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Contents

2

Foreword

Tech trends, from sensors and analytics to software platforms, could bring a golden age for construction tech, argues Leonard's Julien Villalongue.

5

Introduction: Rebuilding the foundations

The construction industry is a sleeping giant that has been slow to innovate, but the pressure to increase productivity and cut waste requires a new mindset.

11

Chapter I: Building together

Europe's construction sector is a €2tn market ripe for disruption, but unlike other tech domains, startups and large players must work together to succeed.

16

Chapter II: Building the startup ecosystem

Digital collaboration, 3D printing and online marketplaces for materials are popular entry points for startups, but the proliferation of new applications and tools will require integration and shared standards.

22

Chapter III: The sky's the limit

To thrive, startups need to understand the unique challenges of the industry, including risk aversion, low margins and time-management, and pay attention to the underserved SME construction market.

27

Predictions

Our experts look ahead to the future of construction tech, including mass adoption, regulatory tightening and market consolidation.

Construction tech

Construction tech is a Sifted Intelligence report, sponsored by Leonard, the foresight and innovation platform of the VINCI Group. It looks at the trends and startups powering the European building industry, from 3D printing and digital collaboration tools to online materials marketplaces. Through interviews with startups and investors from across the continent, the report identifies the unique challenges facing this sector, including the need to shift to more sustainable models and improve productivity, and the recipes for success for new entrants.

Get in touch

Questions? Feedback?

Would you like to partner with Sifted on the next report into your sector?

Or help us profile your emerging tech hub?

Contact Christopher Sisserian, head of Sifted Intelligence via chris@sifted.eu

Foreword

by Julien Villalongue,
Managing Director, Leonard

The construction sector is no stranger to innovation, and technology is at the heart of many engineering feats of the modern world, from the Chernobyl containment dome to the Burj Khalifa. The industry has also made huge strides in safety, pollution control and environmental impact.

But wider innovation trends means the sector can go much further. The ubiquity and falling costs of drones, robotics, artificial intelligence, sensors and Light Detection and Ranging (LIDAR), combined with innovation in materials science, can help the industry further improve safety, increase productivity and raise its environmental performance. We are now seeing drone and computer vision startups like Vhive enable automated inspection of structures like bridges and cranes. Workflows are becoming digitised and optimised, improving planning and risk assessment via innovators such as Nplan. Even building processes are being automated, as with drywalling robotics from Canvas.

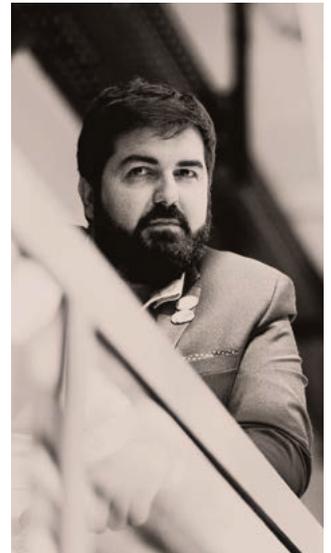
Leonard's objective is to nurture this groundswell of innovation across the construction industry's three key challenges: environment, safety and productivity.

Leonard believes startups are a critical piece of the puzzle. We watch major trends in the business, build innovation roadmaps for the long term,

and experiment with new approaches and technologies. We are also working to build up the ecosystem and construction technology community through our case studies, newsletters and public events.

We now run both internal and external innovation and acceleration programmes, which have delivered over 100 projects in the last four years. This includes the Intrapreneurs programme, which is building a culture of breakthrough innovation within the companies of VINCI; an AI program, through which Leonard supports the realisation of AI projects that help our business units to meet their daily challenges; the SEED programme, which supports early stage startups and helps radical innovators give shape to their projects and prepare them for fundraising; and the CATALYST programme, which offers the most mature innovative companies the best conditions to cooperate with the entities of the VINCI group.

Our vision is to be champions of radical innovation in our companies and our industry, for a productive, safe and environmentally-conscious future for our trade. We are delighted to partner with Sifted on this inaugural Construction Tech report, which looks at the past, present and future of innovation in one of Europe's most important industries.





Leonard:Paris, an open laboratory dedicated to the future of cities and infrastructure located in central Paris

European construction tech startups



/construction tech

Introduction

Rebuilding the foundations



Technology innovators and entrepreneurs across Europe are increasingly eyeing the construction industry as the next frontier for tech opportunity. It helps that construction is a mega market of almost €2tn on the continent alone. But founders — and their investors — aren't attracted only by market size. They're betting on the impact of digital transformation in an industry that has been, so far, a sleeping giant.

Construction accounts for a whopping 9% of the EU's GDP and employs 18m people. It's also one of the least digitalised industries in Europe, with almost stagnant productivity over the past two decades, growing at only 1% — a fraction of the improvement in other traditional industries like manufacturing — according to data from the European Commission.

"The biggest challenges the construction industry faces today are productivity, trash and costs," says Alban Mallet, founder of XtreeE, which uses 3D-printing techniques to produce everything from walls to bridges. "Productivity because it has barely improved over several decades, trash because the construction industry is faced with a pressing need to figure out waste management, and costs because there is major potential for productivity and time gains in this sector."

Key data

€2tn

That's approximately the size of the construction market, given about 9% of the EU's GDP comes from construction.

1%

Productivity gains over the past two decades in the construction industry were slower than in most others, including manufacturing.

374m tonnes

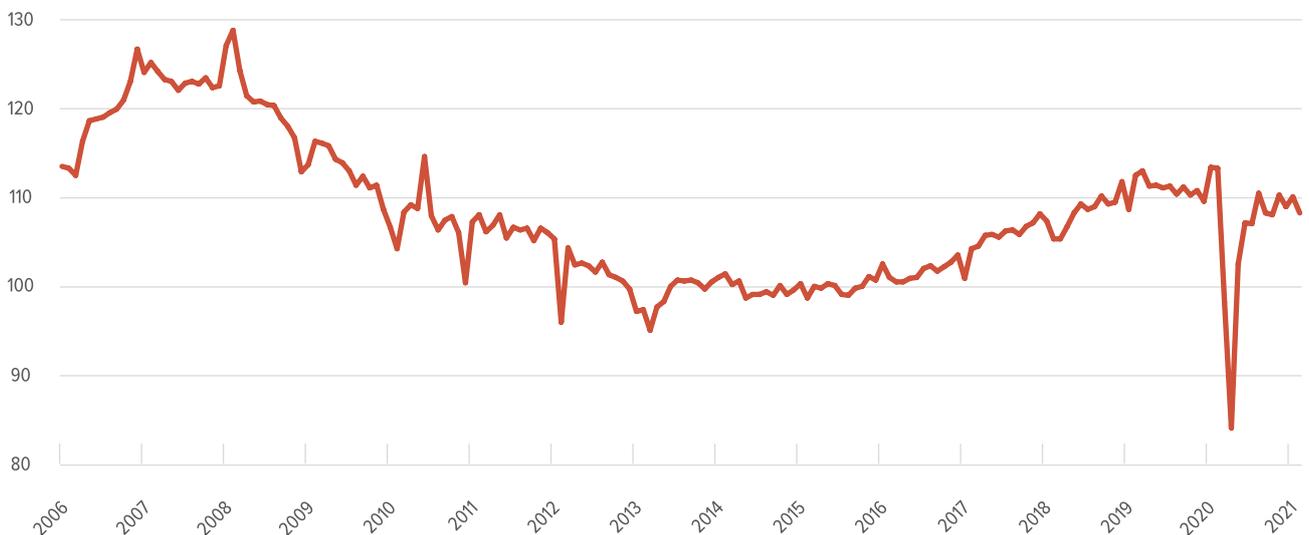
Construction and demolition waste coming from the sector in 2020.

18m people

Construction is a major employer in Europe.

Construction production index for the EU, 2006-2021

Source: Eurostat. This index measures monthly changes in the price adjusted output of construction. Note, the UK is included in the EU data until Feb 2020, when they diverge.



There is huge waste and inefficiency on today's construction sites that software, data and devices are well-suited to eliminate.

French startup Hiboo, which provides a platform to help companies manage heavy equipment, trucks and vehicles, found that across 15,000 pieces of equipment that it tracks, there is on average a 40% rate of 'idling', meaning engines are on but the equipment is not being used.

"That's a huge amount of time spent doing nothing," says Charles Bénard, Hiboo's cofounder. "At the end of the year if you take a fleet of 50, it's a million dollars saved and hundreds of tons of CO₂ avoided."

Despite a growing toolbox of gadgets, from virtual reality headsets and connected devices to high-tech tablets, the reality at most building sites is that pens and clipboards are still the most popular tools of the trade.

“With Covid-19 serving as an accelerator, startups are spotting opportunities to become vectors of change.”

"There's a lot of comms about sensors, the internet of things, data and all sorts of modern gadgets being deployed in the construction space," says Emeric Mourot, a French entrepreneur who cofounded My Digital Buildings, which makes 'digital twins' of construction sites for virtual viewings and data capture. "The reality is that this tech concerns only a small percentage of the overall market."

Like Mourot, entrepreneurs across Europe are out to change that.

With Covid-19 serving as an accelerator, startups are spotting opportunities to become vectors of change, addressing long-standing sector woes from squeezed profit margins to massive amounts of waste — estimated at 374m tonnes last year alone.

Startups are now coming up with dedicated innovations to address the challenges facing the sector's well-

The big names in construction

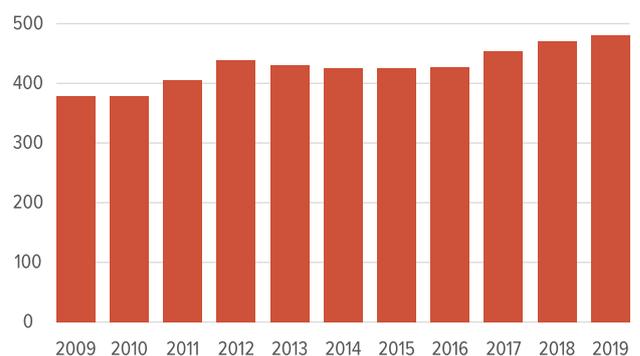
Europe's top five construction companies by revenue.

Source: CE-100 League Table 2020. Note, financial results are from 2019.



Total revenue (€bn) of Europe's top 100 construction companies, 2009-2019

Source: CE-100 league table



established leaders, including France’s VINCI, Spain’s ACS and Sweden’s Skanska.

“The construction space is definitely going through its digital transformation, but it’s a conservative world. It’s a step by step process.”

Data analysis by Fundamental, a construction tech investor, indicates a sector poised for massive growth.

The firm compared venture funding in construction tech relative to other business-to-business (B2B) and business-to-consumer (B2C) markets. They found it takes each sector two to four years to move from \$5 billion to \$10 billion of investment and then another two to three years to move from \$10 billion to \$50 billion.

“Construction just crossed the \$10 billion mark and it took 3.5 years,” says Patric Hellermann, general partner at Fundamental. “That’s one of the macro indicators that shows us that in the next two to three years construction tech will break out to reach \$50 billion or more. We think it’s the most exciting sector to be in alongside healthtech and pharma tech”.

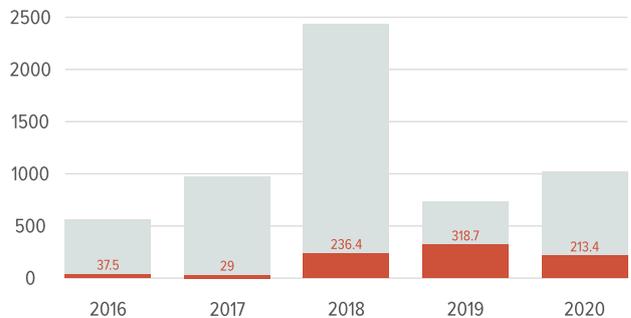
But innovation timelines look very different in construction compared to faster-moving sectors like consumer tech. “The construction space is definitely going through its digital transformation, but it’s a conservative world. It’s a step by step process,” says Mourot. “It’s still a relatively new trend and when you think about it, it makes sense: the digital world is, in essence, dematerialised. So, there’s bound to be friction when you bring digital into an industry like construction, which is all about the physical, the material.”

But the industry has to change. Operational profitability is often 5% at best among Europe’s construction giants. That leaves little room for error when experimenting with new technology and limits budgets for innovation

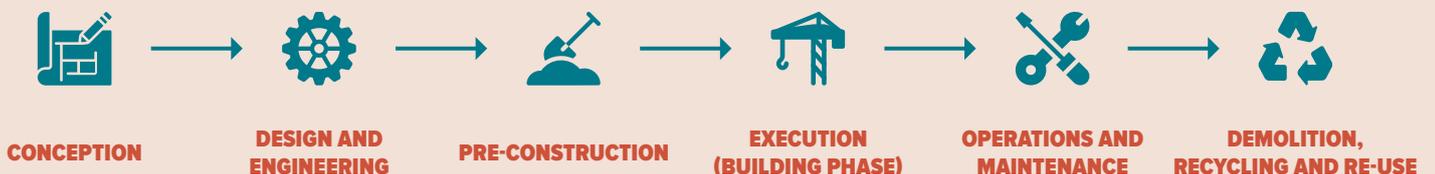
Investment (€m) into construction tech startups, 2016-2020

● EUROPE ● GLOBAL

Source: Europeanstartups.co / Dealroom.co, CB Insights



The construction value chain



upgrades. At the same time, it shows exactly why companies must use technology to figure out how to do more with less.

Conservatism is also a product of the market's fragmentation, with many different players involved at any given phase of a project's life, from architects to contractors, developers and suppliers. This makes for messy coordination and communication mishaps, leading to reworks, delays and unforeseen costs. This serves as both a starting point for innovation, and a barrier to uptake.

SLEEPING GIANT'S WAKE UP CALL

Covid-19 might be the shock the industry needs. Construction sites around the world emptied out due to lockdowns and the economic slowdown. With the path to recovery still uncertain, both for the sector and the broader economy, improving productivity is key to companies' resilience.

“The well-established players are becoming very active in making innovation happen.”

Last year, McKinsey listed Covid-19 as a major accelerator for the transformation of the construction industry and predicted that the sector will look radically different in five to ten years. According to a survey by construction software maker Procore, 66% of construction companies polled in the UK adopted a new technology during lockdown, with 94% reporting operational improvements as a consequence.

“It's like an old dinosaur that is finally ready to move,” says Lucile Hamon, the founder of construction tech startup Backacia, a marketplace for offloading unsold materials based at startup campus Station F in Paris. “The well-established players are becoming very active in making innovation happen, and that's visible in the kinds of conversations that we, as startup founders, are now having with executives at the big corporates.”

Recent raises

PLANRADAR: software for digital documentation and communication in construction and real estate projects.

Austria • 2020 • Raised €30m • Series A

BUILDOTS: data driven project management software.

UK/Israel • 2020 • Raised \$13m • Series A

SCHÜTTFLIX: construction site management tooling.

Germany • 2020 • Raised €8m • Series A

ALASCO: an online platform for digitising construction planning workflow.

Germany • 2020 • Raised €7.5m • Series A

ECOCEM MATERIALS: next generation cements.

Ireland • 2021 • Raised €24.5m • Late VC

PLANET SMART CITY: creating better smart cities.

UK • 2020 • Raised €24m • Late VC



IMAGE: PlanRadar

A year ago, Vienna-based venture capital fund Speedinvest interviewed executives from leading construction companies and reached the same conclusion: change is in the air, and the corporates are ready for it.

“Construction has always been a part of our strategy, but over the past year there’s been an acceleration,” says Andreas Schwarzenbrunner, an associate partner at Speedinvest and the author of the analysis published last June. “Covid has been a factor for acceleration of digitalisation in this space.”

“There’s a shift in mindset to use more digital tools and work with startups in what’s really a super inefficient and low margin business.”

Last year, Speedinvest invested in Germany’s Schütfflix, a digital marketplace for bulk construction supplies such as sand, crushed rock and gravel. It has also bought a stake in CorruX, another German startup, which makes

software that uses data and artificial intelligence to better exploit heavy machinery and construction operations more broadly.

Covid-19 is not the only catalyst. Legislative pressure to go green, the need to swap tedious paperwork for more efficient digital alternatives and the potential for technology to produce virtual models of construction sites and buildings and gather data are all fuelling change.

The pressure on margins makes modular construction approaches a popular way to cut costs quickly. Instead of making everything from scratch on a work site, builders can produce standardised components in an off-site factory, to be later assembled on-site. Startups are tapping into that trend by using new materials and digital tools to improve the manufacturing, aesthetics and logistics of pieces built in the workshop.

“There’s a shift in mindset to use more digital tools and work with startups in what’s really a super inefficient and low margin business,” says investor Schwarzenbrunner. “Corporates — the big players in this space — are driving the change. Meanwhile, we see more and more interesting startups popping up.”



IMAGE: Schütfflix

Chapter I

Building together

Move fast and break things is not a winning mantra in the construction industry, where regulations, costs and timelines cannot be compromised. As a result, innovation dynamics are more collaborative than other sectors, with startups working with the industry to tackle its problems from the inside out.



Unlike sectors like banking, where startups are often pitched as rivals to banks, in construction they see their role as helping the giants step out of their comfort zone and try new things, even when the incumbents lack big innovation budgets or much room for error in operations that are already complex to coordinate.

Entrepreneurs aren't taking on big corporations — and disruption isn't their mantra. Working hand-in-hand with well-established players is key in a sector that is hard to get into and even harder to scale in, according to the entrepreneurs.

"Construction is all about partnerships and working with the existing players — it's a heavy industry that is bound to change at a slower pace," says XtreeE's Mallet. "We don't want to be disruptive. We want to accompany the sector towards the digital revolution, even if we know it will likely be a soft transition to get there."

"These are clients who are working on very short cycles, under immense pressure to deliver results within set calendars," he adds. "For innovation to happen, it needs to deliver results really fast, and not disrupt everything else around it."

“We want to accompany the sector towards the digital revolution.”

Gonzalo Galindo, chief executive of Madrid-based CEMEX Ventures, the venture capital arm of Cemex, says the operational challenges are especially acute for contractors who have "very slim margins. If you're on a job and you need to deliver certain assets or a certain amount at a certain due date, and you want to test something which might work or not, you don't want to play games."

PAST MISTAKES

Before turning to digital solutions, the construction giants experimented with other strategies in recent decades. Many were aimed at addressing workforce



shortages. Most sought to alleviate the pressures that already existed on their business models.

Quick deliveries and easy-to-deploy projects often found favour, especially in a healthy market where high demand encouraged companies to quickly deliver contracts before the next market downturn. That sometimes led them to cut corners.

Administrative errors were one consequence. Paper documents went missing years into a building's life and often weren't properly detailed and compiled in the first place, which plagued the industry for decades and will have people sweating for years to come, according to construction tech founder Emeric Mourot.

"The trend has been that owners don't know their buildings well at all," says Mourot, whose startup My Digital Buildings makes digital maps of construction sites and finished buildings, using technology to address the paper trail problems of the past. "During building works, that can lead to misunderstandings, mistakes that mean redoing parts of the construction — just more costs and delays. And once a building is done, sometimes it means having to tear a wall apart to fix some pipes, in the absence of a proper record of the layers built into the walls."

Quality suffers too, says Ieva Sibilla Strupule, chief executive and founder of Oslo-based Material Mapper, which aims to maximise durability and quality within cost constraints by making reusable materials more easily accessible through mapping out where to source them.

Where are the female founders?

“Recruiting women is a huge challenge for our sector,” says Alban Mallet, cofounder of XtreeE. “99% of the resumes we get are from men.”

In France, industry group FFB (Fédération Française du Bâtiment) estimates the proportion of women across the construction industry at about 12%. It was 13% in the UK in 2019, according to the Chartered Institute of Building.

Gender diversity in the construction industry

● WOMEN ● MEN

Source: FFB and Chartered Institute of Building



Associations including Les SouterReines are working to encourage more female candidates and startup founders in construction. The fact there are so few female entrepreneurs can be an advantage, says Lucile Hamon, the founder of Backacia. “When you show up to a meeting and you’re a woman under 30, there’s definitely that surprise effect,” she says. “It can end up being a great way to gain visibility and attention from potential customers.”

Other notable construction tech startups created by female founders include Norway’s Material Mapper, Germany’s CorruX, UK’s Qualis Flow and France’s Valomat.

“In previous years, it’s been more about making a quick profit and just erecting a building as fast as possible,” she says. As a result, “around Norway, for instance, buildings that are 30 years old, which is not a lot, they’re just being torn down”. The quality of materials used for buildings has been falling, Strupule argues. “[Now] developers have come to a realisation that the lifecycle of this building has reached its potential and the materials used are really poor quality, so it’s just easier to tear the buildings down and to build something new with better materials.”

Design was also often held back at the basics. XtreeE founder Mallet says this has been frustrating for architects, whose most innovative ideas were doomed to remain on the drawing board.

“People used to conceive these amazingly innovative things and then pull back once the time came to execute in real life. We were drawing these amazing things that architects dream of, but when it came to making them real, actually building these innovative structures was impossible or just so outrageously expensive that it was out of question,” Mallet recalls. “We wanted to come up with new techniques to make our architectural vision possible in real life too — that’s what motivated us to launch XtreeE in the end. Technology brings a new freedom to the construction space.”

GREENING BUILDING

The construction industry faces a tough road to achieving sustainability. The industry is responsible for generating 39% of energy-related global carbon emissions. In 2020 alone, 374m tonnes of construction and demolition waste was created. To put that in perspective, that’s 37k times the weight of the Eiffel Tower. It’s also been a focus for European policymakers in recent months.

37,000x

The Eiffel Tower compared to the weight of construction waste created in 2020 by EU countries.



“The construction sector contributes around 40% of emissions in the EU alone,” says Shiva Dustdar, head of the Innovation Finance Advisory Division at the European Investment Bank (EIB). “It’s a high-emission segment and that includes everything around construction, from housing to equipment and materials.”

With construction companies under pressure to respond to legislative changes, government green targets and rising sustainability expectations in society more broadly, they are starting to commit to mitigation and adaptation roadmaps. The adoption of digital solutions has focused on energy efficiency applications, in part as a response to stricter carbon footprint targets.

“If Europe wants to meet its climate targets, and not just Europe but the world, we need to really tackle construction in a systematic way — take a system’s approach,” she says. “This is where new technologies and digital solutions that enable circular business models will play a key role.”

The EU’s strategy is to develop a regulatory framework that strikes the right balance between incentivising clean solutions and penalising polluting practices, she says, adding that when the EIB comes across a company with a promising digital solution for the construction sector, the organisation makes introductions to governments like Luxembourg that are actively trying

to attract these companies to support the industry. “This is where EIB advisory not only helps companies with their financing but also raises their profile. We bring everyone together to accelerate the development of the ecosystem,” she says.

“If Europe wants to meet its climate targets, we need to really tackle construction in a systematic way.”

INCENTIVE FOR CHANGE

For a long time, low industry margins have been an excuse for construction majors to skip on investing in innovation, which explains part of the productivity lag.

“The thinking was often: we don’t have any money so we’re not going to invest. But more and more you could also say margins are low, you can’t afford not to invest and improve,” says Schwarzenbrunner of VC firm Speedinvest. “One construction boss said to me once: ‘we’re like the circus, we move from town to town and start from scratch every time, again and again.’ It’s a hugely inefficient space, and by working with new digital tools you can improve the bottom line a lot.”

Entrepreneurs say tapping into the urgency of boosting the business model is the best way to win new clients because it’s at the core of what the construction majors care about in the current economic context.

“In the construction space, no one is going to invest in ‘nice to have’ technology. It’s all about the magical duo: costs and delays,” says Backacia’s Hamon. “We’re tapping into this trend, and we have no trouble getting budgets and new contracts.”

“Construction giants don’t have money to throw out the window; innovation and tech need to prove their usefulness quickly, and startups need to prove they’re not going to stop the usual flow of work from taking place,” says XtreeE’s Mallet. “One or two years max is the time that an experimentation can go before the plug is pulled.”



IMAGE: Celloz

What it takes to become a construction tech entrepreneur

“To be able to succeed in this space you need to speak the language,” says Speedinvest’s Schwarzenbrunner. “It’s a complicated universe to figure out if you’ve had no experience in it. The way a construction site works, how people communicate — it’s a different world.”

Schwarzenbrunner’s warning to entrepreneurs is echoed by many founders, who highlight the obstacles that stand in the way of outside talent that wants to come into construction tech without any previous experience.

“You have to realise construction is one of these closed worlds: suppliers, builders... everyone knows each other along the value chain,” says XtreeE cofounder Alban Mallet. “It’s a closed world with small margins. As a startup you have to find a way in — part of that is being close to the construction industry to understand how this world works.”

“You definitely need to be familiar with the codes and vocabulary specific to the construction sector to be an entrepreneur in this space,” says Emeric Mourot, who cofounded his startup, My Digital Buildings, with associates including a business school graduate who spent more than a decade in the construction industry, and a civil engineer. His own background is in imaging. “These different expertises, put together with the technical baggage on 3D mapping, is the secret sauce for us. We know how to talk to the construction industry as well as the digital world.”

Even so, some do make it in without a construction background.

Backacia founder Lucile Hamon says she studied at a business school and worked for a couple of years at a waste management company; she didn’t have any experience in construction when she created her company.

“There are a lot of interesting projects coming out of startup studios, but also entrepreneurs who have years



IMAGE: Capmo

of experience in construction and who are launching really innovative solutions,” she says. “It’s a very small world. Everyone knows each other.”

“It’s so much more complicated for someone with no background in this sector to make it,” she says. “It’s a world where networking is crucial. So, I would say even more than being a construction expert, networking and reputation are the key.”

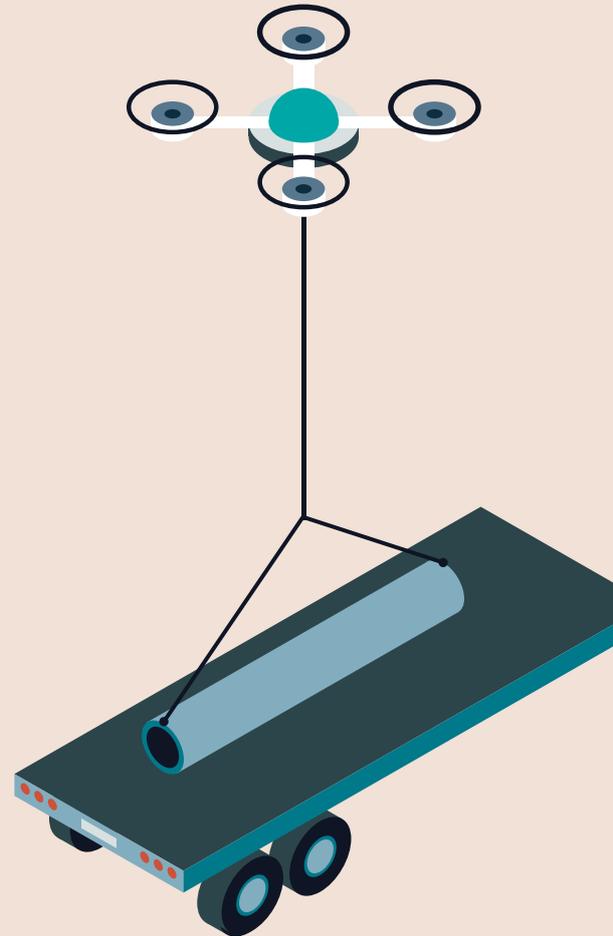
To make up for what she calls the “disadvantage” of not having a construction background, she has surrounded herself at Backacia with experts from the industry. That’s an investment worth making for any startup in this space, she adds.

“The value chain is so complex to understand and the smallest mistake can be fatal for a startup,” she says. “If you don’t want to end up blacklisted, you have to figure out the codes, fast.”

Chapter II

Building the startup ecosystem

Construction has high entry barriers; startups are making inroads in software-driven domains including digital collaboration tools, 3D vision and printing, online marketplaces for materials, and sensors and data analytics for smart buildings. But the proliferation of new technology will require integration layers and shared standards.



Construction players cannot go it alone; they need startups to help them. “Historically, large companies were driving innovation in the construction sector. For the past couple of years, that has changed,” says Backacia’s Lucile Hamon. “It’s now startups and entrepreneurs who are changing the game, bringing technology into an un-digitalised industry with backing from the well-established players.”

Schwarzenbrunner at VC firm Speedinvest identifies three segments with the most startup potential. One is the planning phase. “There’s room for efficiency gains around more collaboration using digital tools,” says Schwarzenbrunner. “Acceptance is still low in a lot of cases, but it does allow collaboration between the different parties: the architects, real estate owners and everyone else. There are a lot of efficiency gains potentially in this part of the value chain.”

Then comes the building phase. “There’s potential to be more efficient on steps like buying materials — buying the right quantity at the best price and avoiding waste, for instance — as well as connecting machines for monitoring and maintenance,” he says.

“There’s room for efficiency gains around more collaboration using digital tools.”

The third area that Speedinvest is exploring investments in is the management of a building once it is finished and delivered. In the future, using sensors to connect parts of the building and gather data on performance, including energy consumption, will become the norm. “It’s a sustainability topic and part of the emergence of more intelligent buildings,” says Schwarzenbrunner.

Startups are bringing digital solutions to construction sites, where workers are often still using pen and paper. “The field where most of the startups are already working is not the physical stuff around construction tech, it’s really the digitalisation of complex processes involving various stakeholders — project management

Construction tech startups worth knowing

Sustainable materials

Provide environmentally friendly materials for construction — for example, from recycled or natural materials.

→ **COMBO SOLUTIONS, RICEHOUSE, LICK, NANOGENCE, CELLOZ, SUSTONABLE, SYSTEM 3E**

Modular construction

Develop building concepts based on modular components produced in off-site factories and assembled on-site.

→ **NOVITO, BRETTE HAUS, MODULOUS**

Online marketplaces

Connect construction companies with third parties offering various services.

→ **WARMANGO, BOBTRADE, DOOZER, RELOK**

Project management software

Simplify construction project administration by focusing, for example, on safety, site supervision, budgeting or a combination.

→ **HIBOO, AOS, VOYAGE CONTROL, VIIBEE, FIELDLY, BUILDSAFE, MYAEDES, SMARTBEAM, BULLDOZAIR, PLANRADAR, REINVENT, CAPMO, ALASCO**

Building information management

Facilitates collaboration between construction stakeholders by generating 3D building models.

→ **INFOGRID, BIMSPOT, WIZZCAD, 3D REPO, XYZ REALITY**

Data analytics

Generate insights about construction projects based on either historical or project-specific data.

→ **CONVERGE, SPACEMAKER, AI CLEARING, CONTILIO, QUALIS FLOW, NPLAN, APRAO**

on the construction site, digitalising audits and analogue processes around health and safety," says Mathias Bosse, senior investment manager at seed + speed Ventures. "It's the process and project management aspect of construction tech that is being digitised."

Last December, Bosse and his colleagues identified 136 European construction tech startups with combined funding of almost \$250m. Almost two-thirds work on collaboration technologies, while just six focus on new materials. "Materials are an opportunity for sure, especially when it comes to sustainability," says Bosse; however, from an early-stage venture investment perspective, he says that they shy away from those areas because of the large amount of money and time involved. "[Also] it's not an immediate opportunity because it takes so long to get such business[es] up and running, including the necessary certifications."

MARKET-MAKERS

Some view the 'marketplace' model — tech platforms that more efficiently connect buyers and sellers — as a good entry point into construction tech. "It's the easiest space to disrupt," argues Schwarzenbrunner. Material Mapper, for instance, maps out buildings that are being demolished and connects the sites with developers who want to tap reusable materials, while Backacia lets sellers of surplus or deconstructed materials find buyers.

Lucile Hamon, Backacia's founder, says building a construction tech marketplace isn't simple. "Maybe it was true a year or two ago that marketplaces were the low-hanging fruit because it's a more agile model that needs little capex, and we do sign deals maybe more easily than other more tech-heavy startups in construction," she says. "But the other side of that is you need mega volumes."

While marketplaces help large, well-established companies save money without spending much on implementation, there are questions about profitability and scalability.

"We're faster at deploying than our customers are at adopting our solutions," says Hamon. "So, beyond the easy-to-get first few contracts, it's not so easy for startups to plough their way into a significant on-the-ground scale." Construction is also a very regional, localised sector, she says: "Every time you go into a new market you have to rethink everything. Adapting a product to a new market requires a huge amount of work — more so than in other industries."

Backacia

GROUND ZERO: The company was set up in 2016

FOUNDERS: One of the sector's few female founders

DREAM TEAM: Founder trained at business school

VISION: A marketplace to offload unsold stocks of materials

GAME CHANGER: Reselling unsold materials means cost savings as well as less waste, in a sector that generates way too much of it already

3D VISION

Tablets, smartphones and digital devices are all bringing 3D insight and computing power to construction sites. "The game changer has been mobility in computing," says David Mitchell, chief executive of UK-based construction tech startup XYZ Reality, which he cofounded in 2017. "I remember seven years ago, I was carrying a suitcase around London with a laptop powerful enough to run a 3D model on."

Like many industry innovators, Mitchell comes from a construction background. "My father was a builder, I learned to walk on a building site," he says. Mitchell worked his way up through the ranks, eventually transitioning into commercial scale construction, with a stint as an architect. Now, he's trying to take the



IMAGE: XYZ Reality

technology one step further by bringing Augmented Reality (AR) to building sites.

XYZ Reality created an AR helmet that projects detailed 3D building schematics in front of your eyes, allowing object positioning to a 5mm accuracy on site.

The company believes that it can help save up to 10% of costs on building projects, incurred as a result of errors introduced between architectural sketches and the finished building. "2D drawings are not a natural language for humans," says Mitchell. "Even when I was an architect and I produced my own drawings, quite often I misinterpret[ed] my own drawings." In June 2021, the company announced a £20m Series A round.

Portable technologies can play a productive role in an industry where few people work in a static location. "It's only been possible to have really frictionless communication and collaboration software usage since cloud technology existed," says Florian Biller, cofounder and chief executive of Capmo, a German startup founded in 2018 that is digitalising the entire construction process to improve on-site collaboration.

Biller believes the moment is right for software-as-a-service (SaaS) startups, with established software players struggling to serve the construction industry because they write software for computers — for CAD (Computer-Aided Design) — whereas more and more of construction is done on smaller digital devices.

“It’s only been possible to have frictionless collaboration software usage since cloud technology existed.”

HOLLOW WALLS AND ARTIFICIAL REEFS

One of the benefits of today's technology, especially 3D printing, is that startups can deliver value across a diverse range of project phases. French startup XtreeE is using 3D-printing technology to help reduce costs, probably the biggest concern among industry giants



IMAGE: XtreeE

today. By bringing new technology-backed building methods, 3D-printing can help cut back on the amount of materials used.

"With 3D-printing, we can make hollow walls, which is something even the most skilled human can't make," says cofounder Alban Mallet. "We can spend less on foundations for the same result because our buildings are lighter."

So far, the startup has 3D-printed parts of houses in the French city of Rennes (about half the house is printed and the other half is built using more traditional methods). "We print all the pieces where it adds value or cuts costs to print. The rest is done the traditional way," says Mallet.

The company has also done bulkier projects, like a concrete reservoir as part of a sewage system in the city of Lille. There, the virtual modelling and printing in XtreeE's workshop cut the usual three-week-plus delay to only a few days. There's also been artificial reefs constructed near Marseille, and green telecom towers built to grow plants, as well as ongoing plans to 3D-print a new bridge in Paris in time for the 2024 Olympic Games.

XtreeE

GROUND ZERO: The company was set up in 2015

FOUNDERS: There are 14 of them, but only five are still involved today

DREAM TEAM: The cofounders trained as architects and engineers

VISION: 3D printing in construction

GAME CHANGER: They're working on a 3D-printed bridge in Paris in time for the 2024 Olympics

That bridge, a collaboration involving several partners, including cement giant LafargeHolcim and construction group VINCI, is also based on XtreeE's hollow designs. The pieces are 3D-printed at the startup's workshop and wired together on-site, resulting in a more resistant structure that's faster to build and uses fewer materials, says Mallet.

"We've cut back on the carbon footprint and it makes economic sense," he says. The bridge, which will be about 40 metres long, is made up of 30 pieces, with XtreeE having a printing capacity of roughly a piece a day.

“We've cut back on the carbon footprint and it makes economic sense”

INTEGRATION LAYER

One emerging challenge in the construction sector is the growing number of players involved along the value chain, and everyone needs to constantly be on the same page, says Emeric Mourot, cofounder of French startup My Digital Buildings. "If one person along the chain gets the wrong information, or outdated data, it can push deadlines back several weeks and bloat budgets with extra costs," he adds.

Yet there are few standard technologies that everyone agrees on. "It's like the alarm system company is coming in with its own sensors and the smart heating folks are installing another set of sensors and proprietary software on top of that," says Mourot. "We're trying to integrate it all together."

My Digital Buildings creates 3D maps of construction sites and buildings using technology such as dynamic lasers and drones to gather precise measurements. The result is a kind of 'Google Street View' that lets users take a virtual walk around a building site at various stages of a construction project, a digital twin that is easy to use for everyone involved, from the architects to the builders on-site.

After running pilot projects with construction giants like VINCI and Eiffage, My Digital Buildings has been approached by several investors in recent months, and is weighing up a potential raise in 2022. So far, it has been financed with its own money, along with loans and backing from France's state investor Bpifrance.

My Digital Buildings

GROUND ZERO: The company was founded two years ago

FOUNDERS: There are four cofounders

DREAM TEAM: The cofounders include a business school graduate, a civil engineer and a visual imagery engineer

VISION: Google Street View for construction sites and building interiors

GAME CHANGER: Can map up to 10,000m² in a single day



IMAGE: My Digital Buildings

MATERIALS MATTER

While many early movers focus on digitalising construction site operations, others see opportunities in revamping the market for materials.

“We are trying to accelerate the transition to sustainable buildings, and I think this is very connected to the current climate crisis we’re living in,” says Jose Ojeda, cofounder and chief operations officer at Spanish construction tech startup 011h, which is focused on building high-tech, wooden “smart buildings” that are carbon neutral to produce and consume less energy once built.

Founded in 2020, 011h is also moving much of the construction process into factories, with elements delivered to the construction site for assembly. This streamlines processes, improves quality control and reduces errors.

The company, which raised an €8m seed round in December 2020, started construction on its first project, consisting of eight dwellings, in May of this year. “It’s our first project where we’re going to put everything to work in terms of the building system that we’ve been developing and the technology,” says Ojeda. The company is hoping to scale up the size of the projects very quickly and reach projects of 75 to 100 dwellings by 2022.

Others are exploring ways to reuse more materials. “It’s the right time and place because finally there is a huge focus on construction and sustainability, all things greentech and the circular economy,” says Ieva Sibilla Strupule, chief executive and cofounder of Oslo-based Material Mapper, a startup launched last year to facilitate the re-use of building materials from demolition sites.

“Finally there is a huge focus on construction and sustainability.”

The startup, backed by the Oslo municipality, has created an interactive map that shows all of the buildings set to be torn down in Oslo over the next

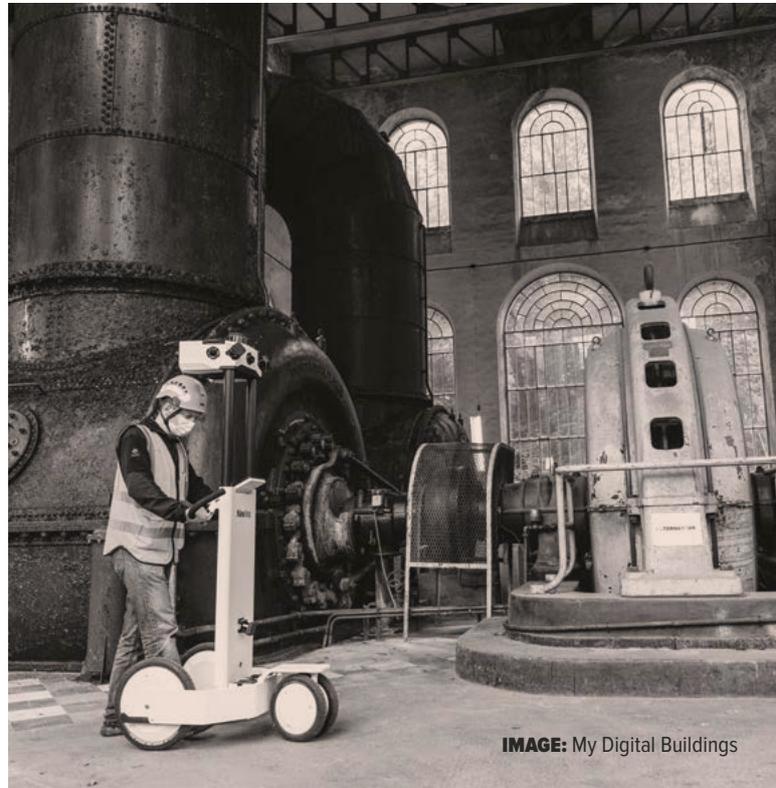


IMAGE: My Digital Buildings

five years, with dots representing each building and estimates of the quantities of each material that will come out of it.

Material Mapper plans to have a fully functional platform in place for at least the five largest municipalities in Norway by September, and will then move into the rest of Scandinavia and beyond.

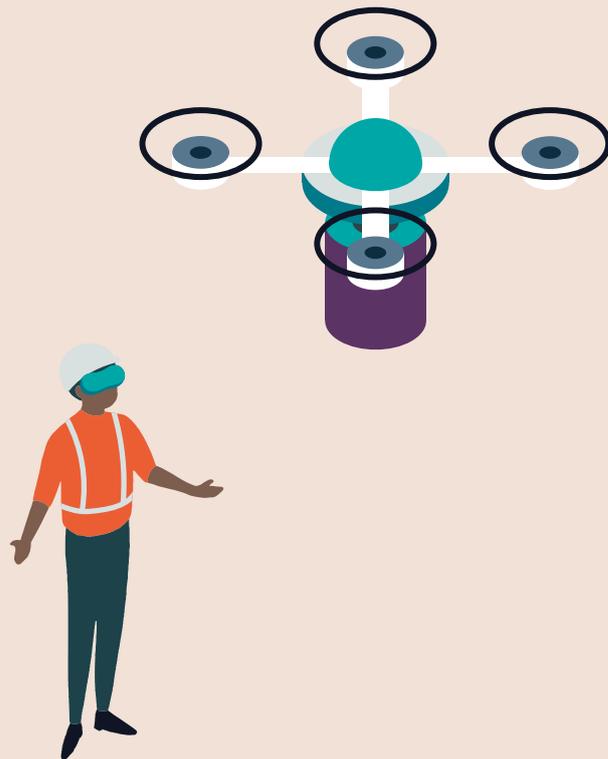
Strupule says what they’re doing is not low-hanging fruit. “We’re working with large amounts of data and structuring it first, before we move on to building a marketplace,” she says. “Construction is different from many other industries because it is very data driven, but nobody’s been working with the data; so, we’re trying to change that.”

Others are bringing rigorous data and automation to life-cycle assessment, analysing the total impact of buildings and infrastructure projects from planning to construction to end of life. Notable startups include Lyon-based Vizcab and Finland’s Bionova, who have both built analytics platforms to calculate the environmental footprint of projects.

Chapter III

The sky's the limit

To thrive, startups need to understand the unique challenges of the industry, including risk aversion, low margins and time-management. They should also pay attention to the vast and underserved SME construction market. Accelerators need to ensure broad market relevance, not limit their focus to the biggest construction corporates. And regulators need to push the industry to improve its environmental performance.



Startups can bring value to a struggling but essential industry across every part of the project life cycle. But success will not come quickly and the chance of a construction tech unicorn galloping into view in the near future is unlikely. "I would say we're a long way from that; this won't happen fast," says seed + speed Ventures' Bosse.

The sector already has its share of flops. In June, US-based construction startup Katerra informed its thousands of employees that it would be shutting down operations after burning through more than \$2bn in funding. The SoftBank-backed startup, founded in 2015, blamed the effects of the pandemic, as well as rising costs of labour and construction materials.

To thrive, startups need to work closely with the construction industry and be sensitive to its unique challenges. One critical issue when negotiating contracts, for instance, is convincing construction majors that a new technology or innovative experiment isn't going to throw their entire project out of rhythm, says Backacia cofounder Lucile Hamon. "The make-or-break factor is whether we can bring in new tech without disrupting the normal course of a work site — causing a delay means turning a building project into a loss-making operation, and that's the kiss of death," she adds.

In a low-margin industry, running behind schedule can mean losing money on a contract. "Our first promise to customers is that they'll gain time and that we won't disrupt the flow of their work site," says My Digital Buildings founder Emeric Mourot. "The last thing you want to do, as a startup in this space, is bring [in] a digital solution that means changing the usual workflow and taking a pause to figure it out."

“The European market is a \$10 trillion industry, but 95% of these companies have less than 5,000 employees.”

Startups and founders may need to move beyond the dominant domain so far - construction sites themselves



IMAGE: Capmo

- which is now getting crowded. "We believe the supply chain is a relatively under-invested area," says Gonzalo Galindo, chief executive at CEMEX Ventures. "It's a much more difficult problem to solve, because you have to deal with a lot of people: suppliers, distributors, truck drivers and so on. But that's where a lot of the money is still up for grabs in terms of inefficiencies. We would like to see more people really jumping into that problem."

Patric Hellermann, general partner at Fundamental, concurs. "Optimising logistics, fulfilment, sourcing of materials, labour, machines - this is an exciting space to be in because you can be much more immediate and instant in the value that you create for the customer."

Startups could also turn their attention to the needs of the SME sector, which is surprisingly large. "The European market is a \$10tn industry, but 95% of these companies have less than 5k employees," says Florian Biller, cofounder and chief executive of German startup Capmo. "They don't have the firepower to invest [heavily in tech], and that's why for the vast, vast majority of the entire construction market, startups are the first solution they adopt when they move away from pen/paper or a generic software like Microsoft."

Investors urge founders to focus on swiftly deliverable innovation, especially in the sustainability space. Patric

Hellermann at Fundamental sees a worrying parallel between construction hardware solutions today and the cleantech sector of a decade or so ago, when many US and European investors pumped considerable sums into laboratory-bound ideas that looked "shiny...with charismatic founders," unlike their Chinese counterparts who focused more on production-ready solutions even if they weren't as groundbreaking. The clock is ticking on the environmental crisis and technology can deliver big gains in construction. "We don't have to chase after the most fancy technology which could deliver something amazing in 15 years. Let's go after the solution that gives us a 30% reduction right now in the most simple way and industrialise the heck out of it".

All tech players need to explore ways to stitch together technology solutions. Bosse says many startups look at specific problems, like organisation on the construction site, health and safety, or building information modelling. "All are relevant, but only solve a certain part of the problem, and they're not integrated," he says. "Someone needs to create an integration layer, where the different parties are using different software but there's still some kind of common overlay where all this data is going to and used along the value chain, from planning over construction to operating the property."

“It’s difficult to make sure that something which was successful in one project will be successful in another project.”

Startups need to acknowledge that construction is a highly project-specific industry which will require different revenue models than might exist in other sectors, especially for Software-as-a-service (SaaS) businesses.

"In the last ten years we've seen a lot of founders offering SaaS with a typical recurring revenue model, which doesn't always align well with construction," says Patric Hellermann at Fundamental. "The recurring enterprise model is typically at least 12 months forward, but a project has a finite lifetime."

The project-based nature of construction also makes it harder to scale a successful innovation to multiple sites. "Because this is a project-oriented sector, it's difficult to make sure that something which was successful in one project will be successful in another project," says Gonzalo Galindo of CEMEX Ventures.

ECOSYSTEM BUILDING

Accelerators and incubators have proven critical to maturing tech ecosystems, but there are relatively few focusing on construction in Europe. Startups feel that more could help, although they should not limit themselves to serving majors.

"If it's only the big construction company setting them up, that's totally wrong because they are representing an enterprise segment that is just a tiny little fraction of the market," says Capmo's Biller. This could mean startups only focusing on building solutions aimed at the big firms, rather than the vast majority of the market. "I think that would be a big issue."

Done right, accelerators could be critical for road-testing innovations in real-world contexts. "What would be massively valuable is having access to multiple construction sites and testing with multiple users, having that accessibility," says David Mitchell, founder and chief executive of UK-based XYZ Reality. "And



IMAGE: XYZ Reality

maybe for those who are coming from the outside into the industry, just some mentorship in terms of understanding the stakeholders and the personas involved in the industry, what matters to who.”

Mitchell adds that construction tech-focused incubators and accelerators should try to work with a broad pool of construction companies and not be overly aligned with single entities.

REGULATING THE TRANSITION

Some startups feel further regulation might be needed to unleash more technology in the industry, whether related to health and safety, sustainability or something else entirely.

“I’m really not a fan of it [regulation], but especially in the construction industry it might not work without increased regulation,” says Bosse. “At least in certain fields, especially when it comes to environmental aspects, regulation might be needed.”

“A sector generating 40% of the CO₂ emissions and nearly a third of all waste in the EU cannot afford to not innovate.”

Ieva Sibilla Strupule, chief executive and cofounder of Oslo-based Material Mapper, agrees that governments need to push the industry to change. “I want to see more regulations, as many of us do,” she says.

In March 2020, the European Commission adopted a Circular Economy Action Plan as one of the building blocks of the European Green Deal. The plan calls for, among other things, greater recycling of building materials. “There’s a part in that specifically about construction, with a quota that 70% of all materials by weight must be repurposed,” Strupule says.

She adds, however, that there needs to be more regulation and follow up on compliance. “We’re going to arrive at a point where the government is going to start

issuing fines,” she says. “[But] they’re just going to pay it off and move on.”

“The legislation part is extremely important to make the push,” says Arnold Verbeek, a senior advisor in the Innovation Finance Advisory Division at the European Investment Bank (EIB). According to a study the EIB conducted in 2016, the construction sector was one of the most promising industries when it comes to achieving a ‘circular economy’ transition.

In areas like reducing CO₂ emissions, Verbeek says these regulations are already coming in and so companies are being forced to adapt. “They will have to innovate and it will happen, and that’s where the opportunity lies,” he says. “A sector generating 40% of the CO₂ emissions and nearly a third of all waste in the EU cannot afford to not innovate and [to not] move to a more circular concept.”

INCENTIVES, NOT LAWS

Governments’ role is not only as lawmakers but also market-makers. “The government is one of the biggest construction owners who contract construction companies, and if they mandate digital construction and require it, that would push it a lot,” says Capmo’s Biller. He adds that what would help is not laws that require digital adoption, but incentive systems that subsidize it.

It also doesn’t help startups that regulations differ significantly from country to country. “I think regulations are a lot more progressive in Northern Europe,” says Jose Ojeda, cofounder and chief operations officer at Spanish construction tech startup O11h. “We are seeing changes in southern European markets, but those are way more advanced and way more sophisticated.”

At the same time, while tougher regulation and slower-to-change industrial giants are obstacles to construction tech startups expanding quickly in Europe, there’s another side to that coin.

“Yes, it’s slower in Europe than, for instance, China, where they’ll build something overnight while we’re working for weeks,” says XtreeE’s Alban Mallet. “But we’re in a space where quality, and the regulation backing it, is essential.”

“Our biggest fear is that one day a 3D construction halfway around the world will collapse because it wasn’t done by the book,” he says. “Then our entire sector of construction tech will unjustly suffer — we definitely don’t need the bad rep.”

CONSUMER-DRIVEN CHANGE

Consumers could play more of a role in supporting a shift towards greater use of construction tech, especially those linked to sustainability.

While awareness of the impact of cars on the environment is well known, CO₂ emissions related to concrete – estimated to account for 8% of total emissions – and other negative environmental impacts of construction are far less understood.

Some see this as an opportunity, in the same way that greater consumer awareness of car pollution helped support the growth of the electrical vehicle industry.

“Today, it’s in the early stages on the consumer side,” says O11h’s Ojeda. “We believe especially the younger generations care more and more about this issue, but the awareness today among consumers is low. It’s going to be critical for the final consumer to understand this.”

While consumer awareness is nascent, the same is not true of investors. “I think capital in particular, and ESG-oriented impact investing capital, is probably now the first one that is responding,” he says.

There is still a sense that the sector is largely overlooked by investors, who are pouring money into the startup ecosystem as a whole, but are out of their comfort zone in construction tech.

“I think it’s a misperception of investors that you need to have that background to build something great in construction; they overestimate the importance of domain expertise, whereas what we’re doing is writing software to make construction management easier,” says Capmo’s Biller. “That’s a lot about processes and understanding collaboration. Knowing construction is helpful but it’s not a necessity.”

Even so, a growing number of funds understand the sector, with some limited partners having construction expertise. “Not only do they have a deep understanding of it, they are super well-connected and you can deploy some of the technologies that you might have with their LPs,” says Ojeda.

Then comes the new generation of investors focused on impact and climate tech, he says: “They’re not specialists on construction tech but they are very aware of overall climate change issues and they understand construction is a big player.”

For the generalist, however, it’s early days, he says: “We’re probably at the beginning of this cycle. It’s not front and centre for them, but I think they’re starting to develop an understanding of the space.”

“VCs are now looking at this industry as an opportunity to make serious change and as a serious investment opportunity.”

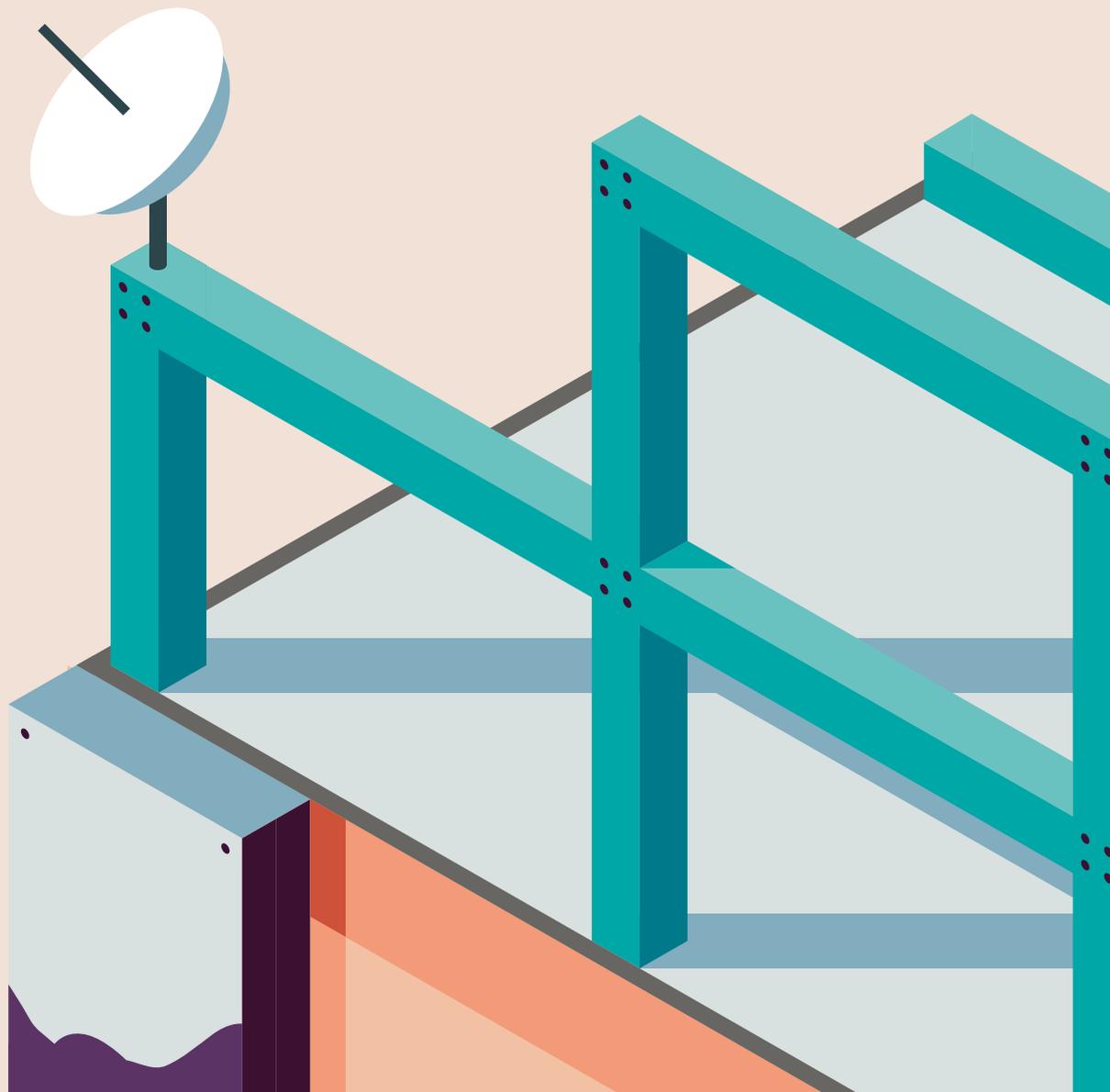
XYZ Reality’s Mitchell observes a notable change in recent years. When he used to walk into meetings with VCs they would almost throw him out of the door when they heard the word ‘construction’, let alone when they heard he had a hardware offering.

Now, the conversation has changed. “I’ve seen the appetite,” he says. “I think VCs are now looking at this industry as an opportunity to make serious change and as a serious investment opportunity.”

Backacia founder Lucile Hamon agrees. “There are more and more investors and there’s money for entrepreneurs to tap,” she says. “Construction tech is maybe never going to be an industry where VCs invest based on a powerpoint — they’re strict on KPIs and entrepreneurs’ ability to execute. They’re cautious, but there’s definitely money.”

Predictions

Where next for construction tech? Our experts expect a tussle between corporates and governments over regulation, a shift from early to mass adoption of tech, consolidation of apps and digital tools to a few large market players, and digital-first building sites.



Green building



"It's a very slow-moving sector. But what we're hoping for and what we believe in is that there's going to be a series of changes. One is around regulations.

Today, the regulation is becoming tighter when it comes to emissions in the energy use of the buildings, but when it comes to the overall CO₂ footprint it's still not at the level that it should be."

Jose Ojeda, cofounder and chief operations officer at 011h



"I hope that construction will shift towards greener, more sustainable models in a significant way, beyond just words. I think further regulatory

changes will be key in making this a reality. It's the major issue of our generation, and I hope regulators seize it — for more durable construction as well as better waste management."

Alban Mallet, chief executive and cofounder of XtreeE



"Construction is taking a huge turn towards sustainability. Greentech is becoming a major trend in this space and will definitely be a central theme in the coming months and years."

Lucile Hamon, chief executive and cofounder of Backacia

Early to mass adoption



"I think the next one, two years will be the phase where we see the early majority adopting. In the next five years, we will move away from having many apps and processes to having two or three large solutions that will dominate the market."

Florian Biller, cofounder and chief executive of Capmo

Digital building



"Digital models are going to become the norm for every building site. We've reached that time of technological maturity as well as cultural maturity — mainly because the big names in construction are becoming convinced that digital tools can make their life easier and help deliver a work site finished and spotless much faster. The big revolution this will bring in the construction space is massive economies of scale. For this low-margin industry, that's potentially a game-changer."

Emeric Mouro, cofounder of My Digital Buildings

Regulatory tussles



“There’s going to be a lot of friction between the large, very cash-rich corporates and the governments. It is not in their interests to have to adapt to change. I would like to be positive and think that everything is moving towards a beautiful future and we will have modernised and zero-emission construction sites. But in order for that to happen, the big players, the big rule-makers, have to make a dent and have to be very brave to go against this outdated industry.”

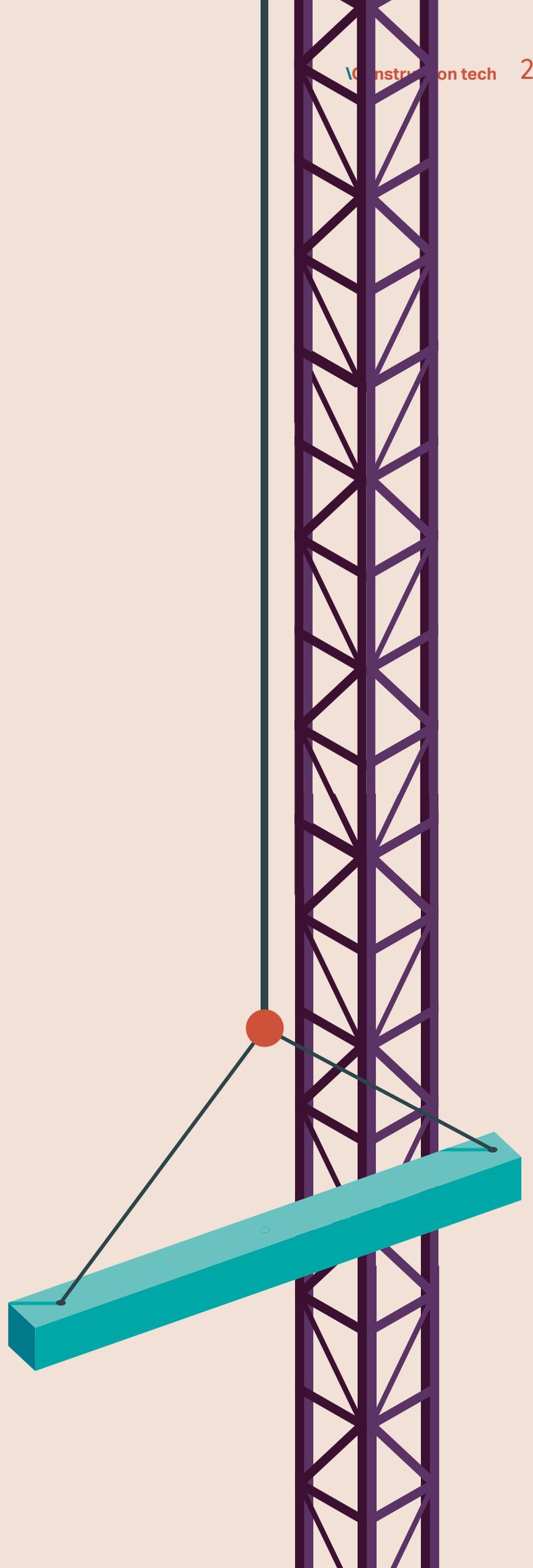
Ieva Sibilla Strupule, chief executive and founder of Material Mapper

Markets galore



“We’ll see more marketplaces in the construction world: marketplaces for construction workers, different service firms. It’s the easiest space to disrupt — the more low-hanging fruit in the construction space. The marketplaces popping up are still mostly small, but they’re growing.”

Andreas Schwarzenbrunner, associate partner at venture capital fund Speedinvest



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This report was written by **MARIE MAWAD** and **KIT GILLET**, edited by **ADAM GREEN**, designed by **GAÉTAN NIVON**, illustrated by **GEORGE CLAYTON**, charted by **BILL LEAVER** and produced by **CHRIS SISSERIAN**.

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LEONARD

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Leonard is the innovation and foresight platform created by VINCI, a global player in concessions and construction, which employs more than 218k people in nearly 120 countries.

Leonard is responsible for monitoring emerging trends in VINCI's businesses and markets including construction, mobility, real estate and energy; identifying long-term challenges and objectives; pinpointing opportunities for transformation in the group's activities and organisational structure; identifying new growth drivers; and developing incubation and acceleration programs for innovative projects open to group employees and start-ups.

To host these programmes and foster meetings with the full range of innovators in VINCI's businesses, Leonard has opened Leonard:Paris, an open laboratory dedicated to the future of cities and infrastructure located in central Paris.

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