Belfast

5G
INNOVATION REGION

5G ADOPTION TOOLKIT

Supporting businesses and industries in Northern Ireland to harness 5G to drive innovation and economic growth

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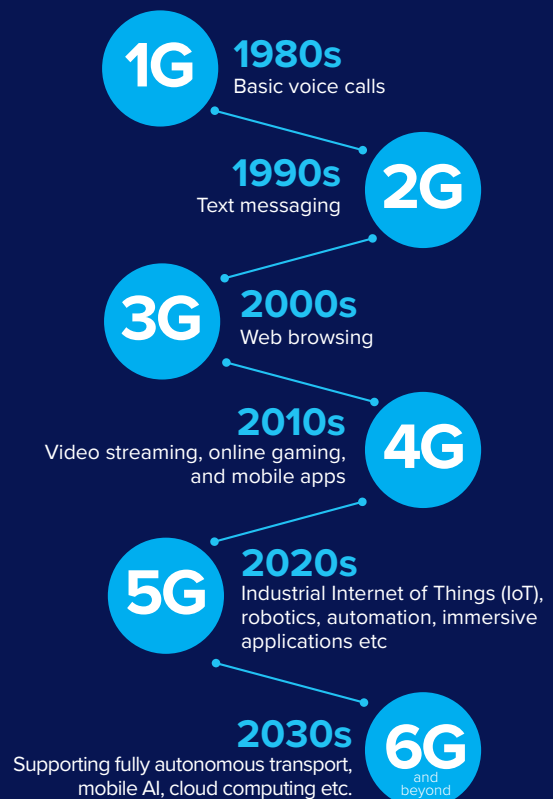### Resources, support and funding

Section 1

Introduction to 5G

What is 5G?

5G is the fifth generation of wireless communications technology. While previous mobile generations were developed primarily for consumers, 5G is about transforming industries, business and services.

5G is significantly faster, more reliable and has improved network capacity compared to 4G, offering greater upload and download speeds, as well as more consistent connections with guaranteed levels of service that can be reliably used for a variety of industrial and business applications.

The evolution of mobile networks

1G **1980s**
Basic voice calls

1990s **2G**
Text messaging

3G **2000s**
Web browsing

2010s **4G**
Video streaming, online gaming, and mobile apps

5G **2020s**
Industrial Internet of Things (IoT), robotics, automation, immersive applications etc

2030s **6G** and beyond
Supporting fully autonomous transport, mobile AI, cloud computing etc.

The 5G journey in Northern Ireland

Each new generation of mobile technology has a development cycle. 5G began to be deployed in Northern Ireland from 2019 but the more advanced features of 5G, such as 5G Standalone network slicing, only began being deployed from 2024. The full benefits and impact of this technology, and the innovative use cases that it will support, are only now beginning to be realised.

2019
Mobile Network Operators (MNOs) start to roll out non-standalone 5G in Northern Ireland, building on top of legacy 4G infrastructure and enabling faster speeds and capacity.

2020
Belfast Harbour and BT build the UK and Ireland's first private 5G network for ports – and the first private 5G network in Northern Ireland.

2023
Northern Ireland's largest 5G testbed goes live in Derry-Londonderry as part of the Smart Nano initiative.

The Belfast Region is designated a 5G Innovation Region by the Department for Science, Innovation and Technology to harness 5G to drive innovation and economic growth. Led by Belfast City Council, the Belfast 5G Innovation Region works with partners and industry to deploy a range of 5G use cases in key industry sectors.

2024
Mobile Network Operators start to roll out 5G Stand Alone (5G SA) in Northern Ireland, built using dedicated 5G equipment on all parts of the network. This supports more advanced use cases by enabling ultra-reliable low latency communications, faster speeds, and network slicing.

BT Group launches the first real-world deployment of 5G standalone network slicing capabilities over the public EE mobile network to support faster and more resilient mobile payments at the Belfast Christmas Market in December 2024.

2030
The UK Government target date for 'all populated areas' in the UK, including rural communities, to have standalone 5G.

2035
The date by which UK Government indicates that the widespread adoption of 5G could see £159 billion in productivity benefits.

How can 5G support Northern Ireland's economy?

World-class digital infrastructure underpins the digital economy and supports several key industry sectors across Northern Ireland. 5G is driving innovation and economic growth by supporting technologies such as cloud computing, edge computing, robotics, automation, IoT, Artificial Intelligence, and immersive technologies.

Key sectors that can benefit from 5G

Advanced manufacturing and engineering
Robotics, automation, IoT and AI can boost production, drive efficiencies, support real-time tracking and monitoring of assets, enable predictive maintenance, and improve health and safety.

Construction
Drones, Augmented Reality, IoT, robotics and digital twins can accelerate the design and construction of new buildings through real-time monitoring of equipment, more efficient site inspections and communication, and improved health and safety.

Healthcare
Wearable devices, telemedicine, real-time sharing of patient information, and robotics can support remote monitoring, diagnostics and treatment, providing better patient outcomes and an improved patient experience.

Agriculture
Drones and IoT sensors can monitor crop health and environmental conditions in real time, leading to more precise water, fertiliser and pesticide application, and optimising crop yields and supporting sustainable farming.

Creative industries
The high-speed connectivity and ultra-low latency of 5G means that it is incredibly effective for live broadcasts and remote production as it enables real-time interaction and high-definition screening.

Public services
5G-powered digital technologies can support traffic and car parking management, street lighting, and other smart city applications.

Energy and utilities
IoT can help to predict and analyse infrastructure and equipment faults quickly, reducing outages and downtime.

Fintech
The fast connectivity offered by 5G can improve the speed, security and efficiency of processes within financial services as well as allow for real-time data analysis, leading to increased productivity.

Transport and logistics
Autonomous vehicles, IoT sensors, drones and intelligent cameras can support the movement and real-time monitoring of goods and assets, leading to smart warehousing and advanced operations.

Benefits of 5G

Faster speeds

5G is much faster than 4G. It speeds up the time it takes to transfer large amounts of data, resulting in more efficient and quicker business operations.

Examples:
Manufacturing: Rapid real-time HD video quality control inspection of production lines.
Healthcare: Instant transfer of large medical imaging files.
Media: Upload/download of 4K and 8K video content in seconds.

Higher capacity

5G can support thousands of devices being connected simultaneously in a small area, enabling large IoT deployments. Connect every sensor, machine, and device in a facility simultaneously - from production line robots to environmental monitors, all communicating in real-time without interference.

Examples:
Smart factories: Simultaneous operation of automation systems, robotics systems, quality control, and worker safety monitoring.
Logistics hubs: Simultaneous tracking and control of numerous automated systems and vehicles.
Agriculture: Connected soil sensors, automated irrigation systems, and crop monitoring drones.

More responsive - lower latency

5G reduces the time it takes for data to travel to a device, lowering latency to milliseconds. Low latency is essential for industries and tasks where even slight time lags can impact safety or lead to financial consequences. Users can control machinery and systems with immediate response.

Examples:
Manufacturing: Precise control of robotic assembly lines with instant response.
Industrial maintenance: Real-time control of inspection drones in confined spaces.

Improved reliability

5G uses edge computing technology that optimises large data loads. This ensures that connections are not broken or interrupted when there are usage spikes, providing guaranteed levels of connectivity. Business systems stay connected even during peak operations.

Examples:
Production lines: Uninterrupted monitoring of critical assembly processes.
Logistics centres: Continuous tracking of thousands of items during peak shipping periods.
Power plants: Consistent monitoring of power generation equipment.

Flexibility

The flexibility of 5G means that networks can often be set up more quickly compared to traditional wired networks that require extensive planning and cabling. This can support more rapid deployment and reconfiguration of business operations.

Examples:
Construction: Rapid deployment of site connectivity for project duration.
Event location manufacturing: Quick setup of temporary production facilities.
Emergency response: Rapid deployment of connected command centres.

Remote access

5G's ultra-low latency delivers real-time communications with zero lag, offering better real-time decision-making off site. This can support industries that involve remote workers such as maintenance staff, engineers and technicians.

Examples:
Manufacturing: Remote expert troubleshooting of complex machinery.
Utilities: Remote inspection of infrastructure using connected drones.

Security

5G offers more advanced encryption capabilities, data privacy, authentication, and controlled access which are particularly beneficial in regulated industries like healthcare, manufacturing, and logistics.

Examples:
Defence manufacturing: Secure production data transmission.
R&D facilities: Protected testing and development communications.
Pharmaceutical production: Secure monitoring of regulated processes.

Mobility

Faster, more stable 5G mobile connections enable users to work flexibly. Access full industrial systems and controls whether on the factory floor, at a client site, or in a supplier meeting.

Examples:
Field service: Engineers accessing full diagnostic tools and documentation on-site.
Quality control: Inspectors conducting remote assessments with real-time data access.

Section 2

Practical steps to adopting 5G in your business

You may require additional advice and support to help determine the right 5G solution for your business needs. Mobile network operators, infrastructure providers and consultancies can offer tailored support and solutions to your business. You can find a list of potential suppliers on the UKTIN website at www.uktin.net.

Step 1: Define your challenge

Is 5G the right digital connectivity solution to support your business needs? And if so, what type of 5G do you need?

To be able to answer these questions, you first need to identify your operational challenges and the goals you want to achieve.

A well-defined set of challenges will enable you to explore various solutions based on your specific needs.

What is the problem you're trying to solve or what would you like to improve?

You may want to increase productivity, deliver more efficient operations, improve quality control, provide a better working environment, reduce carbon emissions, gain a competitive advantage, or deliver better customer service.

Some example challenge scenarios include:

"

Manufacturing

Scenario: "I am a factory owner and want to increase production and reduce downtime."

5G's low latency will support real-time monitoring of machinery, predictive maintenance and can automate workflows.

"

"

Agriculture

Scenario: "I am a farmer and want to know when the best time is to water and fertilise my crops."

5G can enable smart sensors to give live updates on soil moisture and the weather allowing you to make efficient decisions.

"

"

Healthcare

Scenario: "I am a health care manager and want to monitor my patient's vital signs remotely without any downtime."

5G enabled wearable devices can be worn to send real-time health data directly to the provider, allowing a quicker response time if an emergency occurs.

"

"

Logistics and warehousing

Scenario: "I am a business owner who transports hazardous materials, and I need to monitor vehicle conditions and routes to prevent accidents and protect my drivers."

With 5G, sensors on each vehicle can monitor conditions in real-time such as speed or temperature of materials and send live data to the main system. This can prevent accidents and protect workers.

"

Step 2: Assess your current situation and future needs

There are several factors that need to be considered when implementing 5G within a business. Below are some key questions to help guide you. Existing 5G use cases in your industry sector can also provide key insights and learnings. You can find a range of 5G case studies on the UKTIN and Digital Catapult websites.

1 **What digital connectivity do you currently use or have access to?**
- Fibre
- Public or Private 5G
- 4G
- WiFi
- NB-IoT
- LoRaWAN or similar network
- Satellite internet

2 **What digital technology do you currently use or plan to use?**
- IoT devices and sensors
- Machine vision systems
- Automated machinery
- Cloud services
- Artificial Intelligence/machine learning applications
- Virtual/augmented reality
- Robotic systems
- Data analytics platforms

3 **What are your future digital requirements? Are you planning to:**
- Increase automation
- Add more connected devices
- Expand operations to new locations
- Implement real-time monitoring
- Deploy new smart technologies like AI and Machine Learning
- Scale up data processing
- Add remote operations capabilities

4 **What skills and resources do you have access to within your business?**
- 5G network management
- Cybersecurity
- IoT device management
- Data analytics
- Systems integration
- Cloud and edge computing
- Network architecture

5 **What operational changes might be needed? Have you considered:**
- Updates to IT policies
- New security protocols
- Staff training
- Process redesign
- Change management
- System migration plans
- Costs of integration (technical and resources)

6 **Is your infrastructure ready/ future proofed for 5G?**
- Do you have 5G-compatible hardware and devices?
- Are your current systems upgradeable to support 5G?
- Do you have edge computing capabilities?
- Is your current network infrastructure modern enough to integrate with 5G?

Step 3: Connectivity solution

Types of 5G networks

Public 5G networks are provided by Mobile Network Operators and are accessible to the general public. These networks cover large geographic areas, providing wide-scale connectivity for consumers and enterprises.

A private 5G network is secure and isolated from the public interest, allowing only authorised devices and apps to connect and exchange data with one another. They are dedicated, standalone networks deployed and operated by an enterprise for exclusive use. These networks deliver secure, high-performance connectivity in specific locations.

	Public 5G	Private 5G
Coverage	**Wide coverage** Public 5G networks are designed for extensive coverage.	**Limited coverage area** Private 5G networks have a restricted coverage area, and enterprises will still need to use public networks for broader coverage.
Performance	**Variable performance** Network performance can fluctuate due to congestion. The openness of public 5G means that there are often many users connecting to a single public network at one time, slowing down the speed of services at peak usage times.	**Superior performance** Private 5G ensures ultra-low latency, high reliability, and high-speed connectivity, making it ideal for mission-critical applications. Unlike public networks, private 5G does not share bandwidth with external users, ensuring a consistent and robust performance.
Access	**Easy access** Users can connect to public 5G networks with minimal setup, often through a subscription plan.	**Takes more time to deploy** Takes more time to install a private network compared to using existing public 5G. Eg. planning permissions for masts in outside locations.
Control	**Limited control** Enterprises have little to no control over network configurations, resource allocation, or quality of service.	**Full control and customisation** Enterprises have complete control over network configurations, resource allocation, and security, ensuring the network meets their specific needs and applications such as IoT, robotics, or real-time analytics, using features such as network slicing.
Cost and effort	**Cost efficiency for general use** Public 5G eliminates the need for enterprises to invest in their own infrastructure, as the network is managed and maintained by the Mobile Network Operator.	**Higher costs** Designing, scaling, and setting up a private network can be costly. Private networks may also require in-house expertise to deploy and manage the network, which can be challenging to acquire. Alternatively, a Mobile Network Operator or infrastructure provider can provide a fully managed service.
Security	**Security concerns** Public networks are shared, making them more vulnerable to breaches or interference compared to private networks.	**Robust security** Private networks are operated by specific entities, such as individuals or companies, who have full control over the network - only authorised users can connect. This enhances data protection and reduces external threats.
Device density	**Supports many devices, but not ideal for mission-critical use cases** Public networks support many devices and are constantly upgraded by operators to meet demand. However, they are not ideal for mission-critical use cases as they may not meet the ultra-low latency or reliability requirements of some enterprise applications.	**Increased device density** Private 5G can handle thousands of devices in a confined area, which is crucial for smart factories, warehouses, and campuses.

Step 4: Additional considerations

Common deployment models of private 5G networks

Private 5G networks offer enterprises the flexibility to choose a deployment model that aligns with their operational, technical, and financial needs. The available models primarily differ in terms of infrastructure ownership, control, and integration with public networks.

Standalone Private 5G Network

The enterprise owns and manages the entire 5G network infrastructure, including the radio access network, core network, and spectrum. The network is completely isolated from public 5G networks.

Best suited for: Industries requiring high security, reliability, and customisation, such as manufacturing, healthcare, and energy.

Managed Private 5G Network

A mobile network operator or a third-party service provider deploys, manages, and maintains the private 5G network on behalf of the enterprise.

Best suited for: Organisations lacking in-house technical expertise and resources or seeking quick deployment, such as small and medium-sized businesses.

Shared Private 5G Network

Multiple organisations share a private 5G network deployed within a specific location. The infrastructure and spectrum are shared.

Best suited for: Collaborative environments such as industrial parks, ports, and airports.

Hybrid Private 5G Network

Integrates a private 5G network with a public 5G network. Enterprises can leverage private 5G for critical operations on-premises and rely on public 5G for broader coverage and mobility.

Best suited for: Enterprises with both stationary and mobile connectivity needs, such as logistics, retail, and smart cities.

Network slicing on Public 5G

This approach allows enterprises to use a dedicated slice of a public 5G network. The slice operates as a virtually isolated segment, offering guaranteed performance.

Best suited for: Enterprises with moderate performance needs, such as retail chains or remote offices.

How is 5G different from WiFi?

Wi-Fi and 5G are both wireless technologies that offer increased speeds, lower latency, and increased capacity. They can work together to create new connected experiences. However, there are some key differences between the two.

Private 5G stands out for enterprises needing high performance, broad coverage, and secure, low-latency connectivity. It is especially suited for industries like manufacturing, logistics, and healthcare, where reliability and scalability are critical.

Wi-Fi, while cost-effective and sufficient for many general use cases, may not meet the demands of enterprises requiring robust, interference-free, and large-scale connectivity.

Many organisations find that a hybrid approach - leveraging private 5G for critical operations and Wi-Fi for less demanding tasks - provides the best balance of performance and cost.

Step 4: Additional considerations

Security

As with any digital technology, businesses must ensure that they have robust security models in place to reduce the chance of cyber-attacks that could occur. It is recommended to work with established and trusted suppliers who meet UK security standards and have a proven track record in industrial 5G deployment.

Cybersecurity advice and guidance are available on the National Cyber Security Centre website and via the Connected Places Cyber Security Principles at www.ncsc.gov.uk.

Pilots, deployment and scaling

Pilots - Before fully integrating a 5G system, businesses may consider running smaller pilot programmes to test the technology on a smaller scale. This will allow your business to identify problems in a controlled environment. For example: A manufacturing plant may pilot 5G on a single production line, testing remote monitoring and predictive maintenance before rolling out across the entire facility.

Deployment - After a successful pilot stage, businesses can plan a phased approach to implementation, scaling their solution when needed. For example: A warehouse operation might start with 5G-enabled inventory tracking in one zone, then gradually expand to automated guided vehicles, then full warehouse automation.

Testbeds - Businesses can leverage testbed locations to experiment with 5G applications and make use of real-world environments. For example, there are multiple 5G testbeds owned and operated by Digital Catapult in Northern Ireland and the rest of the UK.

Costs

Investing in 5G for business can come with a wide range of variables and dependencies. Costs will vary for each business depending on the infrastructure, size, location, complexity of the project, and what equipment and resources businesses already have access to.

Businesses are advised to research and enquire with a variety of suppliers to determine exact costs for each element such as infrastructure and hardware, cloud and data storage, network and service costs, software, cybersecurity, and training.

Regulation

There are a few key regulations which you may need to consider if you're planning to deploy a 5G network. These are usually managed by your Mobile Network Operator or infrastructure provider.

Spectrum licensing

Ofcom is responsible for licensing spectrum (radio frequencies) to Mobile Network Operators, businesses and organisations to allow them to deploy a mobile network. The licence has specific conditions on location, roll-out, interoperability, transparency and sharing.

Planning permission

Planning permission from your local council may be required if you are deploying a 5G network and need to install telecoms infrastructure such as masts.

Health and safety

In the UK, health and safety regulations regarding 5G are primarily based on the guidelines set by the International Commission on Non-Ionizing Radiation Protection (ICNIRP). The UK Health Security Agency leads on health matters related to radiofrequency electromagnetic fields, or radio waves.

Step 5: Build the business case for internal or external investment

Feasibility study

Carrying out a feasibility study to discover the viability of a business case could determine the likelihood of securing funds from internal or external stakeholders. A feasibility study could include headings such as:

- **Executive summary:** A concise overview of the proposed 5G project, including its objectives, potential impact, and strategic alignment with broader organisational goals.

- **Problem statement:** Clearly define the current challenges or limitations that 5G technology could address within your business. Identify specific issues, for example, restricted data transfer speeds, connectivity limitations, or a lack of capacity for IoT integration. Use specific data where possible to illustrate these challenges, showing how they hinder productivity, increase costs, or limit service delivery.

- **Objectives and goals:** Set out clear objectives that the proposed 5G project aims to achieve, ensuring alignment with the strategic priorities of your business, but also local or national government. Develop clear objectives for 5G adoption, structured as SMART (Specific, Measurable, Achievable, Relevant, Time-bound) goals. Examples might include "to enhance real-time data analytics by reducing network latency by X%".

- **Options analysis:** Evaluate possible approaches to addressing the identified issues, including a comparison of 5G against alternative solutions. Compare options including maintaining current infrastructure, upgrading to Wi-Fi 6, or investing in partial network enhancements.

- **Proposed solution:** Offer a detailed description of the recommended 5G implementation, covering its scope and strategic fit.

- **Benefits and value proposition:** Demonstrate the value that 5G adoption can bring, both tangible (eg financial) and intangible (eg customer satisfaction or user experience).

Financial analysis

Present a clear cost-benefit analysis to quantify the financial aspects of 5G implementation. Include upfront costs (e.g. infrastructure upgrades, training) from a reputable supplier, along with potential ongoing expenses, then compare them to expected financial returns. Use metrics like ROI, and payback period, supplemented by a sensitivity analysis to address financial variability.

Implementation plan

Lay out a phased approach to deploying 5G, including critical milestones and resource needs. Outline the major phases, such as infrastructure set-up, pilot testing, and full deployment.

Risk assessment

Identify potential risks and establish mitigation strategies to address challenges related to 5G deployment. Describe likely risks, such as cybersecurity concerns, compliance issues, or project delays.

Conclusion and recommendations

Summarise the business case, reaffirming the benefits and alignment with strategic objectives, and offer clear next steps.
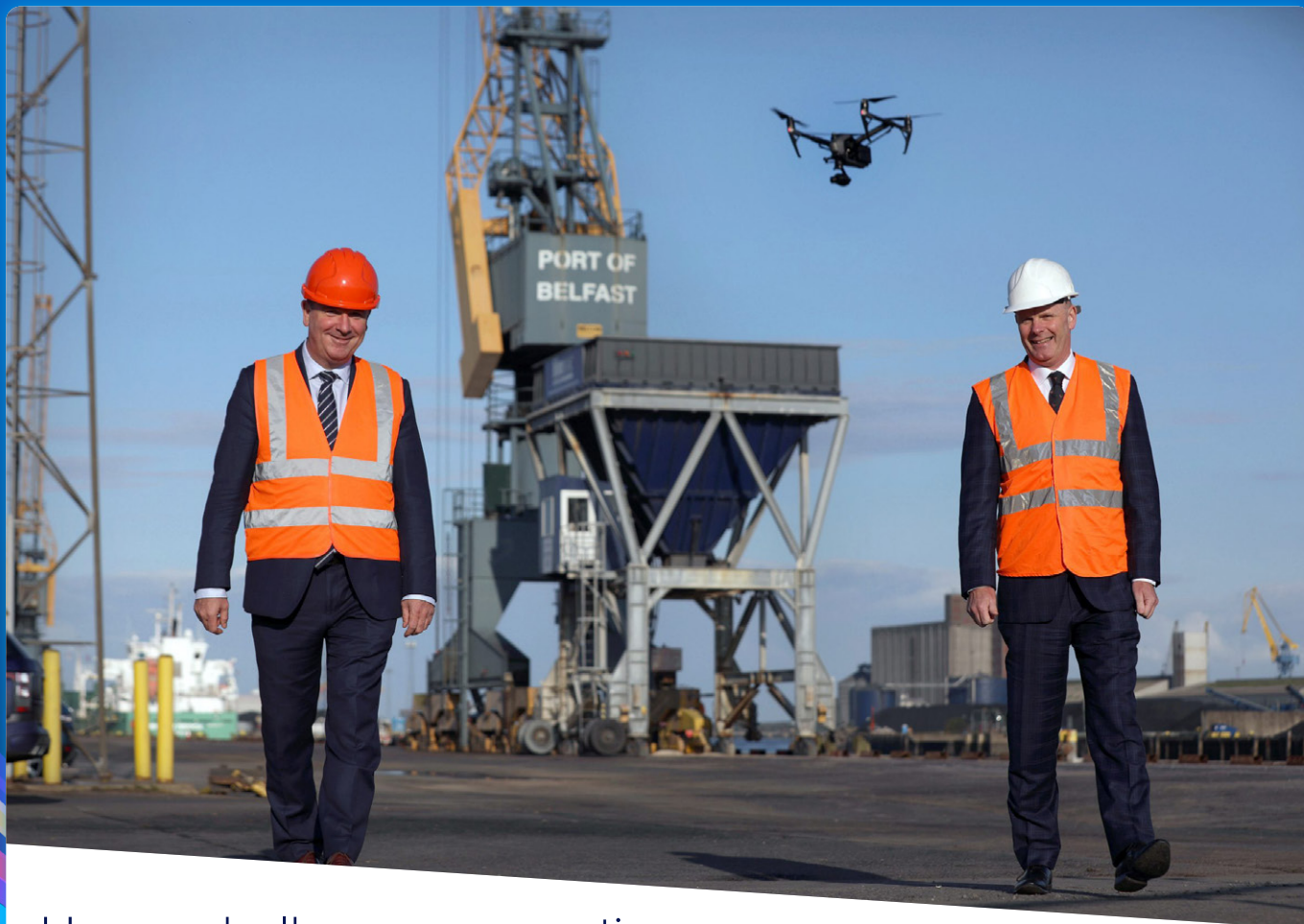
Section 3

5G case studies

Businesses in Northern Ireland and across the UK have realised the benefits of harnessing 5G-powered digital technologies to improve productivity and deliver operational efficiencies. Here are some examples of 5G use cases. More are available at **www.uktin.net**, **www.digicatapult.org.uk**, and **www.ericsson.com**.

5G Transport and logistics

Hopper bulk cargo operations

Belfast Harbour is harnessing 5G-led innovations to accelerate the digitisation of port operations. It has deployed a private 5G network and delivered a range of 5G use cases along West Bank Road (the main port thoroughfare) with funding through the Belfast 5G Innovation Region programme. The harbour is leading the way in 5G adoption and previously deployed the UK and Ireland's first Private 5G Network for ports in 2020.

Lead organisation: Belfast Harbour

The challenge

Funnel-shaped hoppers are used at Belfast Harbour to transfer bulk material, such as grain, from ships to trucks. The operator controls the hopper from a cubicle on the side of the structure – remote operation is not possible. The operators and lorry drivers use radio and a traffic light system to communicate and there's no access to real-time data insights to optimise operations. Troppers are essential for port operations and when one breaks down it affects productivity.

The solution

Belfast Harbour worked with BT to deploy networked IoT devices, sensors, infrared and 3D cameras on a hopper to monitor its condition and operation, optimise the movement of material, and provide operators with real-time information. The devices are controlled by a locally installed edge controller panel. The hopper connects to Belfast Harbour's private 5G network which enables secure, remote network access to the edge controller panel and for data analytics.

Benefits
- Optimised and efficient bulk freight operations.
- Better working environment - enables remote operations
- More effective communication between operators and drivers.

In-car connectivity to support port operations

Lead organisation: Belfast Harbour and Belfast Harbour Police

The challenge

As part of their operations at Belfast Harbour Estate, Belfast Harbour Police and port staff need real-time access to digital information and remote downloads of data (including CCTV footage), but this is challenging to do with existing network connectivity. Officers on patrol in cars must regularly return to base to access and download information instead of remotely accessing it out on location. This is an inefficient use of time and resources.

The solution

Belfast Harbour worked with BT to fit ten port operations and police vehicles with equipment to enable them to connect to public and private 5G networks. This provides staff with real-time access to business applications, digital information and remote downloads of data while in their vehicle.

Benefits
- Reduced number of return visits to base.
- More efficient use of resources and assets.
- Reduced fuel consumption and carbon emissions.

Air quality monitoring

Lead organisation: Belfast Harbour

The challenge

Belfast Harbour's Air Quality Strategy sets out its vision to be the world's greenest multi-modal port. Its action plan presents a range of measures to reduce emissions from vehicles and vessels associated with Harbour operations and improve air quality. An emissions inventory is required to evaluate the emissions.

The solution

Belfast Harbour worked with BT to install Air Quality and Noise Smart Traffic Sensors in the port area to provide real-time, 24-7 environmental monitoring, data capture and analysis over a private 5G network. The sensors capture data on air quality particulate levels, nitrogen dioxide (NO2) levels, noise levels, temperature, and humidity which is fed into a data hub to provide analysis and visualisation of environmental data.

Benefits
- Reduction in emissions.
- Access to real-time, 24-7 environmental data.
- Actionable insights to improve air quality.

5G Transport and logistics

Smart logistics

Lead organisation: Manfreight

The challenge
Logistics company Manfreight operates a 50,000 sq ft chilled distribution hub at Belfast Harbour. It stores and transports goods on behalf of customers in the food, beverage and retail sectors.

Manfreight needs to accurately manage and monitor the movement of vehicles and product within its facility to improve operational efficiency, optimise the supply chain, and enhance safety and security.

The solution
Manfreight is harnessing Belfast Harbour's private 5G network and worked with BT to enhance its logistics operations with connected cameras, machine learning, scanning and Push-to-Talk technology.

With ultra-low latency and real-time data transfer, Manfreight's Push-to-Talk system provides instant, business-critical communication, supported by live location tracking, text alerts, and man-down safety features. This ensures seamless coordination, reducing delays and enhancing site security.

AI-powered computer vision - enabled through connected cameras - enhances tracking, security, and compliance by identifying products, personnel, and potential safety risks in real time. Combined with 5G connectivity, this technology delivers end-to-end visibility from the warehouse to final delivery, driving efficiency and reliability.

Benefits
- Faster, smarter, and more secure operations.
- Optimised movement of trucks, trailers, and product across warehouse.
- Enhanced safety for workers.

Smart Trailer Yard

Lead organisation: Stena Line

The challenge
Ferry company Stena Line transports over 500,000 freight units through Belfast Port for customers across the UK and Ireland each year.

Stena Line needs to track and monitor the movement of trailers carrying freight to and from the ferry and trailer yard to ensure every trailer is efficiently and accurately managed.

Each trailer must be positioned in the most efficient manner, and ferry loading procedures followed precisely.

The solution
Stena Line harnessed Belfast Harbour's private 5G network and worked with BT to deploy connected cameras, Push-to-Talk and advanced tracking technologies to deliver more efficient operations at its freight trailer yard by optimising the movement of trailers to and from the ferry.

Benefits
- Improved operational efficiencies.
- Increased accuracy of trailer placement.
- Optimised loading and unloading of trailers.
- Reduced turnaround times for ferries.

5G Transport

NI's public transport provider, Translink, is harnessing public 5G to enable enhanced operations and network planning along its Glider bus routes. This will further improve services, maximise and optimise resources and ensure continued development of high quality, sustainable and attractive Glider services.

Lead organisation: Translink

The challenge

Translink operates the Glider bus service across Belfast and manages Grand Central Station in Belfast city centre. It needs access to data insights to help inform network planning, respond to peak demand, and monitor potential safety issues to keep passengers and staff safe.

The solution

Translink is working with BT to deploy 5G Rapid Deployable Cameras and AI video analytics around Grand Central Station and along the Glider route between Belfast City Centre and Titanic Quarter. The cameras use the public 5G network and connect to Translink's Operations Control Centre.

BriefCam video intelligence software uses AI, real-time alerting and quantitative video insights to transform the video feeds into valuable information for Translink to use to inform its operations.

Benefits
- More efficient operations.
- 24-7, real-time alerts to potential safety issues and incidents impacting services.
- Optimised use of resources and assets.

5G Creative industries and tourism

5G Film Anywhere

Ulster University's Studio Ulster virtual production studio and Advanced Wireless Technologies Lab are harnessing 5G to accelerate screen production processes.

Lead organisations: Ulster University and Studio Ulster

The challenge
The film and TV industry operates in a very competitive landscape where the demand for high-quality content is ever-increasing. Traditional production methods, heavily reliant on green screen filming and extensive post-production visual effects (VFX), can be time consuming and costly.

The solution
Ulster University has deployed 5G-powered remote virtual production, creating a seamless, real-time link between a remote filming location and the Studio Ulster virtual production studio. This enables filmmakers to capture footage in real-world environments while simultaneously incorporating virtual elements, all within a streamlined collaborative workflow.

A small remote filming team can capture any location and transmit the footage to Studio Ulster in real-time.

The studio team can provide immediate feedback, iterate ideas, and even control the remote cameras for enhanced collaboration. Both teams have access to the same virtual world, seeing the final composited result in real-time.

5G's bandwidth and low latency enable real-time rendering and streaming of dynamic content - streamlining production workflows, reducing extensive post-production, and enhancing performance and collaboration.

Benefits
- Accelerates screen production processes.
- Reduction in production costs and time.
- More efficient use of resources.
- Reduction in carbon emissions - less vehicles traveling to filming locations.

Immersive studio

Lead organisation: Retinize

The challenge
As one of Europe's fastest growing immersive tech studios, Belfast company Retinize enables real-time and collaborative 3D animation, performance capture, and virtual directing via its Animotive platform.

Its goal is to connect performers, directors, camera operators and students in remote virtual production, making 3D content production fast, fun and affordable without being tethered to a traditional studio environment.

Access to fast, high capacity, and low latency digital connectivity is essential for remote production, and this is not usually available at a customer's remote location or venue. This leads to issues with high latency affecting natural performance, slow speeds to transfer 3D files, and users being disconnected from production sessions.

The solution
Retinize is harnessing private and public 5G networks to enhance its Animotive virtual reality platform, bringing advanced motion capture technology to educational institutions and production companies.

This new set up enables production companies to do performance capture in any location, eliminating the need for expensive studio rentals. Directors and animators can collaborate remotely via the 5G network, reducing turnaround times and creating more streamlined, flexible production schedules. The setup allows for virtual directing in real time, enabling teams in different geographical locations to collaborate effectively on the same project.

Universities and schools can also offer students a hands-on experience with advanced motion capture technology. By bringing the system directly into classrooms, students can engage with cutting-edge tools used in animation, gaming, and virtual reality production. The portability and ease of deployment mean educators can set up temporary workspaces quickly, providing an immersive learning experience without the need for permanent infrastructure.

Benefits
- Accelerates remote virtual production processes.
- Increased portability and ease of deployment.
- Increased productivity.
- Cost savings – no need to rent studios.
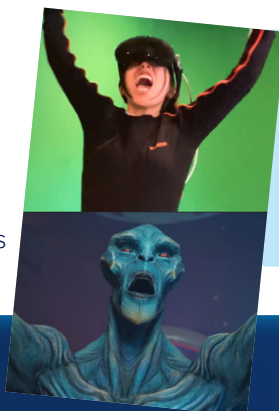
AR Experience at Belfast City Hall

Lead organisations: BT and Belfast City Council

The challenge
Belfast City Council's visitor exhibition in Belfast City Hall opened in 2017 and offers a self-guided journey from Belfast's past to present, showing the vibrancy and diversity of the city across six themed zones.

The council was keen to explore how new technologies could be used to enhance City Hall's visitor experience and inform their thinking around future tourism projects including the Belfast Stories visitor attraction which is due to open by 2030.

The solution
BT collaborated with Belfast City Council to deliver a unique R&D trial of cutting-edge digital technology across three rooms within Belfast City Hall's visitor exhibition.

Visitors are invited by an animated seahorse from the Belfast Coat of Arms to experience the digital magic of augmented reality as the city's hidden river is revealed, walls crumble to uncover secret passageways, and books open to let their stories take flight.

The new Extended Reality (XR) experience uses augmented reality, projection technologies, gesture controlled interactive gaming, 3D maps and 5G to offer visitors new and interactive ways to explore the stories of Belfast.

Combining EE's 5G network with AWS Wavelength cloud services enables efficient, high speed and secure connectivity and accelerated XR processing, creating highly realistic images of the city.

It is the first public trial of a XR service running on AWS Wavelength, streamed over EE's 5G Network to show how 5G streamed cloud-rendered XR can provide "best in class" immersive experiences that exceed what's possible on handheld devices alone.

BT collaborated with several partners including AWS, JAM Creative Studios and UM Labs to bring the project to life.

Benefits
- Enhanced visitor experience - offers visitors new and interactive ways to explore the stories of Belfast.
- Attracts new visitors to City Hall.
- Helps to informs the council's future tourism projects.

5G Advanced manufacturing and construction

Seagate Technology

Lead organisation: Seagate Technology

The challenge
To develop advanced prototyping and smart manufacturing methods for new technologies, particularly in nano manufacturing and photonics, aiming to drive self-sustaining local industry and economic growth through research and innovation.

The solution
In partnership with CGI and Nokia, Seagate implemented a first-of-its-kind 5G and 4G Mobile Private Network. Implemented through the Smart Nano NI programme - a consortium of industry partners and academic institutions – the testbed includes an LTE-based NB-IoT network, for low-power IoT monitoring and tracking solution.

The testbed is enabling several use cases, with a focus on increasing efficiency and productivity through the manufacturing lifecycle.

Benefits
- Ability to collect audio and sensor data in focused areas of the facility.
- Asset tracking across the facility to optimise production processes.
- Improved energy monitoring.

Construction of Advanced Manufacturing Innovation Centre

Queen's University Belfast is harnessing 5G, Building Information Modelling (BIM), Digital Twin technology and robotics to support the design and construction of their £100 million, state-of-the-art Advanced Manufacturing Innovation Centre (AMIC).

Lead organisations: Queen's University Belfast's Advanced Manufacturing Innovation Centre and Henry Brothers

The challenge
The construction of buildings and the management of building sites presents several challenges for the construction industry including safety issues, the management of people and equipment on site, and the resources and time required to carry out construction processes and site inspections.

The solution
Queen's University Belfast worked with BT to deploy a private 5G network at the AMIC construction site using a temporary mast on a trailer. AMIC is harnessing the 5G network to connect robotics systems, drones and IoT sensors to support the construction phase of the new centre. This includes lidar scanning to monitor the quality and progress of the build. 5G also enables the speedy optimisation, reconfiguration, and improved performance of robotics systems. IoT sensor monitoring of site assets increases efficiency of on-site reporting, collaboration and interaction between on-site and off-site stakeholders, and improved health and safety monitoring.

Benefits
- Accelerated building processes.
- Efficient monitoring of quality and progress of construction.
- Efficient use of resources.
- Improved building site management.
- Increased safety of site workers and visitors.

5G Health and Social Care

Connected Health and Social Care

Lead organisation: Liverpool 5G consortium (led by University of Liverpool)

Challenge

Health and social care services are increasingly reliant on the use of digital devices which require excellent connectivity. However, in households with the highest need, there is often poor access to broadband due to limited finances. Public services are increasingly constrained by finances too, so cannot step in to address this gap between need and access. The result is technology adoption is limited and, therefore, so is impact on health and social care outcomes.

A consortium of partners came together to address the question: "Can 5G connectivity be sufficiently cheap and effective in health and social care provision that it will be cost effective to give free access to those unable to afford either phone or broadband access?"

Solution

Between 2018 and 2019, as part of the UK Government's 5G Testbed and Trials, the consortium recognised the need to bring together a range of technological solutions, which would be easily adopted and used by care services. They recognised that they would also need to focus on:
- Reducing the digital divide
- Providing affordable connectivity with the necessary level of service
- Creating capacity within social care services
- Improving efficiency in health and care services
- Improving people's quality of life and reducing social isolation

The testbed created a privately owned 5G mesh network using council-owned street furniture, and the council CCTV network as the fibre backhaul – creating the largest mmWave network in Europe. They connected telehealth services and enabled the use of virtual reality in palliative care; trialled devices in people's homes to tackle loneliness, manage medication and improve safety; and deployed IoT devices in the community to support health and social care products.

Over 200 nodes deployed for the network now provide WiFi into surrounding properties for health and social care purposes. Following further investment and support, they have incorporated a mmWave mesh network and small cell radio technology into a deprived part of Liverpool to support public service delivery.

Benefits
- Improved health outcomes for service users.
- Improve quality of life and reduction in loneliness for service users.
- Potential cost savings for health and social care services of £248,000 per 100 users per year.
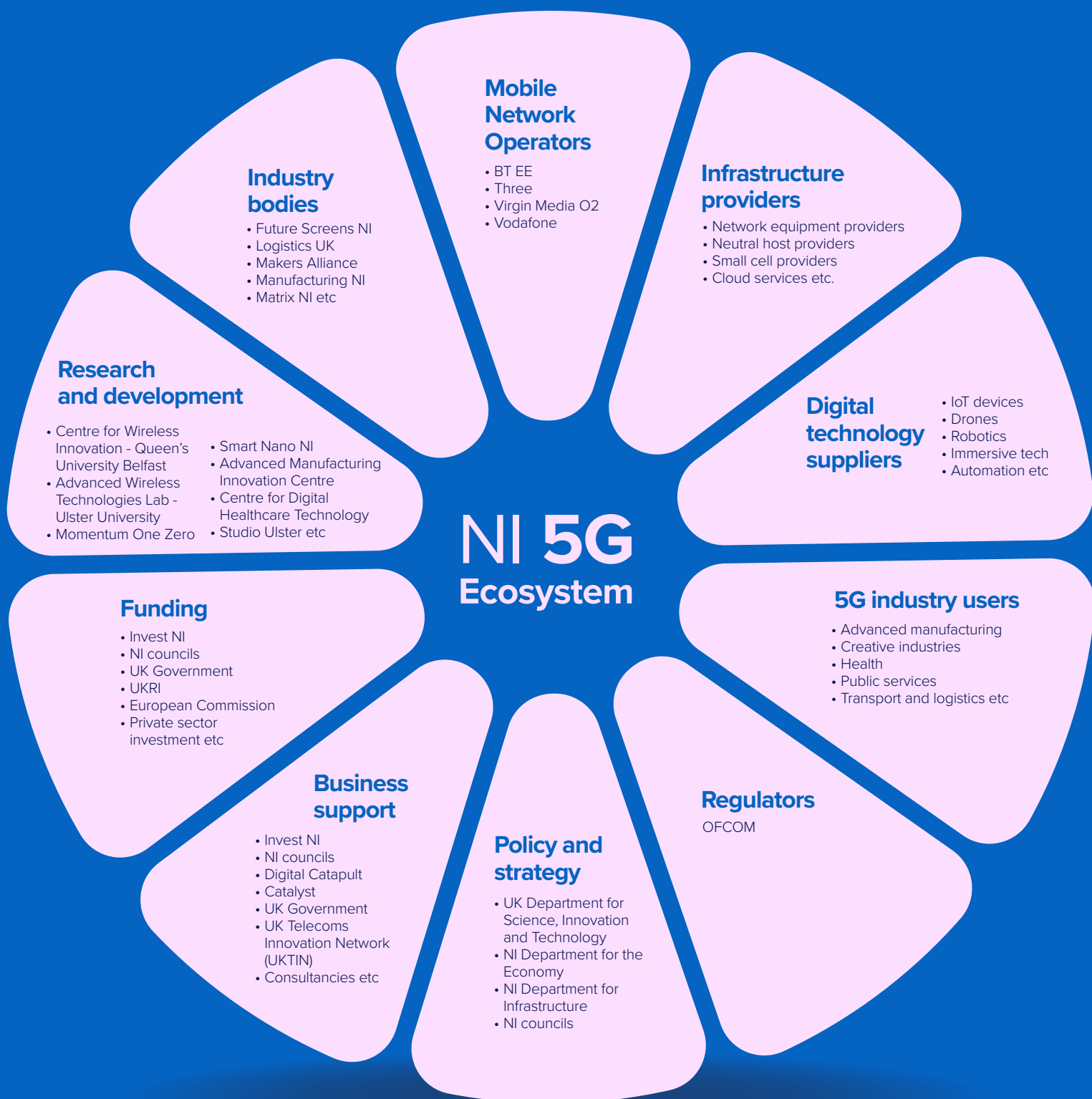
Section 4

Resources, funding, and support

This section explores various resources and guidance available to support the deployment and adoption of 5G-powered digital technologies across Northern Ireland.

Resources

NI 5G Ecosystem Map

Several organisations in Northern Ireland and across the UK play a role in our local 5G ecosystem.

NI 5G Ecosystem

Mobile Network Operators
- BT EE
- Three
- Virgin Media O2
- Vodafone

Infrastructure providers
- Network equipment providers
- Neutral host providers
- Small cell providers
- Cloud services etc.

Industry bodies
- Future Screens NI
- Logistics UK
- Makers Alliance
- Manufacturing NI
- Matrix NI etc

Research and development
- Centre for Wireless Innovation - Queen's University Belfast
- Advanced Wireless Technologies Lab - Ulster University
- Momentum One Zero
- Smart Nano NI
- Advanced Manufacturing Innovation Centre
- Centre for Digital Healthcare Technology
- Studio Ulster etc

Digital technology suppliers
- IoT devices
- Drones
- Robotics
- Immersive tech
- Automation etc

Funding
- Invest NI
- NI councils
- UK Government
- UKRI
- European Commission
- Private sector investment etc

5G industry users
- Advanced manufacturing
- Creative industries
- Health
- Public services
- Transport and logistics etc

Business support
- Invest NI
- NI councils
- Digital Catapult
- Catalyst
- UK Government
- UK Telecoms Innovation Network (UKTIN)
- Consultancies etc

Regulators
OFCOM

Policy and strategy
- UK Department for Science, Innovation and Technology
- NI Department for the Economy
- NI Department for Infrastructure
- NI councils

Initiatives and innovation centres

Several local and UK-wide initiatives and innovation centres are supporting the development, deployment and adoption of 5G and other advanced wireless technologies in the UK.

UKTIN
www.uktin.net
The innovation network for the UK telecoms sector offers the latest 5G news, use cases, resources, and events to support 5G adoption.

UK 5G Innovation Regions
www.gov.uk
The Department for Science, Innovation and Technology has funded ten 5G Innovation Regions across the UK to drive economic growth and innovation by unlocking the opportunities presented by advanced wireless connectivity and digital technologies.

Belfast 5G Innovation Region
www.smartbelfast.city
Led by Belfast City Council's City Innovation Office, the Belfast 5G Innovation Region is delivering a range of 5G use cases across transport and logistics, creative industries, advanced manufacturing and construction industries.

Smart Nano NI
www.smartnanoni.com
A Northern Ireland consortium is collaborating to develop game-changing advanced prototyping and smart manufacturing methods to deliver new technologies. They launched Northern Ireland's largest 5G testbed in Derry-Londonderry to supercharge the smart manufacturing sector.

Seagate 5G Industrial Accelerator Programme
www.digicatapult.org.uk
A collaboration between Digital Catapult, Ericsson, and industrial partners including Seagate and Tharsus, the programme is demonstrating the benefits of 5G technology in industrial settings by providing real-world 5G use cases aimed at improving operational efficiency at Seagate's Springtown facility including predictive maintenance, wireless robotics and asset tracking.

West Midlands 5G
www.wm5g.org.uk
The West Midlands 5G Testbed (WM5G) has delivered a range of 5G use cases to support the health, manufacturing and transport sectors.

Scotland 5G Centre
www.scotland5gcentre.org
Scotland's national centre for accelerating the deployment and adoption of 5G connectivity within industry and the public sector.

SONIC Labs
www.digicatapult.org.uk
SONIC Labs (SmartRAN Open Network Interoperability Centre) is a world-leading innovation programme and R&D facility based in central London. Find reports, articles, events and news related to 5G and Open RAN in the website's knowledge hub.

UK Telecoms Lab
www.npl.co.uk
A national facility located at the West Midlands technology hub in Solihull, which provides test and evaluation capabilities to strengthen confidence in the resilience and security of telecoms systems deployed in the UK.

European Space Agency 5G/6G Hub
https://connectivity.esa.int
A centre for collaboration and innovation, enabling industry to harness the potential of converged satellite and terrestrial telecommunications networks to create advanced applications.

Centre for Wireless Innovation - Queen's University Belfast
www.qub.ac.uk
Queen's University Belfast hosts the Centre for Wireless Innovation, the UK's largest R&D and exploitation base in physical layer wireless.

Advanced Wireless Technologies Lab - Ulster University
www.ulster.ac.uk
The Advanced Wireless Technologies Lab aims to develop innovative enabling technologies relevant to Future Communication Systems.

Smart Internet Lab - University of Bristol
www.bristol.ac.uk
Fusing research expertise and innovation in a range of areas including IoT, 5G and Beyond, Future Transport Networks, smart cities, autonomous networks, machine learning, AI, and mobile edge computing.

5G/6G Innovation Centre – University of Surrey
www.surrey.ac.uk
Hosts a cutting-edge 5G and 6G innovation centre which brings together leading academics and key industry partners to define and develop critical 5G and 6G infrastructure.

Guides and toolkits

UKTIN Advanced Connectivity Toolkits

www.uktin.net

These practical toolkits are supporting the agriculture, manufacturing, transport and logistics, and health and social care sectors to harness the power of advanced wireless technologies, including 5G, to solve problems.

Industrial 5G - Toolkit for Business in a Digital Future

www.digicatapult.org.uk

Digital Catapult has created a useful guide offering a variety of resources necessary to promote the adoption of 5G in manufacturing and logistics.

Additional guides and toolkits are available on the UKTIN website at **www.uktin.net**.

Strategies, policies and reports

UK Wireless Infrastructure Strategy 2023

www.gov.uk

Sets out the UK Government's ambition to deliver nationwide coverage of standalone 5G to all populated areas by 2030.

Matrix NI Advanced Wireless Networks Report 2023

www.matrixni.org

The Northern Ireland Science Industry Panel explores the potential of advanced wireless technologies to drive innovation and economic growth across Northern Ireland.

NI Mobile Action Plan

www.economy-ni.gov.uk

The Mobile Action Plan for Northern Ireland, launched by the Department for the Economy in 2022, identifies several barriers to the rollout of mobile infrastructure in NI and an action plan to address these challenges.

Economy 2030 - Industrial Strategy for Northern Ireland

www.economy-ni.gov.uk

The Economy 2030 strategy, launched by the Department for the Economy in 2023, recognises the vital role that telecoms infrastructure and services play in sustaining economic growth.

Ofcom Connected Nations NI Report 2024

www.ofcom.org.uk

The report measures progress on the availability of broadband and mobile services, including the rollout and take-up of full fibre and 5G networks.

Funding

There are several sources of funding which may support the development and deployment of 5G use cases.

Invest NI

www.investni.com

Offers research and development grants, innovation vouchers, Access to Finance advice, and the Technical Development Incentive to help businesses in Northern Ireland to innovate and grow.

NI Business Info

www.nibusinessinfo.co.uk

The Business Support Finder lists funding available from a range of organisations to support local businesses in Northern Ireland.

Digital Transformation Flexible Fund

www.dtff.co.uk

Offers NI businesses grants of £5,000 - £20,000 to assist in their digital transformation ambitions including AI, IoT, robotics, data analytics, and immersive technologies.

Government funding in the UK

www.find-government-grants. service.gov.uk

The Find a Grant service lists funding opportunities to support UK businesses and organisations.

UK Research and Innovation

www.ukri.org

Offers grant funding to support innovation across a range of UK industry sectors.

European Commission

https://commission.europa.eu

Available EU funding includes Horizon Europe which funds research and innovation with a scientific, technological, economic, environmental and societal impact.

Belfast 5G Innovation Region programme led by:

Belfast City Council

Funder:

Department for Science, Innovation, & Technology

Partners:

Antrim and Newtownabbey Borough Council

Ards and North Down Borough Council

LCCC Lisburn & Castlereagh City Council

Mid & East Antrim Borough Council

Comhairle Ceantair an Iúir, Mhúrn agus an Dúin — Newry, Mourne and Down District Council

5G projects:

Belfast Harbour

Manfreight

Queen's University Belfast

RETìníZE

Stena Line

Translink

Ulster University

Technical leads:

BT

CATAPULT Digital