The impact of digital transformation on the UK economy:

Construction Sector

A Cebr report for Virgin Media Business

March 2021

Authorship and acknowledgements

This report has been produced by Cebr, an independent economics and business research consultancy established in 1992. The views expressed herein are those of the authors only and are based upon independent research by them.

The report does not necessarily reflect the views of Virgin Media Business.

London, March 2021

Contents

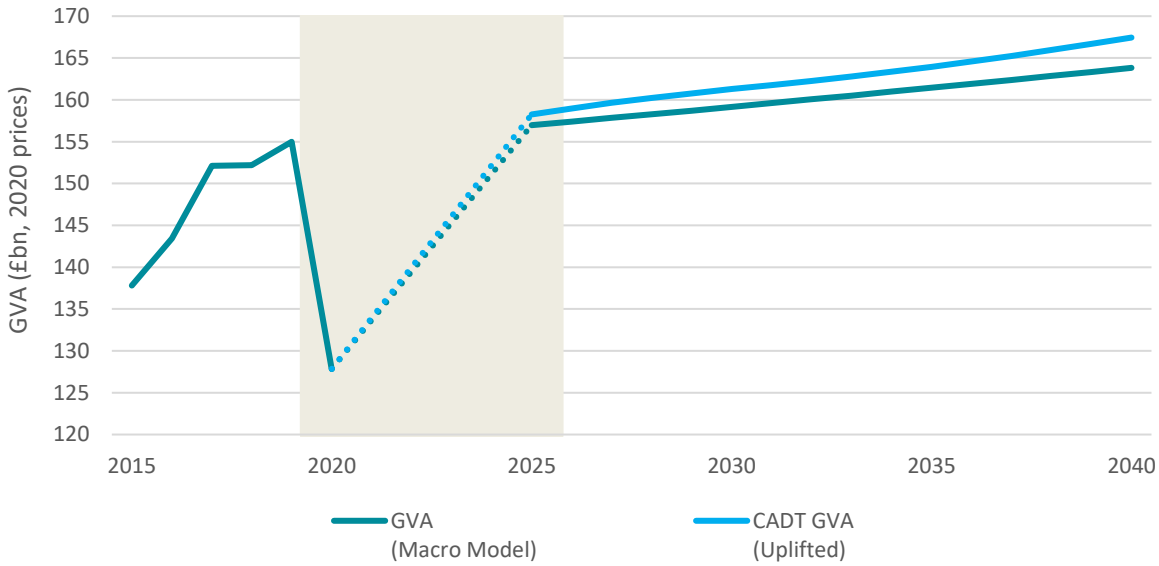
Executive Summary

- This is a Cebr report for Virgin Media Business on the impact of Covid-accelerated digital transformation (CADT) in the **construction** sub-set of the private sector.
- Following the release of Cebr's extended report for Virgin Media Business on the topic of Covid-accelerated digital transformation, and its impact on the UK economy more broadly, this report focuses on the **construction sub-sector**.
- This is the third in a **series of sector-specific vertical reports**, providing a review of the role that digital transformation is expected to play in accelerating the UK's rebound from Covid-19.
- Within **construction**, we consider **building** and related services, such as **plumbing**, **electrical** and **heating**.
- As detailed in the main report, increased adoption of key digital technologies due to the pandemic could lead to a period of Covid-accelerated Digital Transformation (CADT). **Boosted investment and fast adoption of CADT technologies over the coming decades is set to increase UK GDP by £232bn[1] or 6.9% by 2040**.
- **Across the three "in scope" private sectors,** we estimate that **a total of £40bn of additional GVA** could be realised **in 2040.**
- This represents a combined **GVA uplift** of approximately **4.8% above the baseline** for the three "in scope" private sectors.
- In **construction**, the digital transformation uplift is estimated to be approximately **£3bn in 2040**, a gain over the baseline of around **1.8%,** bringing the size of the sector **to £167bn** in 2040.
- The size of the construction sector **pre-COVID** is also shown in Figure A, where it can be seen that **GVA fell by approximately 17%** between 2019 and 2020 to **£128bn**.
- Under the **CADT scenario**, pre-COVID levels of GVA could be achieved by **2025**, when the size of the sector is estimated to be **approximately £158bn** – representing around **0.6% of the total construction sector GVA**.

1 All figures are presented in 2020 prices.

- **Figure A**, below, sets out the **forecasted size of the construction sector** under the **baseline scenario**, together with the estimated **size of the uplifted sector**, as a result of **accelerated digital transformation in the construction sector**.

Figure A: Construction sector GVA, 2015-2040



Source: Cebr analysis

1. The impact of COVID-accelerated digital adoption

This section sets out the findings of the research, that is, the estimated sector-specific impact of accelerated adoption of digital and technological initiatives in response to Covid-19, estimated over a 20-year time horizon.

For reference and context, Table 1 sets out a summary of the results for the **whole of the UK** economy, after which the construction sub-sector results are presented.

Table 1: UK-wide impact of post-Covid digital transformation adoption

Year	Baseline GDP (£bn, 2020 prices)	Uplifted GDP (£bn, 2020 prices)	Additional GDP (£bn, 2020 prices)	Percent Boost
2020	2,178	2,178	0	0.0%
2025	2,651	2,725	74	2.8%
2030	2,891	3,018	127	4.4%
2035	3,143	3,314	171	5.4%
2040	3,361	3,593	232	6.9%

Source: Cebr analysis

The 2021 – 2025 short run

It should be noted that this research has been carried out in real-time, against an uncertain economic backdrop with particular respect to the long-awaited Brexit deal announcement, and indeed Covid-19 – the surrounding circumstances of which have been subject to frequent and last minute change. Results are estimated using assumptions that are based on the state of the world at the end of 2020, and the near-term forecast might consequently be subject to change.

As noted in Cebr's extended report, the shape of 'economic recovery', in the period 2021 – 2025, is uncertain.[2] Opinion ranges from a quick 'V-shaped' to a prolonged period of lower output. This uncertainty is largely due to the unpredictable progression of the virus and governmental responses. While a fast and effective rollout of vaccines may allow for a return to normality and a quick economic recovery, prolonged restrictions well into the second half of 2021 would lead to greater scarring in the economy and slower economic growth in the following years.

We have therefore placed greater focus on the medium and longer-term findings by excluding annual estimates for the years between 2020 and 2025. Longer-term findings are more robust and less likely to be impacted by the current – and ongoing – changes to government policy and pandemic trajectory. By the start of the long term steady state period (currently estimated to be 2025), increased Covid-accelerated Digital Transformation is estimated to have added £74bn to GDP.

2 The immediate term between 2021 and 2025 can be thought of as the of the 'economic recovery' period, before the UK transitions into a long term steady state. 2025 has been chosen as a suitable analytical starting point from which to undertake the analysis because that is the nearest steady state marker that is currently identifiable.

It can be seen in Table 1 that under the baseline scenario, sectors operate under normalised assumptions, following non-accelerated technological usage trajectories. In this case, GDP across the UK economy as a whole is estimated to be approximately £2,891bn by 2030. However, the results of the model in which we consider accelerated technological adoption, indicate that GDP could increase to approximately £3,018bn – an uplift of £127bn, or 4.4%.

By 2040, the counterfactual GDP – with normalised assumptions regarding technology adoption – is estimated to be approximately £3,361bn. However, with increased use of digital technologies, it could be uplifted by around 7% to £3,593bn – an increase of £232bn.

As detailed in the extended report, the private sector is treated differently from the public sector. Increased efficiency in the private sector – attributable to accelerated adoption of technology – raises employee productivity, which manifests itself in the form of increased sectoral output, a portion of which is assumed to be channelled into increased investment. The gains of such investment lead to higher GDP from the year after the investment is made, and in turn, bring about a further increase in sectoral GDP.

Table 2 summaries the results in 2040 for the three "in scope" private sub-sectors. It can be seen that the total digital transformation uplift is approximately £40bn in 2040 – representing a combined GVA uplift of approximately 4.8% above the baseline for the three sectors.

Table 2: Summary of private sector digital transformation GVA uplifts in 2040

(Real, £bn, 2020 prices)				
Private Sector	**Baseline 2040**	**Size of Uplifted Sector in 2040**	**Digital Transformation Uplift**	**Percent Gain**
Construction	164	167	3	1.8%
Professional & Scientific Services	333	349	16	4.8%
Retail	340	361	21	6.2%

Source: Cebr analysis

The importance of the interaction between worker productivity and technological transformation drives the larger impacts in retail and professional services, as digital technologies enable more efficient work.

The following section sets out the results for the construction sector.

Construction sector

Table 3 sets out the estimated size of the construction sector, starting in 2020, and then each year from 2025-2040.

Under the uplifted CADT scenario, GVA in 2025 is estimated to be approximately £158bn, bringing the size of the sector back to pre-COVID levels of GVA. By 2040, the size of the construction sector is estimated to be £167bn, an uplift of approximately £3bn over the counterfactual baseline, which assumes normalised levels of digital adoption, as opposed to accelerated levels.

Despite the uplift appearing to be arguably modest, relative to the other two "in scope" private sub-sets of the private sector, it is significant and represents approximately 1.8% of baseline GVA for the sector in 2040.

Table 3: Impact of accelerated digital transformation in the construction sector

	(Real, £bn, 2020 prices)		
Year	Construction sector baseline GVA	Size of uplifted construction sector GVA	Digital Transformation Uplift
2020	128	128	0
2025	157	158	1
2026	157	159	2
2027	158	160	2
2028	158	160	2
2029	159	161	2
2030	159	161	2
2031	160	162	2
2032	160	162	2
2033	161	163	2
2034	161	163	2
2035	161	164	3
2036	162	165	3
2037	162	165	3
2038	163	166	3
2039	163	167	3
2040	164	167	3

Source: Cebr analysis

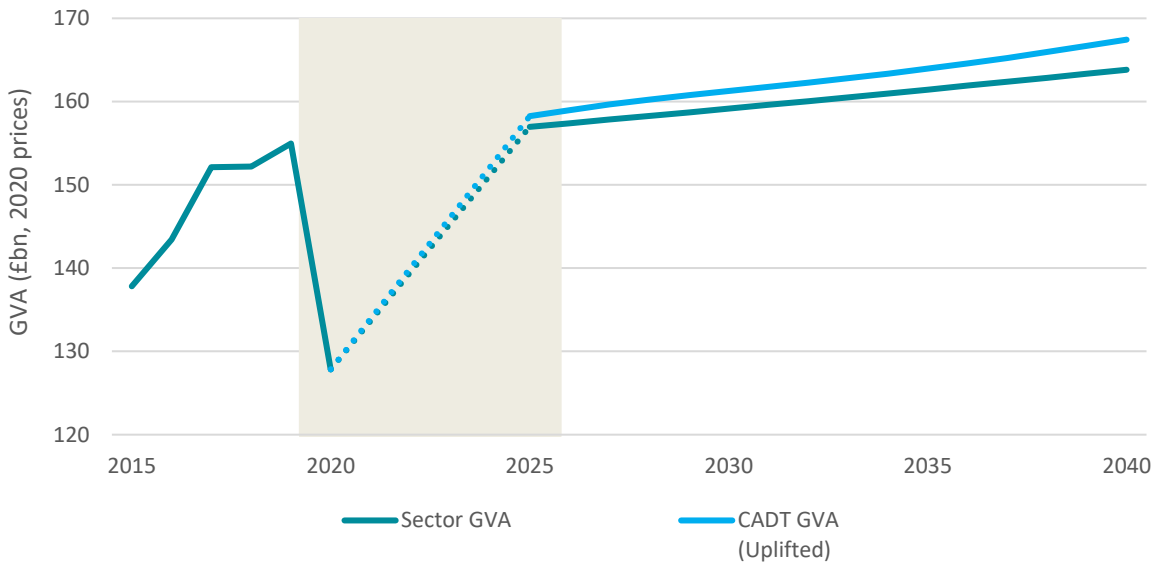
As noted in the literature (see Section 3), the construction sector was seen to be a slower adopter of digital transformation, owing among other things, to the fragmented nature of the industry.

Further to this, and despite the benefits that the sector may theoretically realise in time, findings from the panel workshops suggest that significant transformations (that bring about considerable gains) are not currently taking place across the board. Rather, it is the smaller tasks are currently being digitised and as such, gains can be considered as arguably modest.

Figure 1 shows the GVA of the construction sector between 2015 and 2040 – with the CADT uplift scenario also indicated from 2020 onwards. The delta between the two lines indicates the size of the uplift brought about by accelerated digital transformation.

Between 2015 and 2019, the sector grew by around 12%; however, owing to the events of 2020, sectoral GVA fell by approximately 17% to £128bn in 2020. It is expected to return to pre-COVID levels by 2025, and is estimated to reach a GVA of £1367bn under the CADT uplift scenario by 2040.

Figure 1: The impact of accelerated digital transformation in construction sector



Source: Cebr analysis

2. VMB case studies

The following case studies supplied by Virgin Media Business serve to demonstrate the forms of digital transformation organisations working in throughout the public sector have successfully implemented throughout Covid-19.

2.1. Canary Wharf Group

Why you should put user experience first when building a new home or workspace

Connectivity is key to building beautiful, digital-first spaces. Lightning-fast internet on tap is essential for the way we live, work and play today.

Homes and offices should be designed to fit the lifestyles of the people using them. And new builds should work straight out of the box.

That's the mantra of Canary Wharf Group, the driving force behind Canary Wharf in London's Docklands.

Over 20 years the E14 postcode blossomed from an ugly duckling into 97 acres of the most desirable real estate in the world.

Its soaring buildings define the modern London skyline. New, exciting living, working and retail development continues to this day. And digital innovation is taking it to new heights.

Mark Nallen, Director of Technology and Innovation at Canary Wharf Group, says: "People use tech in their day-to-day lives and say, 'I want this in the office as well'.

"Amazon and Netflix have helped them embrace change. Everyone has a smartphone, everyone uses apps. those things have helped with flexibility.

"You used to need a manual for a video recorder. Now you get an iPhone with no instructions. You just turn it on. You don't need a manual. You never ask, 'How do I use this?'

"Apps have made user experience frictionless. It all comes down to that. That frictionless thing is what we are hoping to create with our working and living spaces.

"We have Wi-Fi in lobbies and lifts, it goes throughout retail. You don't need to re log in, you just connect and it's done. All our parks and open spaces are fully lit with 5G, 4G and ultra-fast WiFi.

"We make sure you have the best connectivity. There's nothing more frustrating than waiting for a page to download or an app to update.

"We depend so much on what's in our smart phones or tablets, we can't be without it. For us it's not an afterthought.

"Our Vertus build-to-rents are all live. If you went to one of our rental apartments tomorrow, it's ready to walk in. You get 500Mb download speeds instantly.

“Once you've put your key in the door, the only thing you've got to work out about is how I'm going how am I going to sleep tonight.”

He adds: “We're all looking for that convenience, whether it’s for home deliveries, Amazon lockers, or click-and-collect.

“At work we want that same ease of use, to make our life better, to do all those things we want. What’s enabled it is the way mobile communication has become so quick, easy and seamless.

“We made sure that we have the best Wi-Fi and the best mobile coverage to make everything as fast and seamless as possible.

“Those things are huge enablers. If you don't have great baseline communication, you have friction logging into Wi-Fi and nothing will work.

“We're looking to take that friction away, so our tenants don't even think about it. Getting great connection becomes as easy as breathing air.”

“Then you start to get that really good user experience, flowing from one application to another. As humans that's what we're really looking for: we look for that easy route.

“It’s the same for office space. How we can deliver that ease of flow with more knowledge about the building?

“We’re making buildings smart to accommodate their usage and help sustainability”

Innovative use of technology also underpins Canary Wharf’s commitment to improving energy efficiency, reducing emissions and achieving net zero carbon by 2030.

Canary Wharf Group is the first real estate business to join The Climate Pledge to regularly report and drive down polluting emissions.

But as more and more tenants demand the highest standards of sustainability, they are unlikely to be the last.

Mark explains: “It’s all about making sure we have a safe, pleasant environment. We’re monitoring buildings with more sensors for air quality and to ensure wellbeing.

“We monitor usage of the estate: how people are going through touch points and if something needs more cleaning in a high-use area we have that data to hand.”

Enforced social distancing during the pandemic has led many developers to rethink the user experience of office spaces across the country.

But while the flexible working revolution was the standout trend of last year, Mark is convinced many still yearn for at least a partial return to the office.

He says: “Businesses need their teams to understand the ethics of company culture. You're not going to truly get that culture by being so remote. So it’s a balance.

“How office spaces are used may be slightly different after the pandemic: with more space between desks and more breakout areas.

“But to make that company culture and rich experience of knowing your colleagues work, you need the water cooler conversations.

“You see the impact on people’s wellbeing as we come out of lockdown. The tone of emails start to get a bit less harsh the moment people came back into the office.

“The moment you see other people, communication is better. The anxiety starts to disperse. That’s just from having face-to-face communication and hearing tone of voice.

“Seeing facial expressions makes a big difference. It’s different from email. I could see just managing my own team it was a lot lighter when we could get back into the office.

“Yes, you can pick up the phone. Yes, you can chat at home. In theory you can do everything when working from home.

“Tech has been great to keep businesses functioning as usual, but there's a lot more to it than that. There's that human element key to keeping company culture going.

“Calling over at someone’s desk and finding that personal touch is what companies will miss having a purely working from home environment.

“Just seeing someone smile is worth a huge amount on its own. Coming into work is a lifeline for them. It really does matter.”

And Canary Wharf Group make sure its team are always on hand to upgrade work spaces so they are fit for the post-pandemic era.

Mark says: “Our construction is shell and core. But we have a construction arm and a fit team.

“We offer that flexibility to assist and work with clients to create the space they want and cater for how they want to work.

“If they want more open plan space… or large open balconies, for example, we can work with them. That flexibility is one of the benefits of our estate.”

The positive impact of digital innovation has been felt equally by the backroom staff at Canary Wharf, and the pandemic has greatly accelerated this.

Mark continues: “The property industry is generally slower to take up tech and a bit more reserved in taking risks. But the pandemic allowed us as a company to embrace changes.

“It's shown how quick you can roll out new innovations. The cloud has been huge enabler to get services up and running quickly, collaborate with teams and share documents.

“Office 365 has exponentially sped up the way we can distribute services.

“If we were in the office we’d have maximum meeting room capacity of 20 people. We’d need two meetings instead of the one we had with 40-plus people attending in Teams.

“So everyone was present on the Teams meeting. You just send a meeting request. You don’t have to look for a meeting room, you're just there.

“If want to share and collaborate as a team on a document you can do it so simply. And you can even record the meeting for those that didn't make it.

“With that sort of interaction and attendance, you can have one meeting instead of three or four. It's really sped things up.”

For Canary Wharf Group necessity forced by Covid-19 proved to be the mother of innovation. But successful implementation still requires strong leadership from the top.

Mark says: “People seeing how this technology has helped at home has sparked their interest in other things that can make life better and more efficient.

“Office 365 was happening any way. But the user take up couldn’t have been higher. In other times you would get a push back. It's natural, human nature.

“But with Covid it was a case of, ‘You're getting it, it's the only way forward. ’The user take up was instant. In fact they were asking to have more.

“Any turn around comes from the top. And with our CEO Shobi Khan on board at Canary Wharf, we have someone who definitely embraces technology.”

Canary Wharf Group has been a Virgin Media Business customer since 2019

2.2. Kier

Managing an epic £253 million project from your smartphone? Welcome to digital-first construction

A high-tech prison-building project is helping to reform the construction industry with a digital first approach that is rapidly becoming the norm.

The contract to build £253million HMP Five Wells in Wellingborough, Northants, was awarded to Kier in 2019.

It’s thirteen buildings were conceived, designed and constructed as digital from day one.

The build is part of a Ministry of Justice (MoJ) programme to reform and modernise prisons, making them more efficient, safer and focused on supporting rehabilitation.

It has windows with no bars and each landing can be split into three, with each spur holding 20 men.

Association space and the visitors' hall are designed to be open and light to instill a sense of normality.

To deliver on the brief, Kier drove a manufacturing mindset by bringing together a diverse, nationwide team to deliver this component-led approach.

James Franklin, Head of BIM (Building Information Modelling) at Kier Strategic Projects, says: "We worked with six factories across the UK, producing 15,000 panels and 60,000 subcomponents."

The project is not unlike a giant, precast concrete jigsaw puzzle. Four-out-of-five of these building blocks are standardised…leaving just 20% needing site-specific design.

This means the component parts designed for Wellingborough can be reused on subsequent Ministry of Justice (MoJ) prison projects, leveraging huge economies of scale.

The ground-breaking approach reduces risk, while enabling a high level of innovation and collaboration between Kier and its supply chain partners.

But it also means everything must be made off site, from cell doors to walls and flooring, with built-in mechanical, electrical and plumbing essentials. And then putting it all together on site.

Without embracing the latest digital techniques this would be a logistical nightmare, if not an impossible task.

James explains: "I come from civil engineering background where a lot of concrete is poured on site. All the waste that goes with that is deleted.

"We aimed for a step change with Wellingborough.

'We've assisted Boris [Johnson] with levelling up the country. Digital-first means we can spread the economic benefits across the country. And we get real-time data."

He adds: "It used to be you only got visibility on production by either visiting the factories ourselves or via reading reports.

"We can't be at all the factories, all the time. And reports can be infrequent. They can be out-of-date and unreliable.

"To give us certainty, we use a field-based tool to view the BIM model. You can do it on your phone. It's incredible! You can raise and action electronic forms.

"If people are doing their quality inspection in factories, as soon as we know we have got a quality check, it's passed. And we have a unit we know we can rely on.

"These snapshots can show someone doing processed concrete check on unit in factory. You can get them on the smartphone we all have.

“I've been involved in construction over the last 10 years and this field technology is really starting to work for us.

“Before we might have had to buy armloads of expensive iPads or use systems that are so complex they require extensive training.

“Now we have a system where everyone has a smartphone and can run it. Even along your whole supply chain.

“It's becoming Google-like. Simple to use. And we don't need this heavy training part.”

Clicking on any precast component in Kier’s system brings up its full quality assurance records, meaning the team can digitally track its journey and monitor progress.

James says: “BIM is all about better information management. And getting the right information at the right time.

“In the old days everyone worked independently in offices, only coming together at milestones and over laying drawings only to see those drawings don't work.

“Now we’re continuously in collaboration…We're getting help from incredibly rapid programmes. If you want to develop an off-site approach then digital *has* to be your backbeat.

“Otherwise we simply couldn't get to that level of coordination quickly enough, with the assurance those items are streamlined across all the programmes.

“It's not just about taking a structure and breaking it down into panels. There’s all the ducting, costings and building work those items need to get to be a finished product.”

The Kier team is full of praise for the Ministry of Justice because of the way it approached the project before even a single piece of concrete was cast.

James says: “The Ministry of Justice set the standards on the project. And they were looking to set the agenda.

“They had previously championed BIM through the Cookham Wood project. When we tendered for this project they were looking to raise that bar again.

“BIM was 20% of the score. The MoJ were setting a precedent right from the tender stage. Now there's an investment in technology.

“We’re looking how we can improve each of our work flows by employing different technologies, everything from supply chain to drone surveys. That’s at the heart of our digital action plan.

“It's not just BIM everything is digital.”

Those digital innovations include 10,000 updated, 360-degree images of progress on site and drone surveys. Again, all accessible from a smartphone.

Lynda Rawsthorne, Director of Prison Infrastructure at the MoJ, says the project required “innovative design” and a “digital-first approach”.

She adds: “Kier and the wider supply chain have embraced the design challenges… which MoJ is committed to and which has helped us drive time efficiency through the construction programme.

“Early engagement with the pre-construction team enabled us to consider options and make the right choices for the design, fully understanding the implications.”

All this has been enabled by BIM which has, in less than a decade, firmly established itself as the best way to manage any construction project.

James says: “I come from a construction family. In my early days I did work experience and worked on site as a labourer. But I took up technology as I was interested in tech.

“I got exposure to construction again when working for New South Wales government, supporting project teams in implementation.

“It’s much more fun to be involved in an actual project, so I retrained as a civil engineer. I was immediately unimpressed with construction’s adoption of technology.

“While I enjoyed working in construction, I was always trying to look at how we could streamline workflows and work a bit smarter. I’ve always pushed the digital agenda.

“Then in 2011 I started hearing about BIM. It was a digital revolution in construction. And I put my hand straight up for that.”

While BIM has changed the way major projects are carried out, more subtle digital innovations have transformed the backroom operations that support them.

James continues: “The BIM movement was already on the rise because that's the direction of travel. But now there's more acceptance of that.

“On larger projects consultants and supply chain are totally geared up for it.

“But as an organisation, we really benefited from the rollout of Teams and Office 365. So did many other construction companies.

“The fact was all the people we work with were able to move to that cloud environment, take the work from the office but continue working from home.

“In some cases the communication is better. A lot of previously wasted time isn’t there. We can be a lot more effective.”

As a result, while the coronavirus pandemic ground much of the country to a halt, construction of HMP Five Wells hardly missed a beat.

James says: “Nothing actually stops the projects. We were told to carry on through Covid. We did step down to assess the risks and put mitigation in place.

“But we were able to continue throughout. While the office staff were able to stay at home, we were able to pick everything up and continue to work.

"What we've seen is a much wider adoption of tools like Office 365.

"Whereas people might have shied away from it before. The pandemic has sped up the process of digital transformation

"Now we're getting somewhere. Digital first is not just a new idea or concept, we're proving it does work and brings efficiency. And most of this stuff is scalable.

"What I'm really excited about is ever closer integration with supply chain and factories. Tracking those components on a live basis. We're already starting to get closer.

"We're also tracking the workforce on site. Because of Covid we've put active trackers on our workforce.

"Now we can record interactions on site. So that if people do fall ill, we can remove the right people from site and get them the attention they need.

"Wearable technologies will come into play much more because of the pandemic. And we've really embraced robotics … that's going to come into play."

Virgin Media Business has provided services to the Keir Services Limited group since 2008

2.3. Smarter London

Are your new building upgrades good enough for London 2.0?

London Mayor Sadiq Khan has ambitious building plans to create a tech mega city, with new rules to ensure all its residents live the digital-first dream.

High speed internet will be the capital's fourth utility. Gigabit connection for all new builds will be as essential as plumbing and lighting.

The city's Chief Digital Officer, Theo Blackwell, says: "London's largely copper network supported growth into one of the leading tech regions. But now we need gigabit capable connections.

"But as more and more devices get switched on in the same household, we need to have the speeds in place to deal with that demand.

"Put together all the phones, laptops, smart TVs, fridges, and the data demand goes up by 30% a year in London.

"We need that infrastructure to be in place to meet that demand. Modern infrastructure drives growth and jobs."

The Mayor and his team are determined that the benefits are felt by every citizen, from Hillingdon to Havering, and they have come up with creative solutions to make sure that happens.

Theo explains:

"Next generation mobile technology requires infrastructure. And we're ensuring that fibre reach is right across the city, not just in areas where the market demands.

"With Transport for London, we're using tube tunnels and a huge number of public assets to ensure there is that reach for full fibre across the city.

"We're making London much more investable…A place where infrastructure providers can do business.

"Across its 32 boroughs we've created standardised agreements so people can have consistent access to everything from lampposts to buildings.

"London has more than 500,000 lampposts. In new generation of lampposts, you can put 5G or air quality sensors. You generate a lot of data and functionality beyond just giving light.

"Leveraging public assets will deliver that service to planners to help eradicate 'not spots' and improve services for people with existing connections.

"All these things together create a digital infrastructure that benefits Londoners, making neighbourhoods cleaner greener and more pleasant for people."

And, from 2021, any new construction in the city will have to live up to exacting standards set by Sadiq Khan.

Theo says: "The new London Plan is a step change in planning law, with a requirement for great connectivity to happen in all new builds in the city.

"Planning law is one of our main levers. We want the best outcome for residents and infrastructure providers."

He adds: "Five years ago, all City Hall did was hand out vouchers for subsidised connections. What we're doing is a game changer.

"We give clear direction of what's required for a proper functioning building in the 21st century: electrical connection, water connection and a very high quality connection to the internet.

"20% of all full fibre building in the UK is happening right now in London. Hundreds of thousands of new premises are being connected with gigabit speeds.

"The right conditions are being created here."

Reduced friction means the city of 9 million will continue to grow at a rapid pace…and be even more connected than ever before.

Theo says: “We see there should be densification in 40 areas of the city. They’re ripe for new housing and new businesses over the next 20 years.

“Kings Cross was seen as the biggest development in London that will happen for many generations people didn't think there would be that much land and lo and behold we have it.”

Virgin Media Business pioneered connectivity in London and across the UK

2.4. Waterlodge

How a digital-first strategy helped float a new business (literally)

Waterlodge was the brainwave of two veterans of the boat trade who spotted a 'gap in the marina'.

As the popularity of yachts and other pleasure boats began to decline, the marinas that catered to them began to suffer too and there'd be vacant berths, often in a town with a chronic shortage of housing.

The answer, Andrew Hyland and Ian Watkins realised, was to create floating homes.

They set up in 2018, had their first full year trading in 2019 and were doing ok, using their contacts from the boat industry to reach potential customers. Then came lockdown and those methods were redundant. It looked like they might be sunk.

Instead, by switching to a digital first strategy, their fortunes were transformed.

"It became apparent very quickly once we started transforming our previously flat digital presence that there were a lot of bored people stuck at home who were looking at property online as almost a hobby," says Andrew. "Once we started tapping into that, things just went crazy for us."

His co-director Ian explains: "Initially our methods of reaching people were pretty old school. But once we started carving out an enhanced presence online and making our catalogue more shareable, we started seeing our 'fans', as we like to call them, doing much of our work for us.

“We'd get onto all the major property websites and then started getting a bigger and bigger presence on social media because people liked the look of what we were doing and liked sharing it.

"And that led directly to sales inquiries and orders.

“Lockdown forced us to rethink and embrace digital strategies, and it's changed our fortunes."

Andrew adds: “Now we are looking at running fully digital tours, making viewing one of our lodges virtually a fully participatory experience. We want to embrace digital possibilities to help us reach more people.”

Despite being shut down completely for the first two months of the year the company has almost tripled its sales in 2020 and are planning more of the same next year.

One customer was insurance worker Simon Jenkins, 60, who stumbled on the company when he was idly scrolling through properties in Brighton that he couldn't afford. "I suddenly found I could get a place for a third of price of comparable homes on land," he says.

2.5. Pagabo/Future of Construction

Marketing guru. Finance expert. Drone pilot. More. Digital skills for the builders of the future

The construction industry is on the frontline of building a better Britain. So it's only right it should take a lead in defining innovative, digital ways of working.

Builders of tomorrow will be the brightest and the best. They have to be multi-skilled, multi-talented, with career opportunities that match their broad, new skillsets.

Charley Wainwright of national framework provider Pagabo leads the Future of Construction project. Created early in 2020, it acts as a catalyst for change, to future-proof the industry.

He says: "It looks at various themes in industry. Covid really accelerated everything. It got us thinking about how we can improve things."

The project – engaging Pagabo's network of 300 construction firms and open to all in the construction industry – focuses on five main themes:

- Skills, learning and the future workplace
- Occupational health and wellbeing
- The regulatory framework
- Innovation, new products, processes and technologies
- Sustainability, environmental and net carbon reduction

Charley explains: "The construction industry is the leading light that will get the economy going. We're the ones who will back up Boris Johnson's promise to 'build, build, build'.

"Three million people work in construction. That's a significant proportion of the working population. And we're hoping to turn it into a life-long career.

"There's a skill shortage at the moment. We're looking to encourage people into the industry and give them the ability to retrain within the industry.

"In the past you might go into the industry as a labourer and hope you might end up one day as a foreman…whereas now you might want to go into finance.

"Or if you wanted to go into marketing, you had to leave the industry. We say building needs marketing, so let's keep the talented people by creating better places to work."

“We still need those manual skill sets of construction. Houses won't build themselves. But we’re trying to encourage opportunity.

“We want the ability to change skills and adapt. As technology and innovation comes in there will be a requirement for more skills.

“10 years ago no one on site needed to know how to fly a drone. Now it’s essential that somebody on site does. We're bringing in outside skills and new technology

“Our people are far more computer literate than they used to be. That innovation is driving change.”

But Charley recognises there is a long way to go.

He says: “There's only one industry in the country that spends less per capita in research and development, and that's fishing.

“Considering how many people work in construction we need to look to innovate compared to other industries.

“We’re behind in digitising things that were mainly pen and paper. It causes problems and inefficiencies: doubling up work, making things more expensive.

“But we feel we’re getting the right results. I’m really optimistic about the way the construction industry is heading.

“Everyone is keen for change and Covid has required acceleration of that change.”

3. Literature review and panel insight

In order to undertake the analysis, it was first necessary to conduct an in-depth literature review of each "in scope" industry. This enabled sector-specific assumptions to be made which were then further verified through panel interviews and workshops with industry practitioners. These assumptions were used as modelling inputs in support of estimating the impact of accelerated digital transformation on each of the UK sectors of interest.

This section sets out the findings from the literature review. Of particular importance was data on current levels of technological adoption for each sector, from which it would be possible to estimate trends in tech adoption. It was also important to gather evidence on the tech-enabled productivity increases that *could* be realised across a variety of industries – which would provide an indication of the potential gains that could be achieved with accelerated use, owing to events such as Covid-19.

The literature review and panel insight also provide important background information against which findings from the research can usefully be contextualised.

Construction sector

According to the literature, the construction industry has been among the slowest to adopt digital transformation programmes. As a result, productivity growth in the sector has remained largely flat, while other industries – such as manufacturing, retail and agriculture – have seen increases of up to 1,500% since 1945.[3]

Commonly cited challenges regarding the adoption of digital transformation include:

- Fragmentation along the value chain;
- Lack of replication;
- Transience of project teams: and
- Decentralisation.

However, per the manufacturing industry, there are significant efficiencies to be achieved through use of construction technologies, including drones, robotics and 3D printing, together with more widely used technologies such as mobile applications and analytics. Given the value of the construction industry, and in light of the number of projects that typically go over budget (approximately 98%[4]), even small upticks in efficiency could amount to considerable project savings.

The opportunities post-Covid are even more plentiful, given the important role that the sector will be expected to play in the recovery of communities. McKinsey (2020) notes that companies that came out ahead following the GFC in 2008 typically moved fast to achieve productivity gains, including cost reductions, to allow for the reallocation of recourses into areas such as digital technologies.[5]

3 Vox. (2017). 'The construction industry is short on human workers and ripe for a robotic takeover'.

4 Ibid.

5 McKinsey. (2020). 'How construction can emerge stronger after coronavirus'.

According to Avonus (2019) [6], one of the most prominent opportunities for digital transformation in the construction sector is the use of robots. Owing to the highly repeatable elements of construction, such as bricklaying and paving, robotics could have the same impact in the sector as it has in the manufacturing industry.

In masonry, for example, a New York-based start-up – Construction Robotics – has developed a bricklaying robot known as SAM100 (Semi-automated Mason) which is currently being used on job sites across the US. The robot is able to lay approximately 2,000 bricks per day, up from the 400 bricks as laid by the average mason – a 400% increase in productivity.[7]

Elsewhere in the US and Australia, companies are achieving masonry efficiency gains of more than 100% through the use of robots, such as RoadPrinter which is 20% more productive than comparable human paving teams.[8]

Similar robot technologies are being applied in scaffolding. Through automated assembly, the Kewazo robot, a first generation of scaffolding robots, has generated labour cost savings of 33% and has simultaneously increased construction speed by up to 42%. Enabled by a machine learning algorithm, the robot familiarises itself with its surroundings to locate the shortest path to assist human workers. In addition to the efficiency gains, the use of robots in this way are expected to reduce scaffolding safety issues.[9]

A separate robotics company in Australia has developed 'Hadrian', a robot that is 'fed' with 3D construction plans, in accordance with which it trims, processes and lays each brick. In so doing, costs are lowered and the quality of 'workmanship' increases. Buildings that would have taken humans several weeks to construct can now be completed by Hadrian in approximately 48 hours.[10]

Similarly, a company in China that is also using 3D technology to print out building parts, has seen a reduction in construction time by up to 70%, and a reduction in manual labour by 80%. It has also saved up to 60% on materials. Further, since the process produces virtually no waste and reuses existing industrial waste (rubble and glass), it offers environmental benefits as well as efficiency gains.[11]

These efficiency gains are significant given the increasing popularity of factory-built homes. US construction firms are starting to consider prefabrication possibilities, wherein homes and buildings are constructed by robots on a factory floor. According to the Wall Street Journal, such factory-built homes are of particular popularity in Sweden and Japan, where 40% and 16% of residential buildings, respectively, are built with prefabrication.[12]

6 Avontus. (2019). 'New Scaffolding Robot and the Acceleration of Digital Transformation in Construction'.

7 Vox. (2017). 'The construction industry is short on human workers and ripe for a robotic takeover'.

8 McKinsey. (2017). 'Reinventing Construction: A route to higher productivity'.

9 Avontus. (2019). 'New Scaffolding Robot and the Acceleration of Digital Transformation in Construction'.

10 Roland Berger. (2016). 'Digitization in the construction industry'.

11 Ibid.

12 Vox. (2017). 'The construction industry is short on human workers and ripe for a robotic takeover'.

According to PwC (2016), using drones for business services has an addressable market of $127bn, of which $45bn is for infrastructure projects.[13]

In the construction sector, drones are increasingly being used for tasks such as site inspections and surveying of stockpiles, which can span over large geographical areas. According to a surveyor at Whitaker Contracting Corporation, the volume of stockpiles at quarries can be accurately measured in 10 minutes using drone technology, as opposed to two days – the time it would take without the use of a drone system.[14]

In addition to drones, robotics and 3D printing technology, more commonly used digital enablers including mobile applications and analytics are also being using in construction to achieve significant efficiencies.

According to research by McKinsey (2019), digital transformation can result in productivity gains of 14% - 15%, and cost reductions of 4% - 6%. For example, one company implemented a real-time feedback mobile application, allowing site teams to tag defects against specific elements and store the information in a single project repository. The resulting improvement was a 12% reduction in rework hours at the job site, achieved through improved communication between the site team and the supplier.[15]

Similarly, a further company used advanced analytics methods to analyse past tender data and identify ways of optimising tender selection and pricing. As a direct impact of that, the company improved its project margins by 3% - 5%.

13 PwC. (2016). 'Welcome to the era of drone-powered solutions: a valuable source of new revenue streams for telecoms operators'.

14 Ibid.

15 McKinsey. (2019). 'Decoding digital transformation in construction'.

4. Industries in practice

To supplement the literature review, we also consider recent industry data for each of the "in scope" sectors.

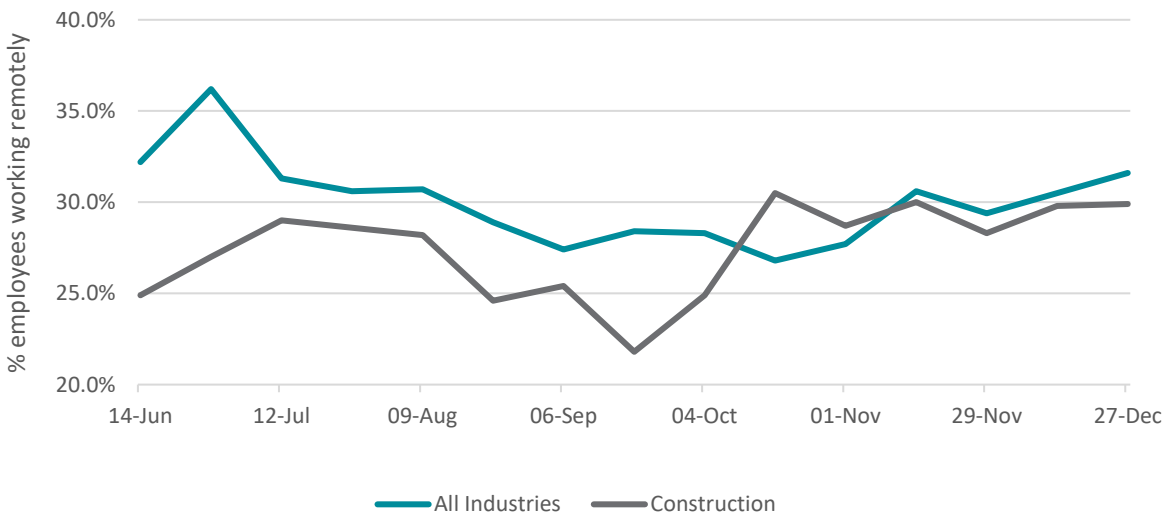
We use ONS data gathered from the voluntary fortnightly business survey (BICS)[16], which looks at financial performance, workforce, trade and business resilience across UK sectors. In the construction sector, this looks at the activity of businesses operating in civil engineering, housebuilding, property development and specialised construction trades, including plumbers, electricians and plasterers.

Remote working in the construction sector

In the context of this research, it is particularly relevant to look at the data pertaining to remote working, and the associated gains and challenges that UK businesses have experienced.

Figure 2 sets out the proportion of construction sector employees who were working remotely as opposed to at their normal place of work from mid-2020 to the end of the year. It also shows the average across all industries in the UK.

Figure 2: Proportion of construction sector employees who are working remotely as opposed to their normal place of work



Source: BICS and Cebr analysis

Owing to the nature of work in the industry, it is not surprising to see that for most of the time period, the proportion of employees in the construction sector who were working from home was lower than that of the UK average. Working from home appears to be highest during the second UK lockdown from the end of October and through November 2020 when the proportion was around 30% - in line with the UK average.

According to BICS survey data from the middle of December 2020, approximately 11.7% of construction sector businesses reported that more of their staff has been working at home as

16 ONS. (2021). '[Business insights and impact on the UK economy: 14 January 2021]'.

a result of Covid-19, with less than 1% reporting an increase in productivity (as compared to the ‘all industries’ average of 8.4%).

Despite this, approximately 6% of construction sector businesses intend to use increased homeworking as a permanent business model going forward. Of these, 43% cite a reduction in overheads as a reason for doing so, and approximately 15.5% cite a reduction in sickness levels, a little above the ‘all industries’ average of 14.5%.