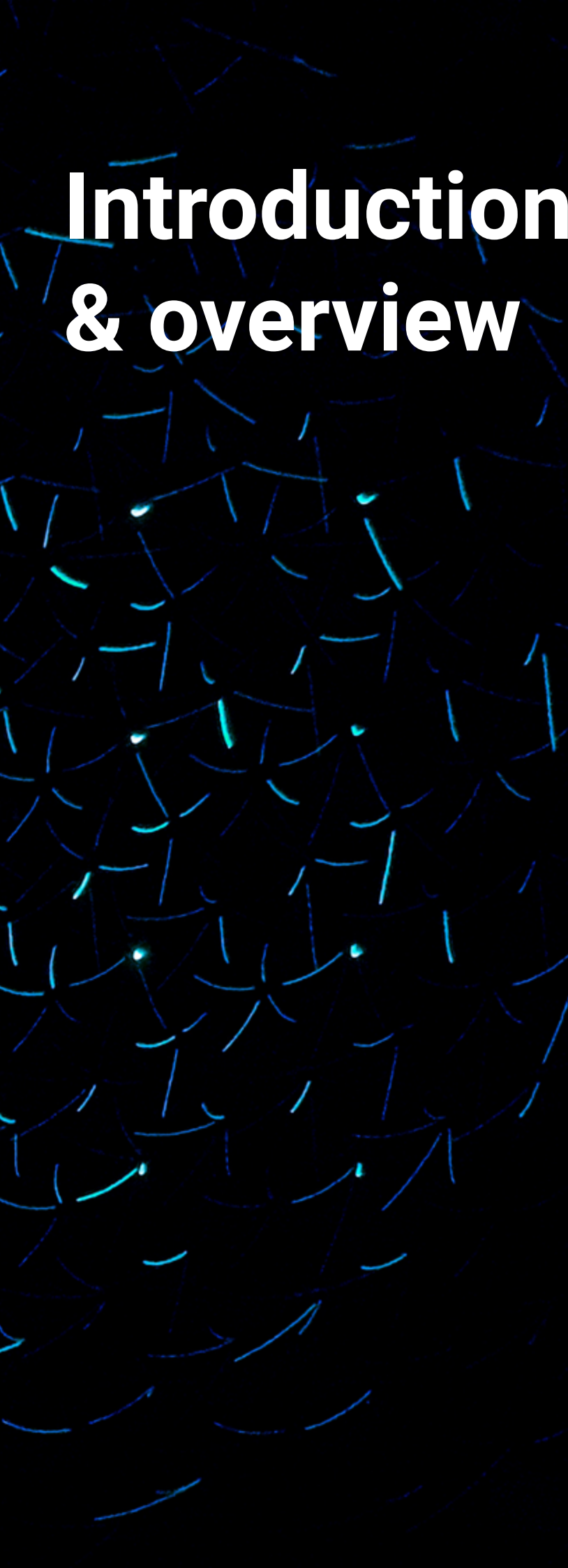
UK 5G Innovation Network

# Vertical Extension Project 2022

# Insights report

# Contents

# Introduction & overview



*The aim of this report is to consolidate and present the findings from the industry and supply-side consultations we have hosted across UK5G's four target verticals.*

*In this report, we have taken a horizontal approach, with findings and recommendations tailored to each sector and grouped accordingly. In accordance with the rest of the campaign, this report aims to identify the key characteristics of these verticals.*

*By understanding the barriers to 5G adoption from both a supply and a demand perspective and beginning to highlight areas of focus for barrier busting we can establish the ways in which comms campaigns and process changes could further support the 5G rollout across the UK.*

*This report summarises insights and opinions conveyed to UK5G over the course of a series of consultations and workshops. The content contained in this report should not therefore be read as the opinions of UK5G.*

# Top line findings & key takeaways

## Market maturity

It was highlighted in the supplier consultations that the current issue with 5G deployment is not necessarily education (although it was noted there are still sizeable gaps in sector knowledge). Rather it's a case of the market, including supply models, needing to mature, costs to come down, processes to be standardised, and regulations to be agreed. As well as education on what 5G can do and how best to go about deploying it, it's vital for UK5G to provide insights into the changing market dynamics of 5G such as the causes for pressures on pricing, the timelines for supply chain issues and hardware availability. This transparency and insight will only help industries trying to plan out their connectivity needs and a roadmap for advance connectivity.

On the public sector side, the Digital Connectivity Infrastructure Accelerator (DCIA) programme was identified as a key pillar in supporting the rollout of 5G communications networks – particularly the fact that DCIA looks at existing infrastructure and assets that might be available to support public sector initiatives. The programme could become a useful resource for smaller private operators in the space – which all sectors recognised as critical for the SME market - as the market matures, providing a single version of truth on existing infrastructure and guidelines on how to access and deploy across it.

**Supply models need to mature as they are too expensive for SMEs and the integration market is seemingly difficult to access for smaller vendors due to pricing structures.**

## Stalemate on stackable use cases and commercial deployment

Consolidating or stacking use cases together was repeatedly highlighted as a route to investment and a safer bet for guaranteeing an ROI on 5G. In addition, by painting a clearer, more consolidated picture of device and equipment demand for vendors, stackable use cases could help the entire 5G market to become more stable and mature. The challenge is that thinking of 5G use cases in a stackable way poses huge challenges.

Firstly, it forces organisations to collaborate across lines and jurisdictions that have not traditionally worked together. In many cases this can include navigating public sector processes or collaboration with private sector competitors.

Secondly, stackable use cases require long-term thinking and increased upfront investment for a longer term pay off. The high prices of much 5G equipment, combined with a market that is firmly occupied by early adopters, means the risk of taking this approach is simply too high currently for many organisations.

We also observed much discussion around the concept of stackable use cases but few tangible examples of where or how this can be done in practice. We need to be careful this doesn't become the latest 5G hype.

## Spectrum sharing

Both industry and suppliers are missing key knowledge and clear instruction of what is possible when it comes to spectrum sharing, understanding what the process is, where to start and where the responsibility lies. This is an issue that needs to be resolved and simplified to make private networks more viable. There were calls to increase the speed of licensing in order to enable pop-up spectrum for short term events at shorter notice. Possibly even automating the processes of acquiring local area licenses for spectrum. Without this practical change, spectrum sharing risks being nothing more than an R&D tool.

It was suggested that DCMS should develop national guidance on access rights/access levels for 5G infrastructure as well as spectrum; and of course the DCIA project is exploring this to an extent. There is also potential to use relevant trials and testbeds to better showcase scalable spectrum sharing in practice, laying down best practice and demonstrable learnings for all industries and vendors.

## The high costs of working with MNOs

The cost of of mobile network operators providing private or hybrid networks was identified as being still prohibitively high, particularly highlighted in the H&SC supplier consultation. A general reduction in cost of 5G enabled devices and network equipment is required to bridge the gap, encourage the building of neutral hosting networks and deliver connectivity to customers. Many highlighted the unavoidable fact of the high auction prices for spectrum limiting the secondary market, with MNOs focused understandably on recouping their costs.

There was a definite tension on this point with MNOs in all the consultations. Other suppliers were frustrated at the high margins added by MNOs. Industry partners were frustrated by the MNOs reluctance to engage with certain sectors and stated they were hoping for even more support and input through the 5G trials and testbed projects.

Consolidating use cases, and therefore demand, was highlighted as a way for the MNOs to gain a better, more stable understanding of the demand for devices across a fragmented market and react accordingly. DCMS could consider how to be a voice for smaller companies across the 5G market, speaking up for the very many SMEs that do not have the operating capital or personnel to navigate the 5G market or access the benefits of 5G.

# Vertical takeaways

# Transport & Logistics

**A diverse sector, from secure ports to public transport, with diverse use cases**

- Ports in particular have substantial levers to pull on to drive 5G adoption. These include developing a safety-first culture which values automation and safety systems, both of which benefit from the low latency and high bandwidth connectivity offered by 5G.
- Ports and logistics operations also have the advantages of typically being broadly closed environments yet dispersed across wide areas, limited public access, and simple settings for private network deployment.
- Public transport use cases on the other hand tend to either be public-facing or needing to operate with the public in mind – whether that's delivering services and experience to passengers or using 5G connectivity to navigate and monitor connected vehicles. They are much more reliant therefore on a ubiquity of coverage that requires far greater public network rollout than we currently have.
- This analysis chimed with the supplier consultation in which we heard that the 5G opportunity with the sector is still "early stage", with the main market opportunity focused on ports, airports and manufacturing facilities.

**Public transport has an opportunity to become a vital pillar of a civic network based around 5G connectivity**

- As with the Health and Social Care sector, the challenge for public transport organisations is that stackable uses cases need to span across multiple departments and jurisdictions to be effective and commercially viable. Recognising this is a significant step forward, but coordinating these efforts is likely to be a challenge.
- It was also reported that there is an inherent culture gap preventing many public transport organisations and departments from coordinating with each other, utilising existing infrastructure and realising how use cases might fit into a connected civic network ecosystem.

**The limitations of the public 5G rollout**

- Given the dispersed nature of most public transport deployments many use cases are functionally dependent on the rollout of standardised 5G networks across the country. As it's unfeasible to invest in private networks on this scale, delays in the public rollout have created a backlog on 5G adoption.

- While many private 5G deployments offer a more complete range of functionality for network slicing, upload and download optimisations, public networks are approximately 2/3 years away from reaching parity. In many respects public networks are still in the “foothills” of 5G.

**Understanding when and why 5G is the right connectivity choice**

- In transport and logistics, 4G and Wi-Fi are both highly capable alternatives to 5G, but where 5G might increasingly be the right option is as more passengers carry 5G-capable devices. Moving these customers onto 5G allows organisations to offer improved connectivity experiences, reducing the load on legacy networks and connectivity. Similarly for logistics, in outdoor environments where high volumes of data need to be securely shared in real time, 5G is likely to be the preferred option.

- Suppliers highlighted the impact that “drive by wire” and autonomous vehicles have had on driving use cases and deployment of 5G and advanced connectivity. Again, these use cases depend on high upload, not just download speeds, as it is vitally important to get data off vehicles and back to the remote operator.

**There seems to be a lack of use cases that would clearly benefit from 5G. There is still a perception within public sector transport organisations that 5G is not their responsibility or concern, considering it instead the MNOs’ responsibility to deploy and enable 5G infrastructure or equipment. The challenge is that MNOs will go where the business case makes sense, not necessarily rural or remote areas.**

# Manufacturing

**Value-added technologies are driving transformation and 5G adoption**

- Manufacturing businesses are increasingly interested in getting more value out of their data, using it to improve operations and output. For many, Industrial IoT vendors are bundling cloud-based AI, ML and insight generation products. Their key aim is to bring as many sensors online as possible, connected via a Wide Area Network, and they are broadly agnostic as to which data transports they use. This presents a key opportunity to introduce 5G to more use cases as the connectivity solution for connecting IoT.

- Another key element here is Augmented Reality, a technology which the industry has readily adopted for use in both training and operations. While this can function over Wi-Fi 6, a key differentiator for 5G is security which is something that manufacturing businesses are keen to see more clearly addressed in use cases, and 5G trial findings.

- Suppliers echoed that many connectivity deployments involve coordination with existing IoT devices and developing bespoke solutions to integrate legacy equipment/networks.

**Working alongside legacy and high-cost equipment**

- When it comes to use cases, manufacturers are particularly interested in examples that demonstrate the readiness of 5G to allow for retrofitting, compatibility with legacy technologies and the practical limits of 5G's use in time critical applications. This is likely due to the long lifecycle and high expense of manufacturing equipment making it unfeasible to replace equipment to allow for 5G connectivity.

- Learnings on time-critical applications are likely to come from health & social care as well as some logistics use cases.

- Similar to Creative Industries and Logistics, the supplier sessions emphasised the importance of uplink speed, not just download, in many use case deployments. The challenge is that vendors have not necessarily developed or emphasised the uplink capabilities of their equipment, instead focusing on the more consumer-adjacent benefits of download speed.

**Security concerns**

- Security concerns were particularly prevalent in the Manufacturing and Health & Social Care verticals. Many IT leaders in these sectors fear that 5G connectivity (and any radio-based data transport option) will increase the attack-surface of an organisation. Despite reassurances, many still view 5G as inherent less secure than cabled infrastructure.

- Although it's been said that 5G is "secure by design", security departments and business leaders are keen to see demonstrable proof and tangible use cases showing that. Critically, articulating what that "proof" might look like, proved challenging.

**An industry heavily invested in fibre**

- Manufacturing has a long-held preference for fibre as a means of data transport. The industry is heavily invested in fibre and a mindset shift is needed for businesses to see the value and need for radio data transport.

- While fibre can handle high bandwidth, it does not enable the reconfigurable manufacturing environment that many businesses are trying to move towards in the coming years. Allowing for reconfigurable and flexible factory floors means expensive tooling and machinery can be upgraded and repurposed, extending its lifecycle and reducing operational costs.

**Understanding when and why 5G is the right connectivity choice**

- In manufacturing, a major mindset shift is needed to see the value of radio data transport and 5G specifically. The increasing drive for reconfigurable and flexible factory floor layouts make mobile connectivity far more convenient and valuable than fixed fibre.

- It was also noted that manufacturing as a sector seems to more readily accept and understand the concept of stackable use cases. At the same time, it was one of the few industries that showed a focus on developing discrete applications for 5G that might stand alone but can be scaled up effectively to deliver maximum impact or ROI.

- The cost of living crisis was widely recognised as a key motivator for the manufacturing industry to turn to other methods of saving money and introducing efficiencies. 5G has benefited from this as a technology and both industry and suppliers have noticed that advanced connectivity has become a more attractive business case as cost savings and energy efficiencies have been prioritised. This may well be the one use case that holds up outside of the stackable use case model.

> **A lot of SME manufacturers are interested in deriving better value from data in order to improve their operations. Industrial IoT vendors are offering cloud-based AI and ML insight products. Many also do a pick and mix approach, harvesting data from existing sensors, deploying new ones and providing the connectivity (often via WAN) to bring them online. These vendors however are agnostic on the data transports they use and could be well placed to sell in 5G where appropriate.**

# Health & Social Care

**Stackable use cases through the lens of a civic network**

- While the overlapping value proposition of stackable use cases is an essential component for attracting investment across all sectors, public sector verticals such as Health & Social Care (H&SC) and public transport have the opportunity to integrate with multiple public services to build a civic network on 5G infrastructure.

- This aligns with the public sector's long-term strategy to shift from providing just healthcare, to providing a digital public service across both H&SC. The creation of Integrated Care Systems (ICS') is already bringing together health and social care under one roof.

- For H&SC, there is an opportunity to layer in education, transport, policing, blue light services and other public services. In this way, 5G can help the public sector to take a holistic approach to social inequalities and the digital divide – all enabled by the stackable use case of a civic network.

- It is important to note that civic networks seem to present a more complex proposition than stackable use cases in private sector organisations. Civic networks may require a mix of funding models and greater systemwide investment, alongside more collaborative development of use cases, all of which poses a significant challenge for public sector organisations.

- Suppliers were also very attuned to this opportunity, prioritising H&SC as a sector where 5G can deliver important and valuable results. For example, connecting COVID patients with loved ones and helping to address other important issues such as maintaining good quality rural healthcare services, reducing wait times, and enabling patient mobility.

**Procurement challenges persist**

- Notably raised by this sector to H&SC is the fact that procurement of 5G services currently must be done through Crown Commercial Services (CCS) which at present only offers 2-3 defined frameworks for purchasing 5G services. Unfortunately, these do not always match up with the requirements of the situation. This is causing frustration to both the sector and suppliers.

- Similarly, the list of approved platforms only includes connectivity suppliers or systems integrators – 5G equipment manufacturers are not listed, despite this being a valid route to market.

- H&SC organisations recognise that flexibility is also essential when framing their approach to procurement and 5G deployment. The technology, device availability and network capabilities available for H&SC organisations all evolve rapidly. The current system of procurement however seems to favour incumbent

- The recently published government digital strategy sets out an intention to make changes to procurement processes to aid the deployment of technology. We expect this to be a positive step. processes and technologies over innovation in either.

- Suppliers agreed with this complexity but found that it impacted smaller organisations more, hurting the industry by excluding them from accessing the better value and more innovative offerings that small vendors frequently provide. Small suppliers in particular identified that the only way they could reach a customer in this sector was through the MNOs, but this often meant the price was prohibitively high for the customer.

**Understanding when and why 5G is the right connectivity choice**

- For health and social care, mobility plays a key role in selecting 5G as opposed to other connectivity solutions when high volumes of data need to be sent at near real-time, from/to mobile locations. The need for secure data transport is another key reason why 5G might be the solution of choice as opposed to 4G or Wi-Fi.

- Suppliers to the sector seem well aligned on the need to start with the patient outcome. Technology and connectivity should not be seen as leading the engagement. Instead, it should follow the outcomes and needs of the organisation. As such, suppliers don't ask whether hospitals, for example, need a private network – they instead focus on what problem they are trying to solve. It was reassuring to hear suppliers leading with this line of thinking.

- Many claimed this focus and the lack of hype around 5G is what marks the sector out from others. This is also echoed by the sentiment survey, where H&SC respondents were least likely to perceive the benefits of 5G across any industry.

**When it comes to stackable use cases, the NHS and ICS' have to take the lead on developing and guiding those stacks. Integrated Care Systems across local authorities are the ideal place for that to happen – with evolution we'll start to see applications where people look for lots of simultaneous benefits to many parts of the community.**

# Creative Industries

**A fragmented industry with small businesses and diverse focus areas**

- More than any other sector, the Creative Industries in the UK are defined by fragmentation. The sector is made up of a high percentage of small businesses and freelance workers.

- As a result, few have the resources or time to enter into working groups and partnerships with MNOs, 5G equipment vendors and standards organisations. This can lead to the sector being deprioritised by the 5G industry, in favour of more consolidated industries such as healthcare or manufacturing.

- This also makes it harder to identify industry tech experts/connectivity specialists that could become sector representatives in discussions around the 5G rollout or agreeing crucial standards/regulations.

**Consumer-facing, but more than B2C**

- All businesses must consider the connectivity requirements needed to reach end customers, making the public 5G rollout an essential lynchpin of developing connectivity capabilities within the sector.

- The Creative Industries are facing a similar challenge to Transport & Logistics in this regard. Developers in each sector must decide whether to build software solutions that leverage the speed and connectivity of new 5G devices (pushing more rendering to the local device) or supporting older, less capable devices (pushing more rendering to the cloud at increased cost).

- Although distributing content and experiences to consumer devices is a core use case for the Creative Industries, the industry is just as focused on the value of high-speed uplink for backhaul and process improvements.

**A sector unsure how to get started with 5G**

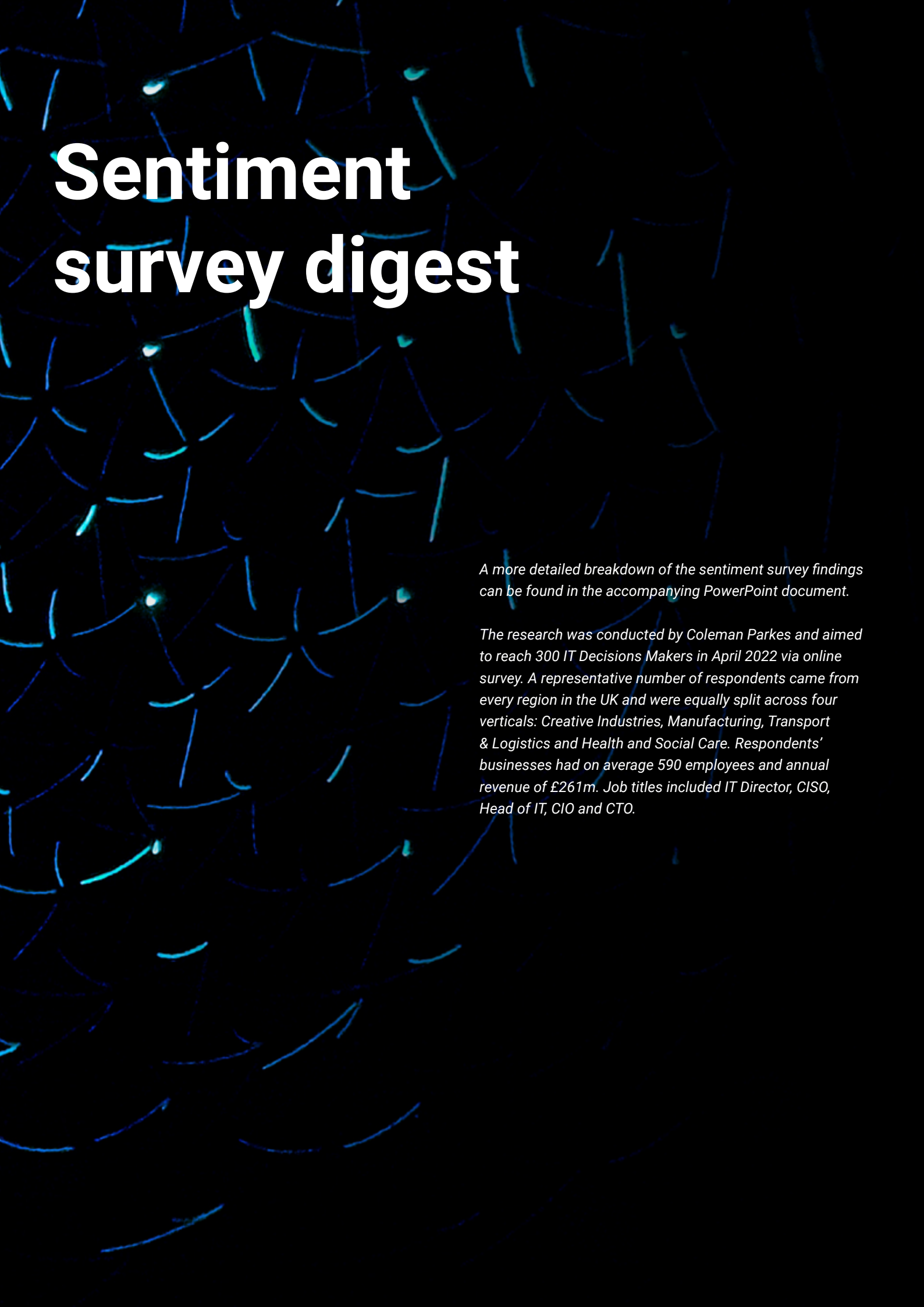
- Across the Creative Industries vertical there is a lack of understanding on how to start a 5G pilot, build a commercial use case and get connected. Aside from the very biggest players, start-ups and SMEs will often find themselves working with hyperscalers such as AWS/Azure with whom they have existing relationships, rather than trying to interact with MNOs or NH providers.

**Understanding when and why 5G is the right connectivity choice**

- Given the variety of both type and size of creative businesses in the UK, choosing 5G vs other connectivity technologies typically comes down to the requirements of the application and the size of the investment. The availability of 5G devices and the complexity of the experience's businesses are keen to deliver are essential to considerations for consumer-facing applications.

- For B2B or backhaul applications, private 5G networks excel at delivering high bandwidth upload and download meaning more functionalities can take place on the move or at remote locations. The importance of delivering real-time connectivity is another deciding factor for the sector.

**Hardware is tough to get hold of so we're always two releases behind. Suppliers need to make a decision on whether they support all devices or only new ones. We need broader industry collaboration in order to be taken seriously as a sector. The fragmented nature of our industry reduces the likelihood that there is a Creative Industries representative in discussions around 5G and spectrum standards.**



# Sentiment survey digest

*A more detailed breakdown of the sentiment survey findings can be found in the accompanying PowerPoint document.*

*The research was conducted by Coleman Parkes and aimed to reach 300 IT Decisions Makers in April 2022 via online survey. A representative number of respondents came from every region in the UK and were equally split across four verticals: Creative Industries, Manufacturing, Transport & Logistics and Health and Social Care. Respondents' businesses had on average 590 employees and annual revenue of £261m. Job titles included IT Director, CISO, Head of IT, CIO and CTO.*

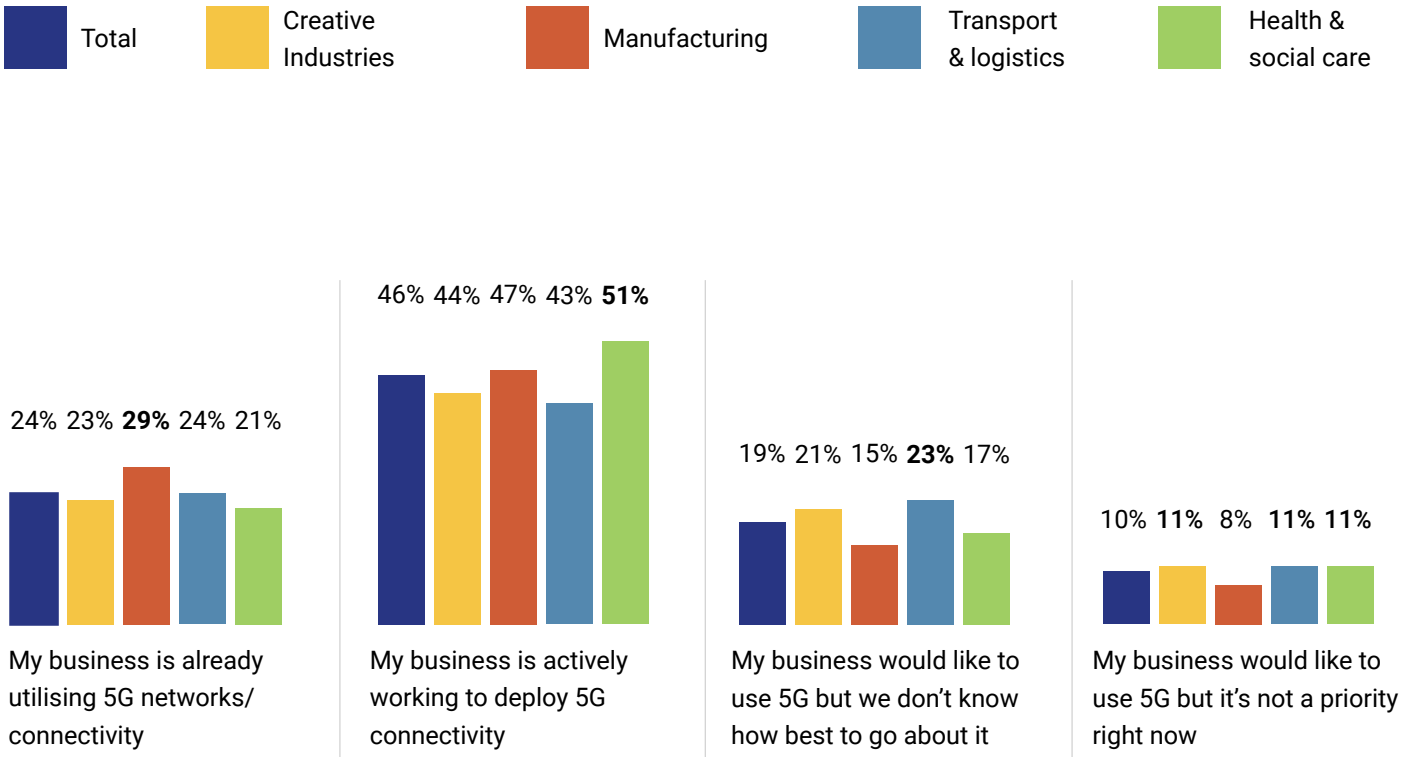
# The State of 5G Adoption

A quarter of respondents are already utilising 5G networks (24%) with almost half (46%) actively working to deploy it. A further 19% would like to use 5G but are struggling to go about it. (Q1)

On average, approximately 60% of LOB heads, IT dept leads and leadership teams are pushing businesses to explore and adopt 5G, and making the commercial case for 5G deployment (Q2)

Most businesses display a confident understanding of the benefits of 5G (73%) and how their business could deploy it (70%). Two thirds (66%) recognise the impact that 5G could have on sustainability efforts and improved customer experiences (65%). (Q7)

Most businesses think the Transport & Logistics sector would benefit the most from deploying 5G connectivity (53%), followed by Manufacturing (42%), the Creative Industries (38%) and finally Health & Social Care (29%).



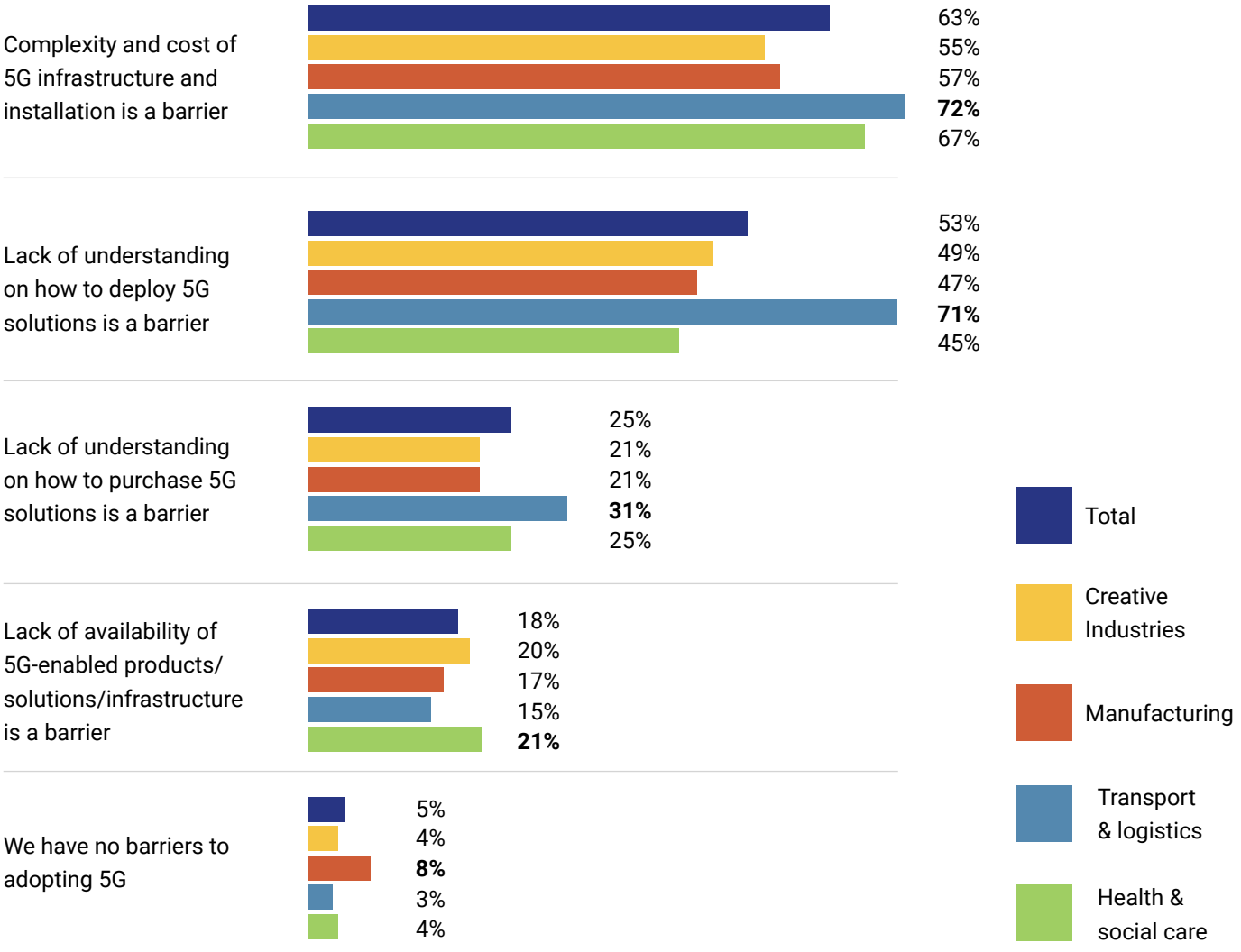
# The Barriers to Adoption

The top barrier to 5G adoption is the complexity and cost of 5G infrastructure, installation, and integration (63%). This was followed by the lack of understanding on how to deploy 5G solutions (53%) and concerns over the organisational/ network security of 5G connectivity (47%). (Q3a)

Half of all businesses surveyed agreed that 5G is not an urgent business requirement so is unlikely to be prioritised over other technology and/or infrastructure investments (50%). However only 23% believe their existing connectivity investments are sufficient for the future (e.g. 4G and Wi-Fi6) (Q3b)

45% believe their organisations are very interested in investing in 5G, and on average the timeline for investment is in the next 13 months. (Q4)

For the majority of businesses, a slower pace of technology adoption is preferred. 56% of businesses wait for technologies to become established before adopting them, and only 32% of businesses agreed that adopting new technologies early is a source of competitive advantage for them. (Q6)



# Recommended Guidance and Support

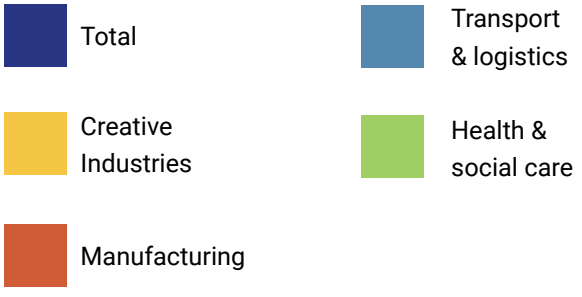
When it comes to encouraging or incentivising investment in 5G, the top factors include more examples of industry specific (66%) and general (62%) 5G benefits, followed by guidance on 5G integration with existing tech (58%) and best practice guides for 5G deployment (51%) (Q5 – Top 3 rank).

Businesses are happy to look outside their sector for inspiration and guidance. 62% of businesses would value reading case studies and best practice examples of 5G deployment from other industries and 61% often find inspiration for new tech investments from other sectors. (Q6)

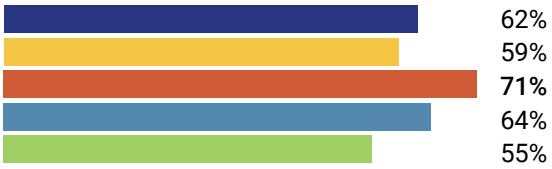
However, 40% agreed that most examples of 5G benefits / use cases currently sound theoretical or impractical and 37% said they understood the benefits in theory but can't see how it could help their business. (Q7)

The majority of these businesses would turn to innovation networks and membership organisations such as UK5G as a primary source for both understanding the commercial benefits of 5G connectivity (58%) and practically accessing and deploying 5G connectivity (53%). (Q8)

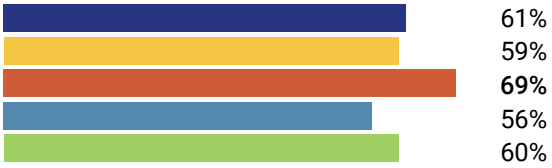
This was followed by big tech companies (46%) and MNOs (40%) for understanding the commercial benefits – and tech system integrators (49%) and MNOs (40%) for understanding practical deployment. (Q8)



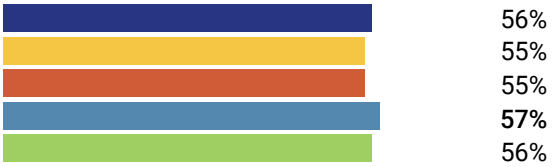

I would value reading case studies and best-practice examples of 5G deployment from other industries



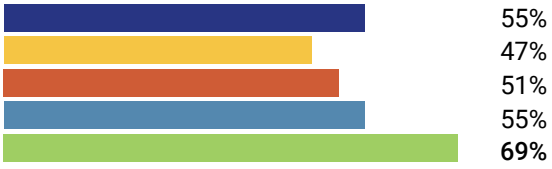

I often find inspiration for new technology investments from other industries/sectors



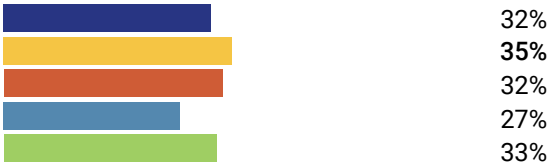

I wait for technologies to become established/mature before adopting them in my business




I'm only interested in learning from what other businesses in my industry have done




Adopting new technologies early is a source of competitive advantage for my business



# Key takeaways

**Transport & Logistics**

- Most likely to view complexity and cost of 5G deployment as a barrier (72%)
- Most likely to list lack of understanding on 5G as a barrier (71%)
- Most likely to consider lack of understanding on how to purchase 5G solutions as a barrier (31%)

**Manufacturing**

- Most likely to have already deployed 5G (29%)
- Would most value case studies and best practice examples from other industries (71%)
- Most likely to find inspiration for new tech investments from other sectors (69%)
- Most likely to turn to MNOs (51%) and big tech companies (36%) to understand how to access and deploy 5G

**Health & Social Care**

- Most likely to be only interested in learning from other organisations in the same sector (69%)
- Most likely to perceive lack of available 5G equipment as a barrier (21%)
- Most likely to turn to government organisations and regulators to understand how to access and deploy 5G (48%)

**Creative Industries**

- Most likely to consider adopting new technologies early as a source of competitive advantage (35%)
- Least likely to agree that 5G has the potential to benefit the UK economy (60%)
- Most likely to trust white papers (78%) and innovation network guidance (52%) to help them understand how to deploy 5G

# Vertically consistent findings

*All sectors are navigating a set of core functional concerns regarding 5G acquisition and deployment, to varying degrees.*

## Hardware availability

- Due to supply chain issues and the global chip shortage, there are lead times of up to 12 months or more on 5G compatible devices and components, meaning that many organisations in a position to invest in 5G will have to wait an even longer time before they can be installed and start generating ROI.
- Many are struggling to find 5G native devices for even simple tasks. There is clear demand for plug and play or off-the-shelf solutions compatible with 5G technologies.
- Compounding this, many organisations fear that investing in any form of 5G infrastructure at the present time runs the risk of their technology becoming obsolete or failing to integrate with existing/future technologies. This is in response to the rapidly evolving nature of 5G infrastructure and technology, combined with a lack of clarity on 5G and spectrum standards, at a national and international level.

## Lack of skills and familiarity with 5G connectivity

- All sectors mentioned a lack of skills and confidence with 5G networks and infrastructure, predominantly driven by difficulties acquiring 5G native equipment and properly integrating it with existing technologies. This is a new skill set for many organisations.
- Ongoing skills challenges continue around managing the environment in which 5G products are deployed. Key concerns continue around the security and availability of 5G networks, with many organisations concerned over the additional skills they might need to maintain the resilience of their 5G infrastructure and looking for additional assurances from 5G vendors.

# Pricing

- Across the industry consultations we saw limited understanding of 5G pricing, particularly on the impact of a scaled rollout on pricing models. For instance, what is the impact on prices when deploying a second or third network? How can existing infrastructure be used to mitigate some of the costs of 5G network deployment? Perhaps more surprising, is that this lack of clarity and understanding was also reflected in the supplier consultations.
- More clarity is needed from MNOs and suppliers on pricing structures, and this has an important role to play in helping organisations develop their commercial models and stackable use cases.
- Similarly, the cost of comparable 5G infrastructure needs to come down to as close to Wi-Fi routers as possible to avoid pushing more customers away from 5G simply because of affordability.

# Spectrum confusion

- There is little harmony on a global / international scale regarding spectrum access, or 5G standards. This lack of clarity means it can be challenging for organisations of every sector to work with global/international vendors, particularly if they are multinational businesses or plan on extending their connectivity into other regions. A lack of clear guidance and international consistency limits the extent to which 5G best practice can be replicated elsewhere.
- We also heard a lot of confusion and even a lack of awareness about the ability to apply for shared spectrum. Vendors expressed frustration about Ofcom processes but more surprisingly, many also demonstrated limited understanding about who should apply and how to do so. On the demand side, many were unaware that shared spectrum was even an available option.

# Cross-sectoral learnings

- Across all our fact-finding sessions we repeatedly heard the willingness of businesses and organisations to learn from use cases and deployments in other or adjacent sectors. This was echoed by the findings of the initial sentiment survey executed in April 2022.
- 62% of businesses stated they would value reading case studies and best practice examples of 5G deployment from other industries and 61% often find inspiration for new tech investments from other sectors.

# Understanding the vendor market

- Businesses of every vertical were keen for help in understanding the options for 5G deployment that range beyond public network operators.
- More information is needed on the offerings and capabilities of smaller service, neutral hosting providers that can bridge the gap between businesses and MNOs.
- All sectors agreed that there's no point paying a premium for 5G unless it meets the specific needs of a use case. In many cases, 4G and Wi-Fi are both seen as highly capable alternatives.
- Suppliers observed that businesses who clearly understand what they want from their connectivity will typically go to an MNO for a private network. But this may be a more expensive option compared to other vendors, in part due to offering 'carrier grade' networks. All sectors expected that as understanding of 5G benefits and the availability of 5G native devices improves, more intermediaries will emerge offering cloud-based solutions that feature 5G connectivity as the data transport method; it was anticipated this would offer more affordable routes to adoption. MNOs also reported that work being undertaken by the FRANC projects is likely to help them to diversify their supply chain, which is also widely expected to lead to a reduction in costs.
- For many businesses, the method of data transport should almost be incidental to the benefits they see from moving to cloud-based technology.

# The role and value of stackable use cases

- Every vertical consultation raised the importance, value and challenge of developing "stackable" use cases in order to justify the expense of 5G investment.
- These stackable use cases can often span multiple departments, jurisdictions and even organisations. But when coordinated properly, these use cases make for effective and commercially viable business cases for investment.
- By combining the ROI of multiple use cases across the same 5G infrastructure investment, businesses and organisations can reduce the pressure of any single use case to deliver outstanding results.
- Additionally, by understanding and working towards stackable use cases, businesses and organisations can start to shift how they think about 5G and infrastructure investment as a whole.
- Grouping together overlapping benefits and use cases encourages these organisations to think in a more digitally enabled and connected fashion, looking for additional value that could be extracted from a single deployment, other use cases and issues that could benefit from 5G connectivity.

# The value and limitations of upper band n77

- n77, also referred to as 3700MHz or the 3.7GHz 5G band is the most commonly tested and deployed 5G frequency in many countries. This is due to its common availability, in the higher spectrum range than that used by existing 3G and 4G networks.

- In the supplier consultations we heard that the strict power regulations around upper band n77 often mean it can't provide the range required for many use cases, and when used can often set limitations on the nature and functionality of the deployment.

- Additionally, the upper band of n77 spectrum that has been approved for sharing in the UK is not widely used in other countries, meaning there's little scope for learnings, expansion or scaling use cases internationally.

- A market study conducted by UK5G in partnership with Real Wireless revealed that although n77 compatible hardware availability is a challenge, the main supply-side challenges are device software development, testing, and MNO support. These kinds of challenges are indicative of an early-stage market, a takeaway that resonates across this report.

- As noted elsewhere in this report, the pricing of 5G equipment is several times higher than equivalent 4G modules.

- It was also noted that the power limitations of the shared access bands preclude rural applications, which chimes with much of the feedback from both the supply-side and industry consultations.

- It was suggested that the consolidation (or stacking) of n77 use cases could make it easier for vendors to understand and improve the volume requirements of the market, reducing supply chain waiting times.

# Supplier feedback: commonalities and disconnects with industry

# Transport and Logistics

Although the prevalence of port and airport-based use cases was echoed by both the suppliers and industry consultations, the extent to which suppliers are focusing on logistics rather than transport is revealing.

It was abundantly clear that use cases for 5G in public transport are more complicated and harder to build a business case for. This was largely due to the dependence on public 5G networks to reach passengers, combined with the relative ease of deploying private networks in secured environments such as ports, airports and depots.

Suppliers are not convinced that Transport and Logistics organisations are ready to think in terms of “stackable use cases”, worrying that private sector businesses in particular struggle to collaborate with other organisations that might benefit from mutual investment.

Another clash was around timelines for ROI and the difficulty of long-term planning around connectivity deployments. Suppliers were keen for industry to view connectivity choice and ROI as a roadmap for the future. While they recognise the need for stackable use cases, suppliers suggested that a way to reduce the complexity of developing them would be to build them over time, having a route to ROI that spans a number of years.

The overall appeal was for the industry to be more open regarding future investment in 5G, adopting a more forward-thinking approach when it comes to connectivity selection. Currently 5G is being driven by early adopters who are opportunity-led, rather than commercial-led, with the IT/Tech leader typically driving the sale rather than a commercial officer.

> **The quickest way to get value from 5G is to allow for the removal or relocation of the safety driver in remote vehicles. Latency becomes critical at that point because of braking distances and timings on public roads and within logistics operations. This would require a big shift in the market but is one of the best ways to guarantee a return on investment on 5G, combined with huge efficiencies and savings across the industry.**

# Manufacturing

Although the latency improvements of 5G are widely touted by vendors and well received by the industry, the challenge suppliers are seeing is that vendors aren't always releasing the latency improvements and features that are expected.

Manufacturing suppliers emphasised the challenge of helping customers understand how to integrate 5G within their own operating environment. SMEs need to focus more on how they develop 5G-enabled operations, from deployment through to maintenance and security.

Suppliers highlighted that UK manufacturing is primarily SME-based and the vast majority of businesses only serve a few customers. As well as running slightly contrary to the assumptions from other industries, this also highlighted how it is challenging for these small, highly specialised organisations to adopt more agile, flexible approaches to connectivity.

There was open acknowledgement that the cost models for 5G today largely precludes SME manufacturers from being able to deploy.

> **Clarity on spectrum is really important. Every 18 months, 5G traffic doubles and we need to focus on expanding the availability of spectrum. Downlink has been the focus of much 5G marketing and development, but for manufacturing the focus needs to be more on uplink speed and capabilities. This enables more impactful use cases such as automation and remote control.**

# Health & Social Care

Smaller suppliers reported challenges when it comes to partnering with Health and Social Care (H&SC) organisations, potentially an extension of the procurement challenges that industry mentioned. Specifically, smaller suppliers find it hard to have a voice when selling into health and social care organisations, finding themselves excluded in favour of bigger tech companies and MNOs. Smaller organisations can bring real value, especially if the client doesn't have a large budget but the challenge is accessing the H&SC market and overcoming industry's concerns over their size, reliability and capabilities.

This was highlighted by the real-world cost of deploying a neutral host network with all four MNOs within a single location, with costs rapidly multiplying to over £250k before any networks and infrastructure have been deployed. Small cell, internet-based connectivity is an alternative but then interfacing with MNOs and regular mobile connectivity remains a challenge.

That said, even bigger organisations find accessing and selling to H&SC a challenge, despite the demand and services that already exist. The existing 5G and connectivity work that is done by MNOs and deployment organisations is often used simply as a technology showcase. As well as the potential lack of sustainability of this approach, the industry is still lacking real, scalable use cases that are delivering tangible impacts on patient outcomes.

Suppliers to the sector also perceive a conflict between the different types of 5G deployment - public, private, and hybrid - both in terms of how you acquire the spectrum if needed, and in how these networks can effectively interact with each other. This comes to a head, for example, when both shared access networks and a single MNO's spectrum are required to deliver both the coverage and the capacity of a use case.

> **"On skills, our experience is that Trusts do need external support with network building and operations. We also see a skills gap on the frontline, although this is often due to time constraints, not a lack of understanding. You can't generalise on frontline skills, but there's a clear focus on delivering care, not understanding and deploying technology. H&SC specialists are often not technologists, and they need to upskill substantially to implement something that helps deliver improved care outcomes. This is why support needs to be so tailored to individual deployments.**

# Creative Industries

It was highlighted in these sessions that smaller vendors are actually often more expensive that bigger ones such as Ericsson when it comes to providing equipment, running contrary to some of the feedback from other sectors. They also flagged the challenge of integrating a diverse range of supplier equipment including the challenge of training and technical support that covers this diversity. The FRANC projects were frequently referenced as being important to overcome some of these integration challenges.

Suppliers see most 5G demand from the sector coming around remote collaboration, allowing different teams to work in real time together at low latencies and collaborate on projects from different locations. This brings together a number of different initiatives such as reducing travel times, costs, and allowing businesses to use cheaper locations and a wider variety of talent.

It was clear that despite the broad array of businesses that make up the creative industries, suppliers are only really looking at a small sub-set: and even then, there was a sense that this is often not a priority sector compared to our other three sectors.

Suppliers highlighted the difference between lab grade and carrier grade equipment in 5G as something that the industry is yet to fully grasp. Where lab grade equipment is more available, more agile, quicker to deploy, and often at a lower price than carrier grade, it also brings with it engineering challenges and is hard to roll out at scale. Carrier grade equipment and infrastructure is simpler, and requires less maintenance, but is harder to get and more expensive as a result.

> **“There’s a big integration challenge for Creative Industries. The opportunity across the sector’s 6m SMEs is huge, and MNOs are working with vendors on possible solutions. Existing deployments are typically corporate customers deploying 3G/4G indoors. This is already quite expensive, approximately £60k for a single office floor. We need to get the price of 5G infrastructure down to Wi-Fi-level if we want to achieve our goals for 5G.**

# Summary & recommendations

*This report aims to consolidate the findings from both industry and supply-side consultations across UK5G's four target verticals. In preparing this report we have also produced targeted strategic messaging documents for each vertical which are available separately.*

*As a summary for this report, we have collated several broader brush recommendations for future activity. Each varies in degrees of scale and feasibility but all should be of value to a number of our UK5G target verticals.*

*These recommendations build on the identified barriers to 5G adoption from both a supply and a demand perspective and show how to break those barriers down and further support the 5G rollout.*

**A voice for SMEs in every industry**

- There were repeated suggestions that the DCMS consider how best to act as a voice for smaller companies across all industries. This could be in standards and industry forums such as 5GMAG and 3GPP meetings. This is to ensure the SMEs that make up the bulk of these industries are not left behind or excluded from the benefits of 5G.

**Digitise the processes for accessing shared spectrum**

- It was suggested that Ofcom work to improve the processes for accessing shared spectrum. This is currently a paper-based exercise where businesses need to call and manually check how their application is progressing. Digitisation would greatly streamline this.

**Improve the procurement process for public sector organisations**

- For public sector industries, it was recommended that the companies shortlisted on the Crown Commercial Services (CCS) platform be reviewed regularly, ensuring that new providers are added and that adoption frameworks are updated to meet the current requirements of public sector organisations.

- The recently published government digital strategy looks to already be addressing this and we should consider how we can communicate the details of this to the sector.

**Promoting smarter spectrum sharing and reuse**

- DCMS should do all it can to push for policy changes or activities that promote neutral hosting, spectrum sharing and spectrum reuse – this will benefit the public and businesses in remote areas that would be able to access or deploy spectrum that is not in use by the licence holder (MNO).

**An emphasis on moving from theory to practice**

- Help businesses and organisations of all verticals move beyond theory when it comes to use cases. UK5G can lead with demonstrable learnings and clear best practice examples when sharing use cases and deployments. Future trials and testbeds should prioritise scalable applications, discrete use cases, tangible results and demonstrable security improvements.

**Continued support of the Digital Connectivity Infrastructure Accelerator (DCIA) programme**

- A key pillar in supporting the rollout of 5G communications networks, the DCIA programme identifies existing infrastructure and assets that might be able to support other public sector initiatives. It is therefore of interest and relevance to Transport & Logistics and Creative Industries – both of which are to an extent reliant on public 5G deployment – and Health and Social Care. Ongoing dissemination activities by DCMS and UK5G should be mindful of this and present learnings and findings in a way that will resonate with these vertical audiences.

**Vertical-tailored dissemination of the FRANC projects**

- Similarly, the FRANC projects – or specifically their outcomes – are of interest to our vertical audiences too. Many of the challenges around cost could potentially be addressed – partially at least – by Open RAN architectures. However, today these pose a number of challenges for suppliers around security, integration and roaming. The FRANC projects are directly exploring and addressing some of these key challenges so engaging with suppliers of our verticals – and to a lesser extent the industries themselves – will be important so they can understand what developments mean for them: more affordable 5G options.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