Print) *[Return comment]*

• **New 3D-printed cement paste gets stronger when it cracks** (Source: Science Daily) *[Return comment]*

• **New Method of 3D Printing Concrete Uses Mesh to Create Lightweight Structures** (Source: 3D Print) *[Return comment]*

• **New scrim 3D concrete printing uses mesh to produce lightweight structures** (Source: 3ders) *[Return Comment]*

• **New smart technology for synchronised 3D printing of concrete** (Source: Tech eXplorist) *[Return comment]*

• **Researchers use a team of mobile robots to 3D print large scale structures** (Source: 3ders) *[Return Comment]*

• **Robots collaborate on 3D-printing concrete structures** (Source: New Atlas) *[Return comment]*

• **RSG 3D's building panel is fire, earthquake and hurricane resistant** (Source: CNBC) *[Return Comment]*

• **Smart technology for synchronized 3D printing of concrete** (Source: Science Daily) *[Return comment]*

• **Smart technology for synchronized 3D printing of concrete** (Source: Science Daily) *[Return comment]*

• **Springy and crack-resistant cement created by 3D printing at Purdue** (Source: 3D Printing Industry) *[Return comment]*

• **Study highlights options for reinforcing 3D printed concrete** (Source: 3D Print) *[Return comment]*

• **US Marines 3D print 500 square foot concrete barrack in just 40 hours** (Source: 3ders) *[Return Comment]*

• **Wasp releases modular crane wasp infinity 3D printer for construction** (Source: 3ders) *[Return comment]*

Artificial Intelligence (AI)   [Back to Quick links]

• **5 ways artificial intelligence can make the construction and engineering sector more efficient** (Source: Trend in Tech) *[Return comment]*

• **Artificial intelligence may aid tunnel boring machine operators** (Source: Construction Dive) *[Return comment]*

• **Artificial intelligence, machine learning infuse intelligence in construction** (Source: Constructech) *[Return comment]*

• **Can artificial intelligence change construction?** (Source: Curbed) *[Return comment]*

• **Construction Scheduling: An Infusion of Artificial Intelligence** (Source: Construc Tech) *[Return comment]*

Building Information Management (BIM)   [Back to Quick links]

• **BIM and augmented reality in construction and maintenance** (Source: The BIM Hub) *[Return comment]*

• **BIM data or digital data** (Source: The BIM Hub) *[Return comment]*

• **Greater BIM applicability with Faro's 3D scanning technology** (Source: Faro) *[Return comment]*

• **Unpacking BIM: how contractors can reap the rewards of a digital workflow** (Source: Construction Dive) *[Return comment]*

Construction materials and equipment   [Back to Quick links]

• **Canada finds use for hemp: concrete reinforcement** (Source: Equipment World) *[Return Comment]*

• **Four alternatives to drywall that don't turn to mush** (Source: Tree Hugger) *[Return comment]*

• **How replacing sand with plastic in concrete solves problems** (Source: Equipment World) *[Return comment]*

• **Hybrid foam combines strengths of wood and metal** (Source: New Atlas) *[Return comment]*

• **Polymer coating uses tiny bubbles to cool buildings** (Source: New Atlas) *[Return comment]*

• **Smarter construction tools** (Source: Constructech) *[Return Comment]*

• **Swedish architect planning to build 31 wooden skyscrapers in Stockholm** (Source: UK Business Insider) *[Return comment]*

• **The case for wood instead of concrete** (Source: Big Picture Agriculture) *[Return comment]*

• **This coating could be the end of air conditioning** (Source: World Economic Forum) *[Return comment]*

• **This water gun can cut through concrete** (Source: Impactlab) *[Return comment]*

Digital disruption   [Back to Quick links]

• **App-based technology comes to the construction site** (Source: The Globe and Mail, Oct 2018) *[Return comment]*

> As workers and supervisors head to a worksite these days, they may bring along hammers, drills and wrenches – but they're just as likely to carry smartphones and tablets to get the job done.

• **The Construction Industry Is Finally Embracing Technology** (Source: Fortune, Oct 2018) *[Return comment]*

> At One Dalton, a 61-story luxury residential tower rising over Boston's Back Bay, is a major major construction site: hard-hatted tradespeople in neon vests, the steady din of diesel delivery trucks, a massive hoist moving tools and materials along an unfinished façade.

• **Home app: The ultimate guide** (Source: Imore) *[Return Comment]*

• **Software tool could help architects design efficient buildings** (Source: MIT News) *[Return Comment]*

• **Three ways construction leaders harness digital transformation** (Source: Construction Dive) *[Return comment]*

• **Workers to get site health records on their mobiles** (Source: Construction Enquirer) *[Return comment]*

Drones   [Back to Quick links]

• **Aerial lidar and photogrammetry: Which makes sense for your construction project?** (Source: Expo UAV) *[Return Comment]*

• **Autonomous drones for surveillance** (Source: Drone Below) *[Return Comment]*

• **BHP increases use of drones for inspections** (Source: Australian Mining) *[Return comment]*

• **Disney made a drone that can paint buildings** (Source: Nerdist) *[Return comment]*

• **Drones, smartphones and tablets taking over jobsites** (Source: Construction Dive) *[Return comment]*

• **Honeywell UAV Service Inspects Over 100 Miles of Power Lines in Five Days** (Source: Drone Below) *[Return comment]*

• **How Hensel Phelps maximizes its use of drones** (Source: Construction Dive) *[Return Comment]*

• **How to get an in-house drone programme 'off the ground'** (Source: Construction Dive) *[Return Comment]*

• **Komatsu is digitizing the jobsite with drone technology** (Source: Equipment World) *[Return Comment]*

• **Mud-spraying drones could help build emergency homes** (Source: Dezeen) *[Return comment]*

• **This autonomous spray-painting drone is a 21st-century tagger's dream** (Source: TechCrunch) *[Return comment]*

• **Vtrus launches drones to inspect and protect your warehouses and factories** (Source: TechCrunch) *[Return Comment]*

Emerging technologies and trends   [Back to Quick links]

• **Technological Changes You Will Probably Notice in the Near Future** (Source: The Costa Rica News, 15 Oct 2018) *[Return comment]*

> An analysis describes how emerging technologies and demographic changes will reinvent the daily lives of human beings. The works, the form of consumption and the regulation of the societies are part of what is indicated in an EY study called "Latin American Megatrends: Beyond Disruption".

• **How will new technologies shape the future of the architecture?** (Source: World Architecture) *[Return comment]*

• **The top 10 strategic technology trends for 2019, according to Gartner** (Source: Information Age, Oct 2018) *[Return comment]*

> Blockchain, artificial intelligence, empowered edge, privacy and ethics, quantum computing, immersive experiences, augmented analytics, autonomous things and digital twins drive the Gartner Top 10 Strategic Technology Trends for 2019.

• **The 10 top emerging trends that will shape real estate in 2019** (Source: Curbed, Oct 2018) *[Return comment]*

> The Urban Land Institute found that the only certainty in its outlook for 2019 was uncertainty.

• **Is Construction Ready for Emerging Technologies?** (Source: Construc Tech) *[Return comment]*

• **Small Businesses Need These Emerging Technologies in 2019** (Source: Chatbots Life) *[Return comment]*

• **The 5 biggest innovations in facility management technology** (Source: Facility Executive) *[Return comment]*

• **These are the top 10 emerging technologies of 2018** (Source: World Economic Forum) *[Return comment]*

Green technologies and renewable energy   [Back to Quick links]

• **BCA announces push toward super low energy buildings** (Source: Indesign Live) *[Return Comment]*

• **Green building materials for sustainable investors** (Source: Fortune Builders) *[Return Comment]*

• **How Solar-Powered, Mobile Water Purifiers Can Help Cities Cope With Bad Water** (Source: IEEE Spectrum, 18 Oct 2018) *[Return comment]*

• **New material pulls carbon from the air for self-repair** (Source: New Atlas) *[Return comment]*

• **New tool could diagnose 'sick' solar panels in real-time** (Source: Knowridge) *[Return Comment]*

• **Solar diverters can supply solar hot water from a rooftop array, without adding any extra plumbing** (Source: Clean Technica) *[Return Comment]*

• **Spheres can make concrete leaner, greener** (Source: Science Daily) *[Return comment]*

• **To curb carbon emissions, cities need more efficient buildings** (Source: PSmag) *[Return Comment]*

• **Your top 5 questions to going solar** (Source: Inside Edison) *[Return Comment]*

> When WorldWater and Solar Technologies deploys its mobile water purifiers—arrays of solar panels, batteries, and high-pressure pumps—the machines usually wind up in natural disaster zones, off-grid villages, or military operations around the world.

Innovation   [Back to Quick links]

• **Construction innovation and the technology ecosystem** (Source: McKinsey) *[Return comment]*

• **Investing in the future of construction innovation** (Source: Constructech) *[Return comment]*

Internet of Things (IoT) and sensors   [Back to Quick links]

• **Industrial revolutions: Using IIoT to create profitable efficiencies** (Source: Australian Mining, 14 Oct 2018) *[Return comment]*

> The vast potential of IIoT (Industrial internet of things) is finally giving industrial companies the ability to control their business performance in real time and drive operational profitability improvements, safely and sustainably

• **IoT analytics guide: What to expect from Internet of Things data** (Source: Network World, Oct 2018) *[Return comment]*

> The growth of the Internet of Things (IoT) is having a big impact on lots of areas within enterprise IT, and data analytics is one of them. Companies are gathering huge volumes of information from all kinds of connected of objects, such as data about how consumers are using certain products, the performance of corporate assets and the environmental conditions in which systems operate.

- **Start-up deploys IOT to save precious resources** (Source: IT Web, Oct 2018) *[Return comment]*

    South African start-up company Apex Innovation is making use of the Internet of things (IOT) to resolve the over-consumption of precious resources like water and energy. The Cape Town-based firm was established in 2017 and involved the collaboration of specialists from the water metering industry, the Electronic Engineering Department of Stellenbosch University, IT and business.

- **Four ways to improve your home's security with the Internet of Things (IoT)** (Source: Gemalto) *[Return comment]*

- **Internet of things shaping new facilities management paradigms** (Source: IT News Africa) *[Return comment]*

- **Internet of things technologies pave the road to the context-aware smart home**   (Source: Internet of Things Agenda) *[Return Comment]*

- **Launch party 'Smarter Homes: how technology will change your home life' which is out now** (Source: All the Internet of Things) *[Return comment]*

- **The industrial internet of things is revolutionising industry and construction** (Source: Wired) *[Return Comment]*

- **Sensor Technology: Tracking Occupancy For Improved Space Planning** (Source: Facility Executive, 18 Oct 2018) *[Return comment]*

Logistics and procurement   [Back to Quick links]

- **A smart alternative to construction procurement** (Source: Industry Dive) *[Return comment]*

Modular and offsite manufacturing   [Back to Quick links]

- **5 Modern Prefabs That Can be Installed in Under One Week** (Source: Dwell, Sep 2018) *[Return comment]*

    One of the most intriguing ways of building a new dwelling, prefabricated homes are continually growing in popularity due to their high-quality construction offsite and relatively quick turnaround times.

- **A Network of Prefab Tiny Homes Allows Users to "Pay as You Live"** (Source: Dwell, Sep 2018) *[Return comment]*

    Smart, sustainable, and minimalistic—these "location-independent, pay-as-you-live" prefab tiny homes introduce a new genre of urban living. In an attempt to tackle rising housing prices among heavily congested cities, the team behind Berlin–based Cabin Spacey has created a project known as the Minimal House, which is a network of easily accessible tiny homes across the world.

- **Modern prefab house was constructed in a month** (Source: Curbed, Aug 2018) *[Return comment]*

    A home isn't built in a day, but in this case, it is in a month. Architecture firm Studio Arthur Casas worked with the engineering and construction company SysHaus to design a prefab home in São Paulo, Brazil, that was constructed within a month—28 days to be exact.

- **Advancing prefabrication 2019** (Source: Advancing Prefabrication) *[Return comment]*

- **EIR Healthcare has created first modular hospital room in world** (Source: UK Business Insider) *[Return comment]*

- **Fast prefab homes** (Source: Dwell) *[Return comment]*

- **Low-energy, prefab tiny cabins** (Source: Inhabitat) *[Return Comment]*

• **Modular housing developer strikes TfL deal** (Source: The Construction Index) *[Return comment]*

• **New York's modular building revolution is here** (Source: New York Post) *[Return comment]*

• **Offsite specialist moves into housing** (Source: The Construction Index) *[Return Comment]*

• **Redrow trials modular garages to cut costs** (Source: Construction Enquirer) *[Return Comment]*

• **Will prefabricated homes may fix Argentina's housing crisis?** (Source: Pri) *[Return comment]*

• **Zedpod prefabs to make Dunstable debut** (Source: The Construction Index) *[Return Comment]*

Robotics and automation   [Back to Quick links]

• **Research Team Develops Humanoid Construction Robot** (Source: Engineering, Oct 2018) *[Return comment]*

> Japan's National Institute of Advanced Industrial Science and Technology (AIST) has developed a robot it says is "capable of the same hard work as human being," including construction tasks like hanging drywall.

• **Are developers ready for construction robots?** (Source: Globest) *[Return comment]*

• **Bricklaying robot drastically reducing Nevada project timeline** (Source: Construction Dive) *[Return Comment]*

• **Creating efficiencies in pricing and promotions: Is automation the answer?** (Source: RIS News) *[Return Comment]*

• **Fiberglass-spinning robots could be construction workers of the future** (Source: Science News) *[Return comment]*

• **Hands-free robotic floor care machine with built-in sensors** (Source: Facility Executive, Oct 2018) *[Return comment]*

• **Inside Amazon's fulfillment centre where robots roam** (Source: Thechronicle)

• **Japanese researchers create humanoid bot that installs drywall independently** (Source: Construction Dive) *[Return comment]*

• **Odico's 'factory on the fly' is a pop-up robotic manufacturing unit** (Source: Dezeen) *[Return Comment]*

• **Organizations are eyeing automation, but culture needs to catch up** (Source: CIO Dive) *[Return Comment]*

• **Robot bricklayers to be deployed in Brexit Britain as developers grapple with skills shortage** (Source: Independent) *[Return Comment]*

• **Skyline Robotics Raises $3M To Automate Dangerous Window Cleaning For Skyscrapers** (Source: Forbes) *[Return comment]*

• **These construction robots never need a lunch break** (Source: New York Post) *[Return comment]*

• **Walmart brings autonomous cleaner robot, "Auto-C" to clean floors** (Source: Business Insider) *[Return comment]*

• **Why a robot is MVP on a hoar construction project** (Source: Construction Dive) *[Return Comment]*

• **Worldwide construction robot market will be fiercely competitive by 2024** (Source: Market Watch) *[Return comment]*

Smart home and buildings   [Back to Quick links]

- **Guide to Smart Home Devices and Tech** (Source: Consumer Reports,) *[Return comment]*

    Consumer Reports tests a variety of smart home devices, including smart speakers, smart TVs, wireless security cameras, video doorbells, smart thermostats, and smart locks, with more product categories in the works.

- **New Technologies are Making Pools Become Smart** (Source: Lera, Oct 2018) *[Return comment]*

    New swimming pool technologies and design make pools smart. Some of the most common trends in pools include landscaping, styles, shapes and evolving built-up techniques.

- **Voice controlled windows tint on command** (Source: Construction Enquirer, Oct 2018) *[Return comment]*

    Manufacturer SageGlass said some of its products can now be integrated with voice controlled speaker systems like Alexa. Building occupiers can now control the dynamic glass tint via simple voice commands to optimise daylight and outdoor views while preventing heat gain and glare.

- **8 Innovations in Home Security Technology** (Source: Mykukun) *[Return comment]*

- **A study says kids and security spur people's smart home purchases** (Source: Digital Trends) *[Return Comment]*

- **Best home security systems of 2018** (Source: TechRadar) *[Return comment]*

- **Five smart homes filled with the latest labour saving gadgets** (Source: Daily Mail) *[Return Comment]*

- **For smart home owners, convenience tops privacy concerns** (Source: Triblive) *[Return Comment]*

- **New Ikea report finds that people don't feel at home in their homes** (Source: Fast Company) *[Return comment]*

- **Smart home devices for the ideal connected home** (Source: Inverse) *[Return Comment]*

- **Smart home integration is key to smart TV success** (Source: Broadband TV News) *[Return Comment]*

- **This crazy new system can detect motion anywhere in your home using nothing but Wi-Fi** (Source: BGR) *[Return comment]*

- **This Device Gives Users the Power to Program Their Own Smart Home** (Source: Interesting Engineering) *[Return comment]*

- **Top 5 benefits of installing smart home technology** (Source: RS Websols) *[Return Comment]*

- **Want a smart home? Start with these simple, affordable products** (Source: The Penny Hoarder) *[Return Comment]*

- **What 'smart house' modifications are available as the population lives longer?** (Source: Daily Newsdig) *[Return Comment]*

- **What are the most beneficial smart home devices to own?** (Source: How To Geek) *[Return Comment]*

- **Your Smart Home Is Spying on You. Here's How to Spy Back.** (Source: Gizmodo) *[Return comment]*

SME support and Contractors [Back to Quick links]

- **Checking Your Construction Estimate** (Source: Fine Home Building, Oct 2018) *[Return comment]*

  Having a fast, accurate way of checking your prospect's budget will save you time and money in the long run.

- **Five Important Practices For Construction Entrepreneurs** (Source: Forbes, Oct 2018) *[Return comment]*

  If you work in the construction field, you probably got into the business because of your knowledge and experience in a certain trade. The work usually requires years of training and ample experience working in the field.

- **5 Problems construction businesses will inevitably face** (Source: Strategy Driven) *[Return Comment]*

- **Here's a sure red flag the home contractor you're considering is untrustworthy** (Source: Washington Post) *[Return Comment]*

- **Nailing the estimate** (Source: CD Recycler) *[Return comment]*

- **Seven important pages for your contractor website** (Source: Fine Home Building) *[Return comment]*

- **Survey: 65% construction workers fatigued on the job** (Source: Construction Dive) *[Return comment]*

- **Technical literature for construction products and how to use it in your spec strategy** (Source: Barbour-ABI) *[Return Comment]*

Virtual Reality (VR) and Augmented Reality (AR) [Back to Quick links]

- **Site virtual reality swings London skyscraper planning appeal** (Source: Construction Enquirer, 19 Oct 2018) *[Return comment]*

  London developer LBS Properties has secured planning at appeal for a £230m mixed-use skyscraper. It's the first time architect Make has used virtual reality to help an inspector assess a new development, marking a significant moment for digital construction

- **After successful pilot, Walmart rolls out Virtual Reality (VR) training to 1m associates in US** (Source: CIO Dive) *[Return Comment]*

- **Artificial Reality (AR), Virtual Reality (VR) to drive efficiencies at every building phase** (Source: Construction Dive) *[Return comment]*

- **Augmented and Virtual Reality in Operations: A guide for investment** (Source: CapGemini) *[Return comment]*

- **Contractor trials mixed reality headsets on school site** (Source: Construction Enquirer) *[Return Comment]*

- **Real results from virtual reality: safer jobsites** (Source: Construction Dive) *[Return Comment]*

- **Smart helmet lets you talk to Google Assistant, see directions in Augmented Reality (AR) display** (Source: Mobile Syrup) *[Return comment]*

Wearables [Back to Quick links]

- **Bollé safety launches new tryon range of safety glasses** (Source: Australian Mining) *[Return comment]*

- **Contractor adopts two-way radio helmets** (Source: The Construction Index) *[Return comment]*

• **Light, thin Virtual Reality (VR) gloves put wearers in touch with virtual objects** (Source: New Atlas) *[Return comment]*

• **Mate is made to look out for your shoulders** (Source: New Atlas) *[Return comment]*

• **Nanoforce Touch Sensor Improves Wearable Devices** (Source: R&D Magazine) *[Return comment]*

• **Smart glasses design projects images right into the eye** (Source: New Atlas) *[Return comment]*

• **This wearable exoskeleton helps relieve back and neck stress** (Source: Interesting Engineering) *[Return comment]*

• **Wearables' Return on Investment is in safety and insurance** (Source: Construction Dive) *[Return comment]*

• **Willmott Dixon trials bionic vest to aid manual handling** (Source: The Construction Index) *[Return comment]*

Notes:

A selection of the emerging technologies continuously monitored by DeltaHedron®

Emerging technologies	Applications	Industries
3D Printing and scanning	Asset management	Aerospace
Artificial Intelligence (AI) and	Protection, tracking	Agriculture, food, agritech
Machine Learning	Anti-poaching	Animals, crops, plants, fisheries
Artificial Reality (AR), Virtual Reality (VR)	Cities and communities	Arts and culture
Automotive	Real estate	Built Environment, construction
Autonomous, flying, hybrid	Smart cities	Constructechs, housing
Electric, petrol, diesel, hydrogen, battery	Smart factory	Chemical, biochemical
Basic sciences	Smart home, office	Defence
Astronomy, biology, chemistry, physics	Customer experience	Education
Mathematics, statistics, geology	Consumers, UX	Edtech
Biotechnology	Digital identity, e-privacy	Higher education and schools
Blockchain	Data protection, GDPR	Corporate learning
Cryptocurrencies	Environment	Energy
Bots	Carbon emissions	Engineering
Chatbots	Climate change, conservation	Entertainment, music
Robotics and automation	Water, marine, oceans	Fashion, textiles
Biometrics, voice/facial recognition	Fraud prevention	Financial, banking, investment
Computers and computing	Anti-counterfeiting	e-Payments
Quantum computing	Games, toys	Fintechs, insurtechs
High Performance Computing	Geolocation, mapping	Insurance, actuarial
Memory storage	Navigation, GPS	Health, pharma, cosmetics
Data	Health	ICT
Big data, analytics, business intelligence	Dental	Logistics, procurement
Cybersecurity, data protection	Digital health	Supply chain
Data science	Diseases/medical conditions	Manufacturing
Digital and ICT	Health and safety	Maritime, marine, oceans
Mobile, cloud, wireless, wifi	Hospitals, homecare	Shipping, ports
Software, SaaS, APIs	Mental health, psychology	Media, journalism, publishing
Broadband, wifi, 5G, VOIP	Pharma, medicine	Social media
Drones	ICT	Mining and minerals
Electronics and photonics	Data centres	Philanthropy, CSR
Antennas, radar, lidar, LoRA, sonar	Enterprise systems	Professions
Energy	Internet, online, web	Accounting, Auditing
Batteries, storage, renewables	Phones, tablets, apps	Engineering, Health, Legal
Electric, fossil, oil/gas, nuclear, hydro	Management/governance	Public sector, digital government
Hydrogen, solar, wind	Search Engine Optimisation	Retail
Imaging	Software development	Security and policing
Holograms, photography, video	Telecommunications	Service industries
Internet of Things (IoT)	Legal, IP and patenting	Sport, exercise, leisure
Industriual, sensors, RFID	Maintenance	Telecommunications
Materials	Marketing, branding	Tourism, travel, hospitality
Building, chemicals, bio, graphene, nano	Packaging	Transport, infrastructure
Metals, metallurgy, plastics, self-healing	Workflow	Air travel and airports
Wearables	X-as-a-Service (XaaS)	Public transport, rail, road

Business impact and cross-cutting themes

Trends and future thinking	Risk management	Leadership and management
Digital transformation	Innovation management	Change management
Disruption	Business models/platforms	Decision-making/support
Dynamics of technological change	Corporate culture	Ethics and values
Societies and communities	Incubators/accelerators	National and regional interest
Generational impact	Science and techno parks	Competitiveness
World of work and employment	R&D, technology transfer	Economic impact
Freelance, gig economy	Ventures, startups and	Fourth Industrial Revolution
HR management, recruitment	entrepreneurship	Innovation systems/policy

DeltaHedron Ltd is a UK-based consulting firm with a global reach, specialising in the management of technological innovation. Our focus is on supporting our clients by providing technology intelligence and decision support to assess and manage the strategic business impact, opportunities, risks and threats presented by emerging technologies and the dynamics of technological change.

"A company with an engineering soul, an innovation mindset and a business outlook"