Tay Cities Digital Ecosystem Mapping

Final Report
Scottish Enterprise and Tay Cities Partners
4th April 2024

J3449

Executive Summary

Background and Context

The Scottish Technology Ecosystem Review (STER) underscored Scotland's fast growing digital tech ecosystem, emphasising the need for strategic collaboration to achieve sustainable growth. The Tay Cities region, with a significant £300 million investment through the Tay Cities Region Deal, aims to capitalise on this vision, stimulating job creation and supporting scalable digital tech enterprises through initiatives that facilitate innovation, develop skills, and nurture growth.

Critical to the growth of the digital tech sector in Tay Cities is the enhancement of digital infrastructure, addressing unique geographical challenges through partnerships with telecommunications providers and leveraging local authority assets. Initiatives have already been launched to improve fixed fibre and mobile network coverage, particularly in rural areas, demonstrating the region's commitment to creating a conducive environment for digital tech businesses. These targeted efforts to upgrade broadband and mobile connectivity are vital for stimulating economic activity and attracting investment to the Tay Cities region.

Efforts by the Tay Cities Digital Thematic Board, Scottish Enterprise, and local stakeholders are underway to develop a digital tech sector roadmap that will be informed by the results of this research. The roadmap seeks to boost the region's digital economy by fostering the growth of tech companies, enhancing the digital skills pipeline, and attracting further investment into the region.

The Digital Tech Ecosystem

The digital tech ecosystem comprises 281 companies distributed across four primary tech sectors and 23 sub-sectors (each sub-sector is associated with a primary sector).

Companies (inner ring of infographic below) are categorised across digital sectors, as follows:

- Digital design, creation, and marketing (including, among others, software/web/app development, gaming and entertainment, digital marketing)
- Infrastructure and security (telecommunications, cybersecurity, IT services, cloud computing)
- Data management and advanced technologies (data & analytics, geospatial, Industry 4.0, IoT)
- Sector-specific solutions (including, among others, MedTech, AgriTech, FinTech)

The primary tech sector with the most companies is digital design, creation, and marketing, within which, software/web/app development is the sub-sector with the most companies. There are notable sub-sector strengths across the region, for example, gaming and entertainment in Dundee City, telecommunications in Perth & Kinross, Industry 4.0 in Angus, and data and analytics in North East Fife. This demonstrates the breadth of capability across the region and highlights areas of strength for the local authorities that make-up the Tay Cities.

There is also evidence of a sizeable support landscape, consisting of education and research institutions, industry networks and event hosts, funding and investment providers, and a range of other assets such as business incubators/accelerators, innovation centres, and office spaces.

Over 50 organisations, initiatives, and programmes provide support to the digital tech businesses in the region, as illustrated in the outer ring of the infographic below. Most of these have a physical presence within the region, however, some serve the interests of digital tech companies across Scotland, such as The Data Lab, Scottish Enterprise, and ScotlandIS and, therefore, are not located in the region. These

organisations are still relevant to the industry-base in the Tay Cities region and, on that basis, have been included.

A snapshot of the ecosystem can be found below:

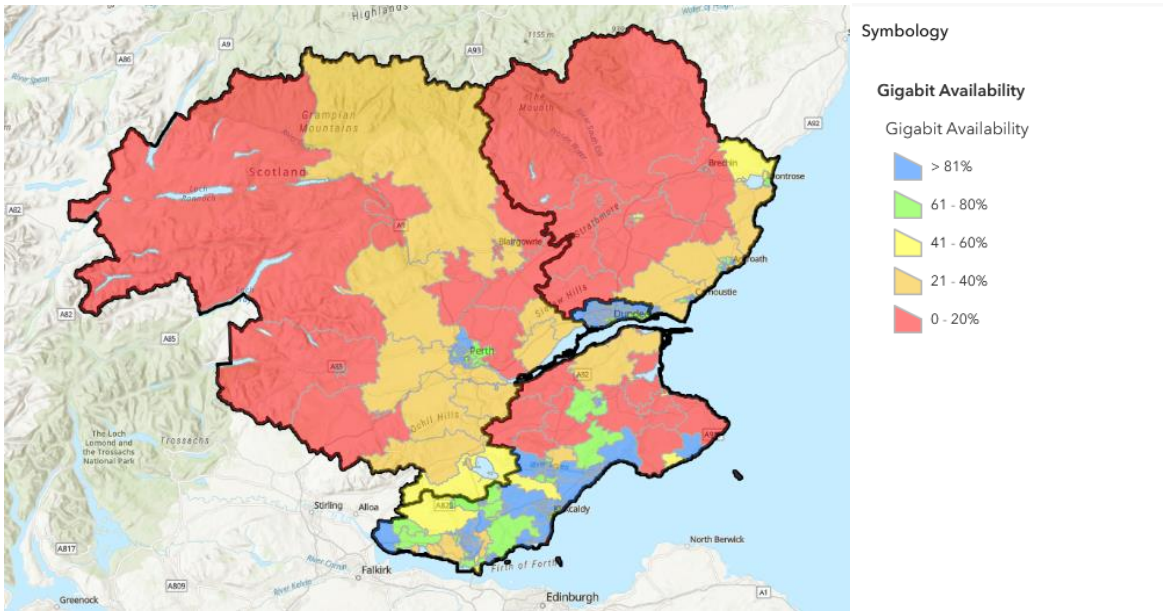
Digital Infrastructure

Scottish Infrastructure Overview

Several initiatives are underway to boost digital connectivity in Scotland, including broader UK efforts. These efforts are concentrated on expanding access to high-speed internet, upgrading digital infrastructure, and promoting inclusivity in digital access. These collaborative efforts from both Scottish and UK Governments underscore a commitment to eliminating digital divides, fostering economic growth, and ensuring Scotland remains at the forefront of digital innovation and connectivity.

Tay Cities – Broadband Deployment

Analysis of ward-level data from Ofcom illustrates the current deployment of gigabit fibre availability across the Tay Cities. Ofcom defines gigabit availability as the percentage of premises that are capable of receiving speeds of 1 gigabit per second (1Gbps). ~~A~~ scale was devised to categorise the percentage of provision. At a glance, the extent of red indicates significant areas of poor coverage (0 – 20%) within the Tay Cities region.



In summary, digital infrastructure and connectivity varies across the Tay Cities, with Dundee leading in gigabit availability and internet speeds, followed by Fife, Perth & Kinross, and Angus. It highlights the rural areas of Angus and Perth & Kinross as relatively underserved, a situation influenced by their geography, low population density, and economic challenges. There is significant potential for improvement in these areas, where enhanced gigabit access could drive digital economy growth, support a variety of digital services, and foster innovation, competitiveness, and sustainable economic development.

Tay Cities – Mobile Network Deployment

Ofcom data was also used to understand the current availability of 4G and 5G coverage across the Tay Cities region. The analysis highlights the varied mobile network coverage in the region, illustrating the differences in 4G and 5G coverage across Angus, Dundee, Fife, and Perth & Kinross. Angus has reasonable 4G coverage but lags in 5G, indicating a gap in the newest mobile technologies. Conversely, Dundee excels with near-perfect 4G and strong 5G coverage, showcasing its advanced technological infrastructure. Fife has reliable 4G coverage and significant 5G presence, pointing to a growing 5G network. Perth & Kinross, similar to Angus, has inconsistent 4G and less developed 5G coverage, signalling a need for further network enhancements.

The UK's Shared Rural Network project is expected to improve 4G coverage in these rural areas, suggesting a future narrowing of the connectivity disparities across the region.

To effectively enhance digital connectivity and future-proof infrastructure in the region, a collaborative approach is essential, particularly focusing on accelerating the deployment of ultrafast broadband and advanced mobile networks, especially in rural areas. Aligning public policies with private sector

investments is crucial for efficient deployment. Stakeholder forums are vital for tackling connectivity issues, understanding specific needs, and exploring alternative technological solutions. Incorporating future-proof strategies into the digital technology roadmap will ensure the infrastructure is adaptable and scalable to meet the region's evolving needs and support sustainable growth.

Key Study Findings

Key findings based on analyses of the evidence gathered can be summarised as follows.

Note: The prioritisation of challenges and opportunities is based on the volume of feedback received for each theme (from most to least).

Challenges

- Recruitment and retention difficulties
- Challenges engaging members of the ecosystem
- Challenges navigating the industry support landscape
- Funding availability and accessibility
- Digital connectivity challenges
- Quality and experience levels of graduates
- Specific skills gaps
- Gaps in the support available
- Challenges collaborating with members of the ecosystem
- Market access and expansion
- Uncertainty about the region’s strengths
- Lack of vision for the region

Opportunities

- Enhance communication, engagement and collaboration across the ecosystem
- Develop a regional identity
- Streamline and simplify the overall support landscape
- Enhance the provision of targeted/tailored support
- Establish leadership and advocacy for the region
- Promote the region to attract talent
- Create skills initiatives to supplement traditional pathways
- Simplify the funding landscape
- Improve communication and engagement regarding digital connectivity
- Explore innovative digital infrastructure solutions
- Foster the development of hybrid skill-sets
- Facilitate market access/expansion
- Enhance investor readiness

Recommendations

The recommendations for sector growth and development have been developed based on a comprehensive analysis of the digital tech ecosystem including stakeholder engagement:

- **Implement industry-backed vision and strategy**
  Establish a vision for the sector that is underpinned by strong leadership and is backed by industry. Ensure all sector development initiatives are allied to this vision.
- **Establish a central ecosystem engagement platform**

Create an online platform/portal to enable businesses to navigate the support landscape more easily. Actively promote and recruit a delivery manager to manage the platform.

- **Launch a comprehensive talent attraction and retention programme**
  Design marketing campaigns to attract talent to the region, using relocation packages as incentives. Develop supplementary skills/career pathways, e.g., reskilling, to bolster job market.
- **Simplify, streamline and tailor support**
  Enhance targeted support measures to address specific business needs and link support measures across the lifetime of a company. Encourage the formation of more investor networks.
- **Foster sector-specific clusters and cross-sectoral innovation and collaboration**
  Direct support at high-growth potential clusters (e.g., AgriTech) and cultivate cross-sectoral innovation/collaboration. Launch outcomes and purpose-driven networking events.
- **Improve digital connectivity infrastructure**
  Facilitate engagement between key stakeholders (infrastructure providers, local authorities, businesses/consumers) to prioritise deployment based on use cases and demand, trialling novel solutions where relevant.

Next Steps

Next steps following the publication of this ecosystem mapping report include:

- Roadmap launch event
- Feedback channel
- Online engagement

Call to Action

Do you want to be updated about the implementation of the roadmap? Please register your interest by emailing sarah.forbes@scotent.co.uk

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Prepared By: Jordan Stodart and Ashley Stewart	**Date:** 4th April 2024
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1 Introduction

1.1 Background and Context

The Scottish Technology Ecosystem Review (STER)[1] emphasised the need for strategic collaboration to propel Scotland's burgeoning digital tech ecosystem to a self-sustaining phase of growth and development. Among its 34 recommendations was the call for equitable development opportunities across Scotland, particularly outside the central belt. This aims to spur job creation and the growth of scalable digital tech enterprises. Tay Cities, encompassing Dundee City, Angus, Perth & Kinross, and North East Fife, stands as a significant beneficiary and contributor to this vision.

Bolstered by a £150 million investment from both Scottish and UK governments through the Tay Cities Region Deal, the area is projected to create over 6,000 jobs and attract £400 million in investment over 15 years. Initiatives like the cyberQuarter, Perth Creative Exchange, and JustTech have demonstrated early success. The Tay Cities Regional Economic Strategy 2019-203[2] underscores the importance of digital sectors such as software and mobile app development, video gaming, and cybersecurity, calling for enhanced digital skills training, infrastructure development, innovation, and internationalisation to ensure sustainable growth. Additionally, a key theme underpinning the Tay Cities deal is Connected Tay[3]. Through the implementation of the Tay Cities Regional Economic Strategy there are aims to support the development of ultrafast broadband in the main urban areas, support the delivery of superfast broadband in the wider region, provide solutions for improved 4G coverage and develop a roadmap for 5G coverage as well as improve the provision of free public Wi-Fi across key settlements.

Efforts by the Tay Cities Digital Thematic Board (consisting of the four local authorities, Scottish Enterprise, and Scottish Futures Trust), Scottish Enterprise's Digital Economy and Place teams, and local stakeholders, are underway to craft a digital roadmap. This strategic plan aims to amplify the digital economy within the region by nurturing the growth of digital tech companies, expanding the digital skills pipeline, fostering innovation, and attracting additional investment.

Digital Infrastructure

Digital infrastructure, in terms of connectivity, stands as an important area for development within Tay Cities. The region's geography presents unique challenges, necessitating partnerships with telecommunications providers to enhance service provision. The completion of projects such as the Local Full Fibre Network, which connects 186 public buildings across Angus and Perth & Kinross, and the development of a 5G testbed, exemplify progress. Additionally, efforts are ongoing to improve mobile network coverage, particularly in rural areas, through the deployment of new 4G masts and the utilisation of local authority assets to expand macro and micro cell sites.

The Tay Cities region benefits from targeted efforts to enhance digital infrastructure through initiatives like the DCMS-funded Digital Infrastructure Accelerator[4]. This programme focuses on using local authority assets to deploy improved mobile network coverage, especially in rural areas affected by poor

1 https://www.gov.scot/publications/scottish-technology-ecosystem-review/
2 https://www.taycities.co.uk/sites/default/files/tay_cities_res_2019.pdf
3 https://www.taycities.co.uk/connected-tay
4 https://www.gov.uk/guidance/digital-connectivity-infrastructure-accelerator-competition-winners

4G coverage. The introduction of new 4G masts aims to address coverage gaps, creating a better environment for digital tech businesses to operate. Efforts to map and enhance both broadband and mobile connectivity across Tay Cities are pivotal, encouraging the growth of the digital economy by improving service provision and attracting new businesses.

Digital Skills

Skills are critical to enabling the sector to grow and develop. The Tay Cities digital skills project is part of the £20 million Regional Skills and Employability Development Programme and was awarded £1.5 million over a 3-year period to support regional economic growth and develop the digital labour market. The Tay Cities Digital Skills Mapping report[5] highlighted a range of potential interventions to support the development of digital skills in the region. The outcomes of this report were considered as part of our research and synergies and differentiators identified and discussed within this report.

1.2 Study Aims and Approach

The purpose of this study is to develop a map of the digital tech ecosystem in the Tay Cities region, alongside a map of the connectivity infrastructure that underpins it. The study also aims to identify key barriers and opportunities for enhancing the digital economy in the region alongside recommendations for growth.

Study outputs:

- **Digital Ecosystem Map.** This provides a comprehensive overview and breakdown of the industry-base and the industry support landscape. Members of the ecosystem are categorised by, for example, size, local authority, and digital sector (for companies); and the type of support offered, e.g., innovation centre, educational institution, industry network, event provider, and other types of assets (for industry support stakeholders).
- **Digital Infrastructure Map**. This provides an interactive map illustrating good and bad coverage regarding gigabit availability and mobile network across the region. This map is supported by analysis and narrative discussing the current deployment of superfast broadband and the impact of initiatives such as the Digital Scotland R100 projects, the UK Gigabit Project, the Shared Rural Network (SRN) and Scottish 4G Infill (S4GI), alongside anticipated deployment over five years and the importance of collaboration and leveraging local assets to achieve deliver connectivity.
- **Barriers, opportunities, and recommendations for growth.** The identification of business challenges/barriers, opportunities for the sector, and recommendations for sector growth and development to inform the creation of a digital roadmap for the region, delivered through the Tay Cities Digital Ecosystem Group.

The approach taken to deliver the study consisted of an extensive phase of desk research and analysis, followed by engagement with key stakeholders across the industry and the support landscape via one-to-one interviews and a workshop. This was followed by a further phase of analysis which informed the development of recommendations for growth and development.

[5] https://www.digitay.scot/wp-content/uploads/2023/10/231017-TCD-Digital-Skills-Project-Skills-Mapping-Report-Final.pdf

2 Tay Cities Digital Tech Ecosystem

This section of the report presents the results of both the desk research and primary engagement phases of the study.

The following definition of a digital tech company was used for the purpose of this study:

A digital technology company is a business that develops a digital technology, product, service, platform or hardware. This can include a wide range of activities, such as software development, graphic design, cloud computing services, artificial intelligence, and more. Tech-enabled companies, i.e., companies that leverage digital solutions but do not create them, are not within the scope of this definition.

Desk research, utilising a range of sources (e.g., The Data City[6], company directories, internal databases, etc), was used to identify organisations within the ecosystem.

To qualify as a company within the ecosystem, the following criteria had to be met:

- Company is 'Active' on Companies House
- Company has an accessible website
- Company is located within the region (based on website or, if the website does not include any addresses, the registered address on Companies House is used)
- Company is a digital tech business based on the agreed definition (above)

Industry support stakeholders qualified based on their relevancy to the sector and either location in the region or by serving the interests of businesses in the region, i.e., a national centre or initiative not physically located in the region, but relevant at a sector level.

The ecosystem was then depicted in an infographic, which provides a visual snapshot in time of the digital ecosystem in the region. An interactive map has also been developed which shows the regional breakdown of the industry-base as well as company attributes (e.g., digital sector affiliation).

The full ecosystem dataset is contained in, and provided as, a separate Microsoft Excel document.

2.1 Ecosystem Overview

A graphical representation of the ecosystem can be found further below.

Headline Figures

- 281 companies
    - 4 primary tech sectors
    - 23 secondary tech sectors (distributed between the 4 primary sectors)
- >50 support organisations/programmes/initiatives
    - 4 primary support categories
    - 12 secondary support categories (distributed between the 4 primary categories)

[6] The Data City is a data as a service company providing unique, real-time industrial data on the most dynamic emerging economic sectors via its AI driven platform (https://thedatacity.com/)

Figure 1: Tay Cities Digital Ecosystem - Infographic

A description of each segment of the ecosystem is as follows:

Industry Landscape

The industry landscape is segmented into four primary sectors, made up of a number of secondary (or sub-) sectors. As follows:

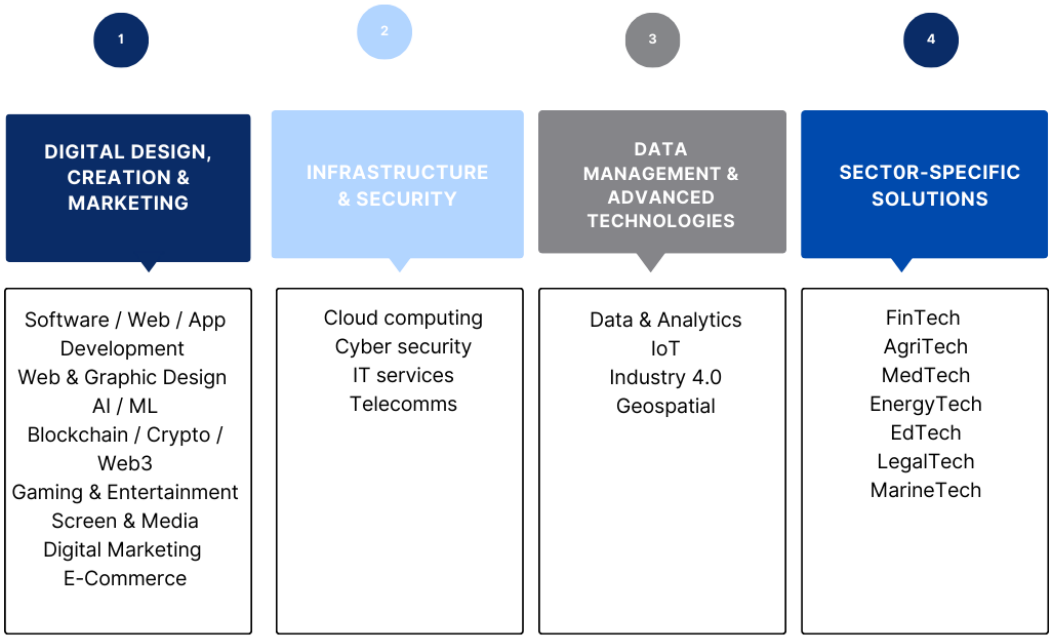


Figure 2: Industry Categories

Industry Support Landscape

The industry support landscape is also made up of four primary categories, each with its own secondary categories, as illustrated below.

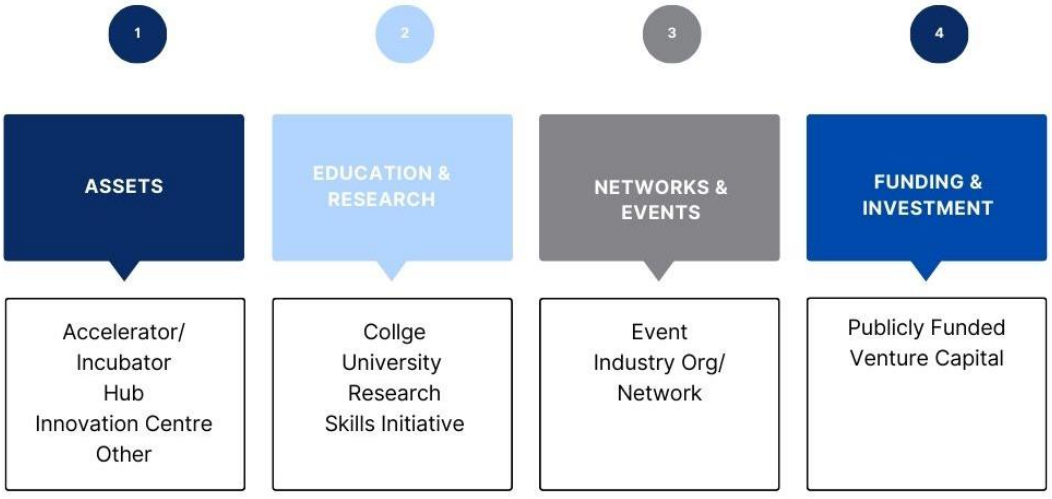


Figure 3: Industry Support Landscape Categories

2.1.1 Industry Analysis

The following chart (Figure 4) shows a breakdown of the 281 companies by local authority. Approximately half of the company-base is based in Dundee, which is to be expected considering the population density and other business/tech friendly characteristics of this part of the region (e.g., two universities, office space availability, etc.). Perth & Kinross represents 28% of businesses, and North East Fife (Fife) and Angus represent 12% and 9%, respectively. Overall, companies are well distributed throughout the Tay Cities region, showing that businesses are not overly concentrated in urban areas; rather there is a notable formation of clusters across the four areas indicating a distribution of activity in both urban and rural areas.

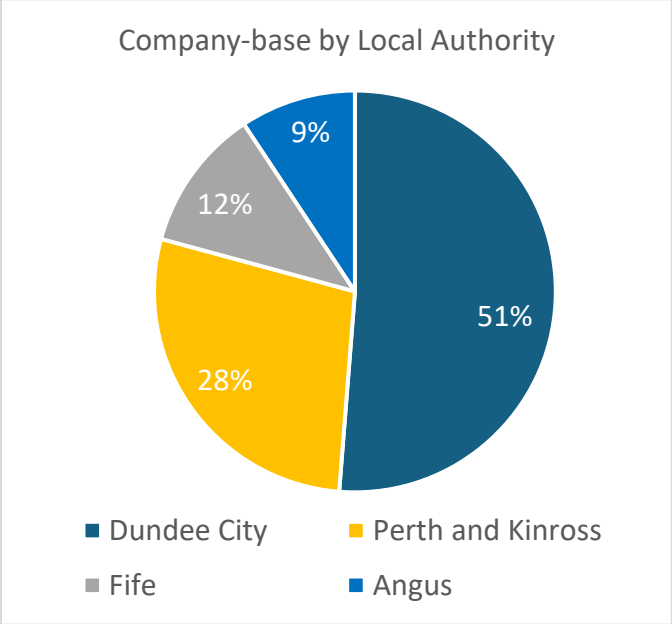


Figure 4: Proportion of Companies by Local Authority

Almost two thirds of the company-base offer a service (Figure 5), either relating to software or hardware, such as software development (for specific needs), graphic design, IT services, digital hardware design, telecommunications installation, etc. Product providers are most typically associated with video game development or the development of sector-specific solutions in MedTech, FinTech, AgriTech and EdTech.

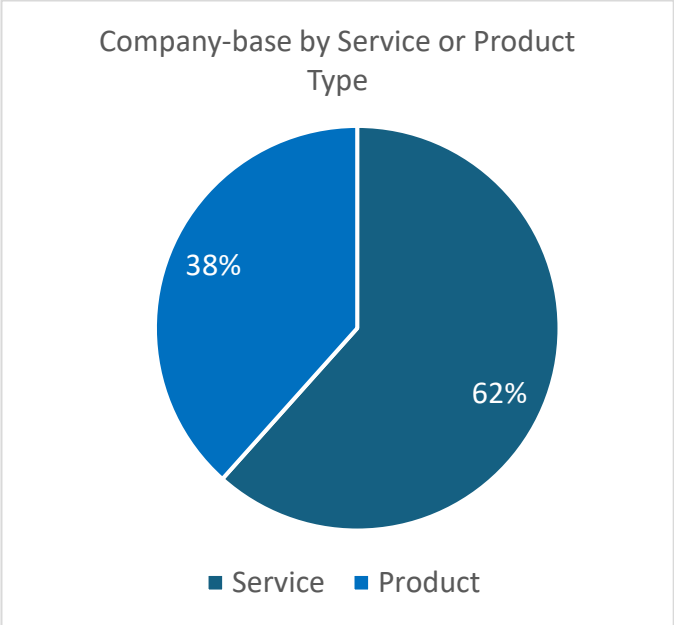


Figure 5: Proportion of Companies by Service or Product Type

In breaking down the company-base further, by whether they offer a software-related product or service, hardware-related product or service, or consultancy advice, more than three-quarters of the company-base provide a software-related service or product (e.g., digital marketing service or video game product development). Companies involved in digital hardware products or services make-up 21% of the sector and may be involved in the installation of hardware, e.g., telecommunications service providers, or in the manufacture of hardware. Consultancy providers represent 1% of the company-base and typically provide specialist consulting services such as strategy and planning. This is summarised in (Figure 6).

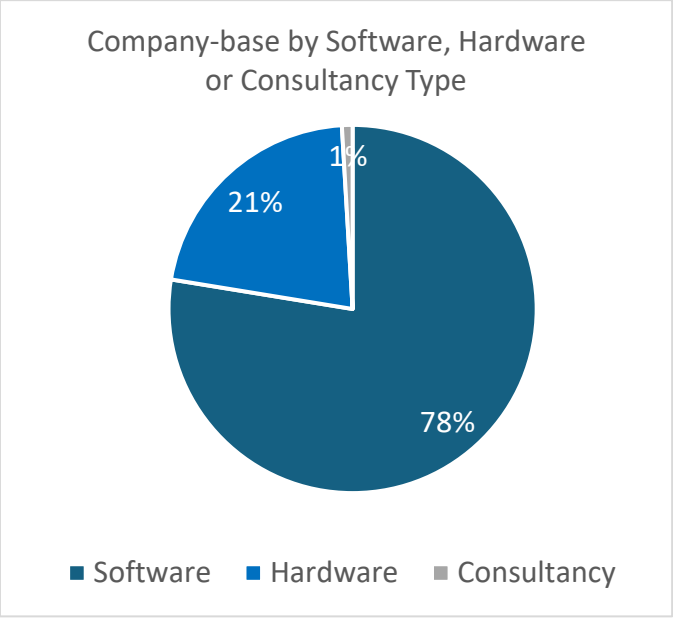


Figure 6: Proportion of Companies by Software, Hardware or Consultancy Type

As previously mentioned, the company-base has been segmented into four primary sectors, each of which is made-up of a number of sub-sectors. More than half of the company-base is involved in the design and/or creation of digital tech (digital design, creation, and marketing), whether through product development or the provision of a service; digital marketing falls within this primary sector. Infrastructure and security companies make up 21% of the company-base, with sector-specific solutions (e.g., AgriTech, FinTech, etc.) and data management and advanced technologies representing 14% and 12% of the industry landscape, respectively. Similar to the breakdown of the company-base by local authority, it is encouraging to note the spread of companies by sector, albeit with notable strengths in the digital design, creation, and marketing segment, as shown in Figure 7.

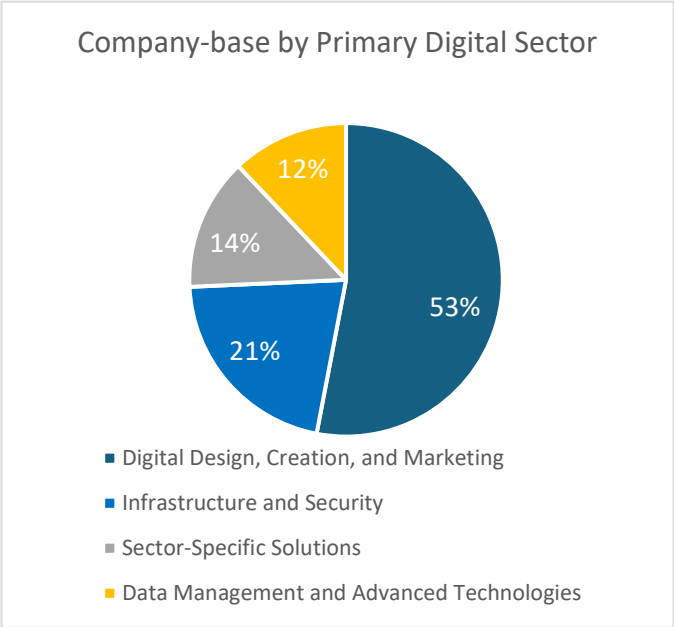


Figure 7: Proportion of Companies by Primary Digital Sector

Figure 8 illustrates the breakdown of the four primary sectors by the local authorities within the Tay Cities region. Each local authority has representation from all four primary sectors, with similar proportions across the region. This further demonstrates the spread of capabilities across the region, with key strengths in digital design, creation, and marketing across all four local authorities, in particular, Dundee; additional pockets of strength can also be found in infrastructure and security in Perth & Kinross, data management and advanced technologies in Fife, and sector-specific solutions in Angus.

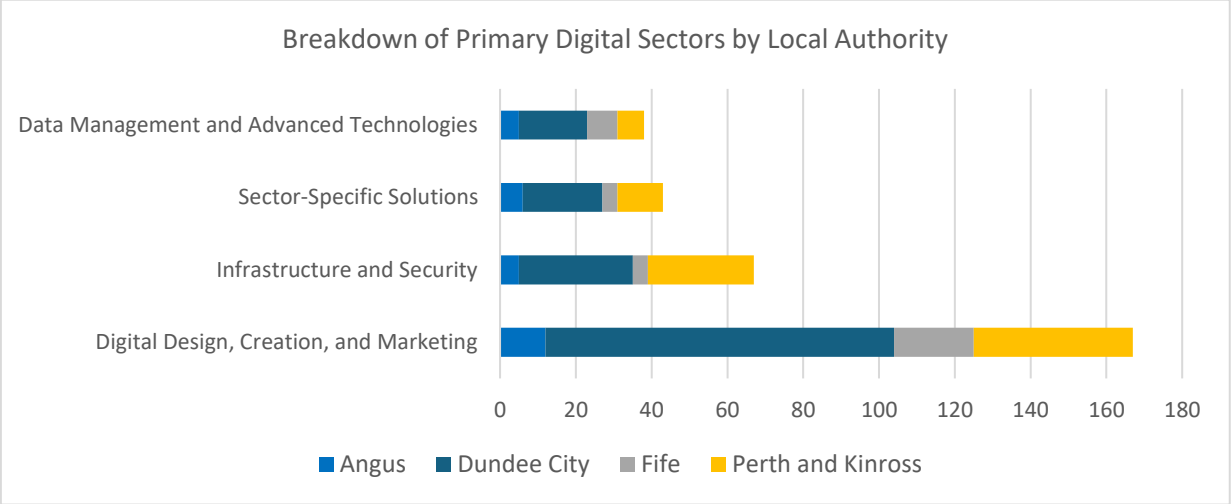


Figure 8: Primary Digital Sector by Local Authority (total no. companies)

Figure 9 highlights that the top four digital sub-sectors (e.g., software/web/app development) are all part of the primary sector digital design, creation, and marketing. This further signifies the region's strength in this overarching sector. There is also a strong base of capability in telecommunications and IT services (part of the infrastructure and security sector), as well as data & analytics and geospatial (part of data management and advanced technologies sector), and evidence of clusters forming in areas such as AgriTech, MedTech and FinTech (part of the sector-specific solutions sector).

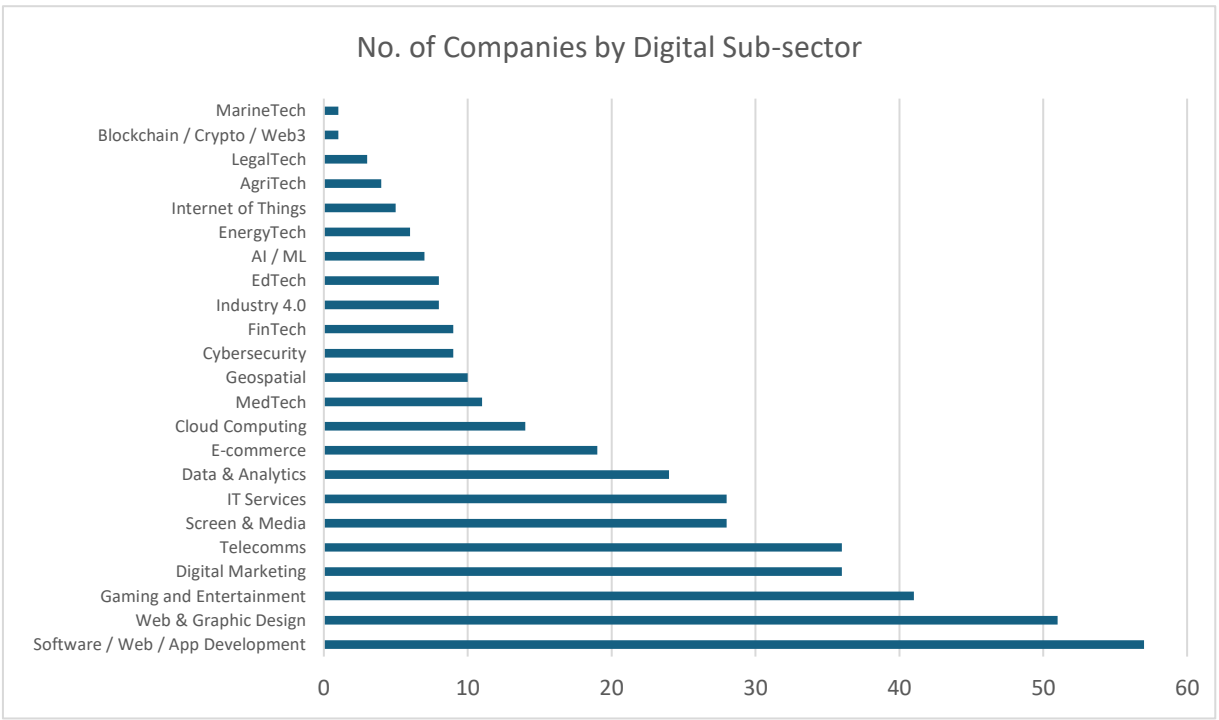


Figure 9: Number of Companies by Digital Sub-sector (total no. companies)

There is variation in sector strengths between local authorities (as shown in Figure 10), despite software/web/app development featuring in the top two sub-sectors for each local authority. Some sub-sectors are almost exclusively present in one authority (e.g., gaming and entertainment in Dundee City),

while others are more evenly spread. Each local authority also appears to have certain sub-sectors where they excel comparatively speaking. For example, gaming and entertainment is Dundee City's main strength (28 companies) despite it being 3rd in the ranking of sub-sectors by total companies across the Tay Cities region. North East Fife shows good potential in data & analytics, geospatial and EdTech where, proportionally, the area would expect to have fewer companies; Perth & Kinross has clear strengths in web & graphic design and telecommunications; while Angus has established a cluster of companies in Industry 4.0. This may indicate specialised local industries or simply a concentration of companies in these areas.

In addition, the top four sub-sectors are all part of the primary sector digital design, creation, and marketing, further cementing the region's strength in this primary sector.

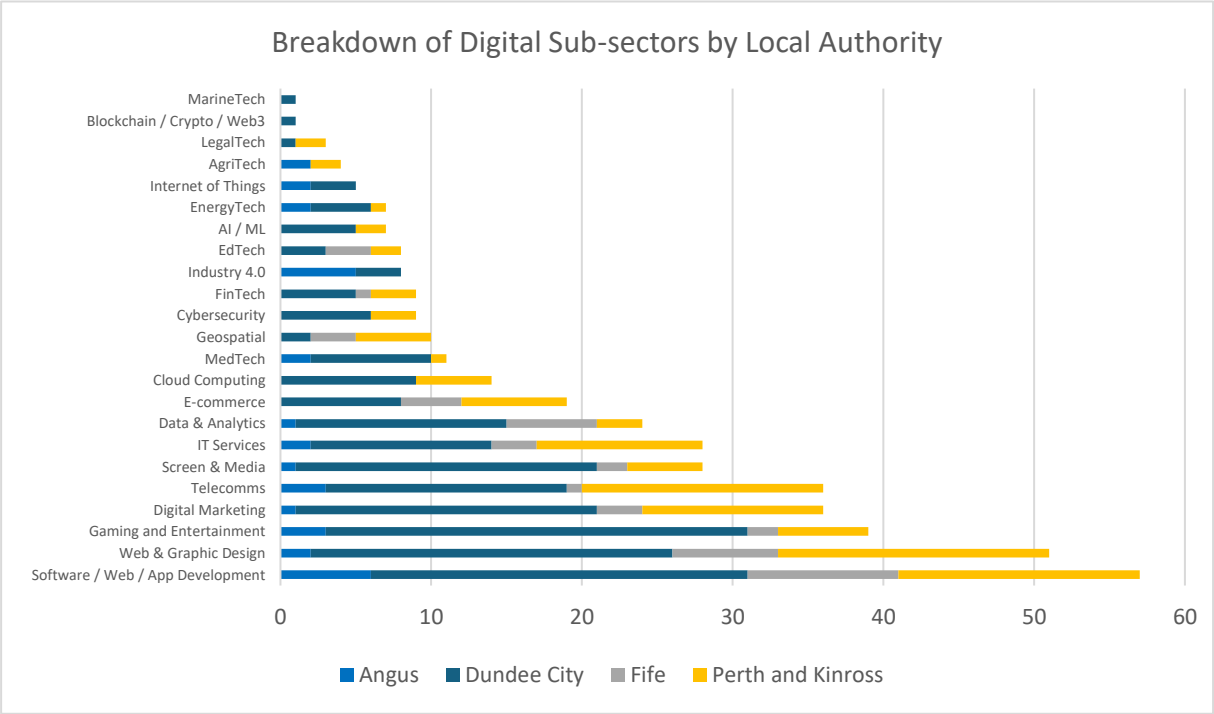


Figure 10: Digital Sub-sectors by Local Authority (total no. companies)

To support the identification of companies at the 'scale-up' stage, The Data City platform was used as it offers functionality to filter companies based on whether or not they meet the Organisation for Economic Co-operation and Development (OECD) definition of a scale-up:

"All enterprises with average annualised growth greater than 20% per annum, over a three-year period should be considered as high-growth enterprises. Growth can be measured by the number of employees or by turnover."

Companies are, therefore, categorised as 'scale-up' based on the following criteria:

- A company must have had at least 10 employees (this could be an estimate) in at least one point in time.

AND

- Have a growth rate which exceeds 20%. This is their average annual growth rate.

Analysis shows that a modest 6% of companies within the Tay Cities digital ecosystem are deemed to be at scale-up stage, as shown in Figure 11.

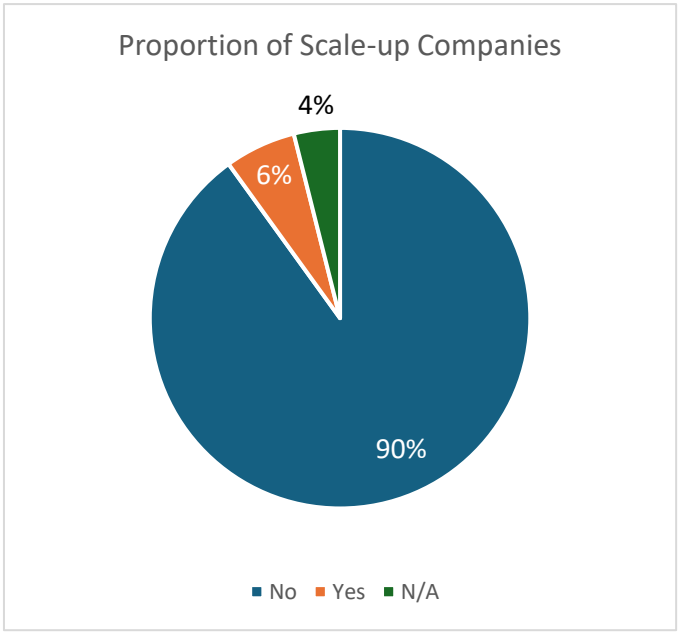


Figure 11: Proportion of Scale-up Companies Based on OCED Definition

Most of the scale-up companies can be found in the digital design, creation, and marketing sector, with several in sector-specific solutions and one in data management and advanced technologies, as shown in Figure 12 below.

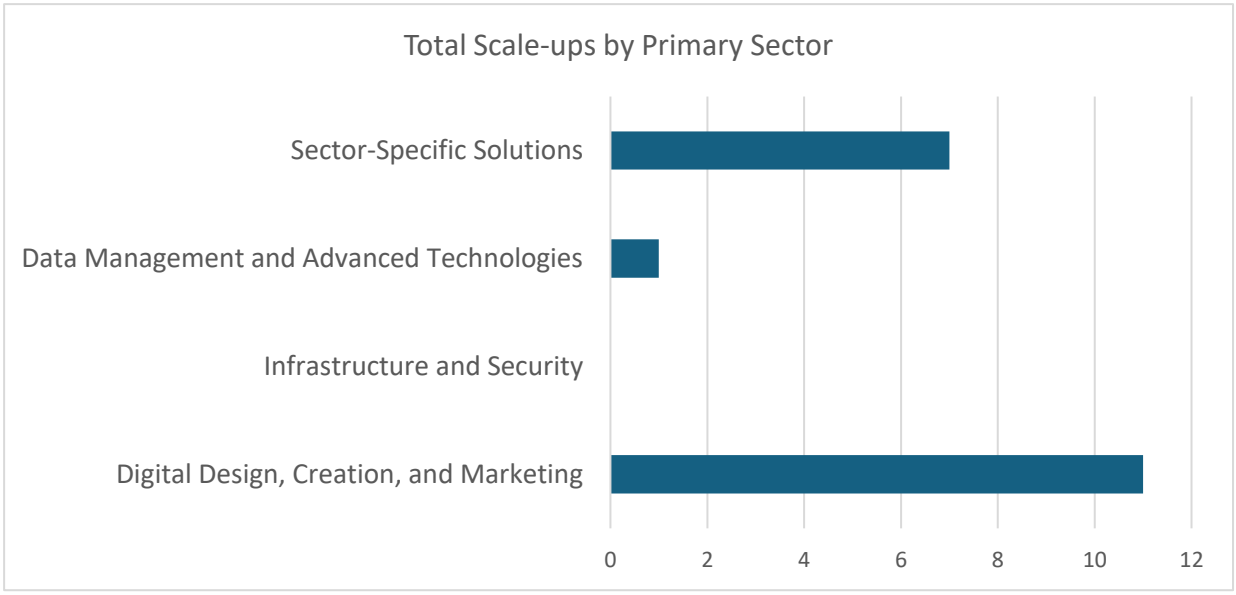


Figure 12: Total No. of Scale-ups per Primary Sector

However, it should be noted that the functionality afforded by the Data City platform was the most efficient method of determining company stage during this study. Therefore, the analysis provides a useful snapshot of the potential scale of high-growth companies in the region but, without further assessment and/or company engagement, it is difficult to form meaningful conclusions about the make-up of the sector based on the stage of growth metric.

In addition to identifying scale-up companies in the region, data about investment funding was also obtained via the Data City platform based on original data from Dealroom.co[7]. This type of data is useful to indicate the attractiveness of the region for investment. Key findings are:

- 21 companies identified as receiving investment funding
- £998,089,972 estimated total funding received
- 1x company received £838,799,987 (84% total funding) – this company's HQ is not in Scotland
- ~£160 million across the remaining 20 companies

It is important to highlight the limitations associated with the investment funding analysis, namely the reliance on one source for identifying companies that have raised capital (Dealroom.co). Additionally, the funding figures are substantially inflated by the presence of one large company which has raised almost £1 billion but, while it does have a registered address in Tay Cities and there is evidence of a small workforce in the region, the main operations are not located in Scotland.

2.1.2 Support Landscape Analysis

Over 50 organisations, programmes or initiatives have been identified as key members of the industry support landscape in the Tay Cities region. As outlined earlier, the landscape is comprised of four segments, each made-up of sub-categories of support. The breakdown is illustrated in Figure 13.

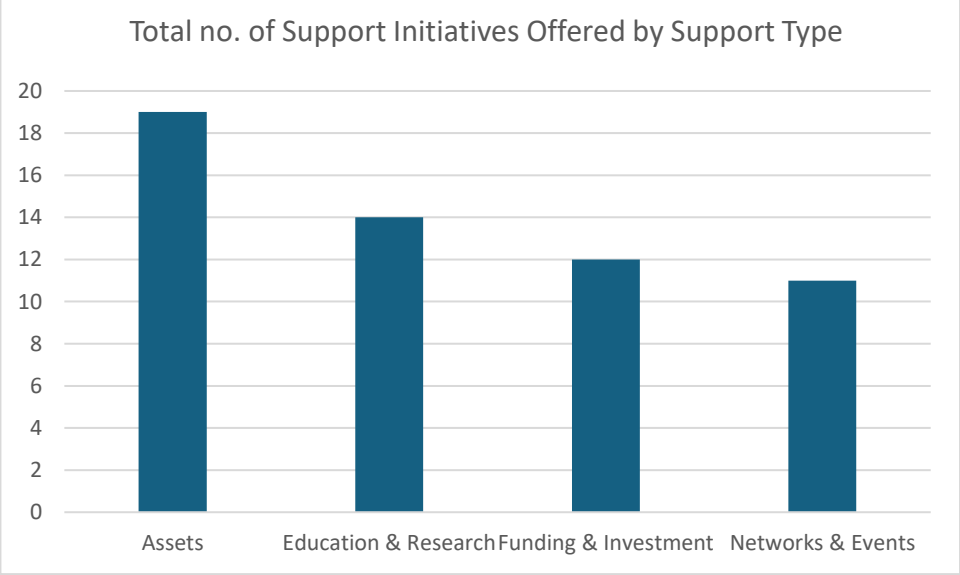


Figure 13: Total Organisations/Initiatives/Programmes Offered by the Type of Support

[7] Dealroom.co is a global data platform for intelligence on startups, innovation, high-growth companies, ecosystems and investment strategies (https://dealroom.co/)

This suggests that there is a fairly healthy landscape of support available to digital tech businesses in the region. Whilst all organisations in the support landscape support tech businesses in the region, several have a wider remit than just Tay Cities and, therefore, accommodate the needs of tech businesses across Scotland, e.g., national innovation centres, government agencies, venture capital firms, etc. The support landscape in the Tay Cities region demonstrates a collective effort aimed at fostering growth, enhancing skills, and driving economic growth.

2.2 Challenges & Opportunities

A programme of engagement was carried out with a small sample from the Tay Cities digital tech ecosystem. Briefing materials used during the engagement programme and a list of participating organisations can be found in Appendix A.

More than 35 one-to-one interviews were carried out with a range of digital tech businesses and industry support stakeholders (e.g., universities, innovation centres, local authorities). These one-to-one interviews enabled the collection of rich and insightful views, with feedback organised and categorised into thematic areas, tracking the frequency (ranging from High to Low) of identical or similar comments. It is important to mention that the size of the feedback group was comparatively small, indicating that a more extensive survey programme is advisable for additional quantification and assessment of the views shared below.

The feedback themes are as follows:

- Skills, talent and education
- Funding and investment
- Market access and business development
- Availability, identification & suitability of support
- Infrastructure and assets
- Engagement and collaboration
- Vision and identity

The challenges and opportunities discussed below relate to these overarching thematic areas.

Note: For clarity, any recommendations associated with the challenges and opportunities described below can be found in Section 5.

2.2.1 Industry Challenges/Barriers

The key challenges/barriers faced by tech businesses in the region are illustrated in Figure 14 and described further below.

Figure 14: Challenges/Barriers Faced by Digital Tech Businesses in Tay Cities

Recruitment and retention difficulties (Rating: High)

The most prevalent challenge identified amongst the participants is the recruitment and retention of personnel. This can be broken down into the following sub-challenges:

- High cost of recruitment
- Difficulties attracting and retaining those in senior roles due to competition/higher salaries elsewhere
- Demand outstripping supply in general
- Comparably higher national income tax rates impacting the attractiveness of the region
- Region generally being perceived as unattractive to live and work

Challenges engaging members of the ecosystem (Rating: High)

A barrier to growth and development is the lack of engagement across the ecosystem which impacts the generation of business opportunities, collaboration, and knowledge sharing. Sub-challenges include:

- General lack of engagement between industry and support landscape
- Siloed ways of working across the support landscape (i.e., reluctance to signpost elsewhere)
- Companies lack appetite to engage, particularly larger companies
- Lack of facilitation of engagement (e.g., networking/events, signposting)

Challenges navigating the industry support landscape (Rating: High)

It is generally acknowledged that while support might be available for general issues (e.g., starting a business, renting premises, recruitment advice, etc.), the complexity of navigating the landscape often leads to such assistance not being accessed. Sub-challenges include:

- Complexity and fragmentation of the landscape
- Lack of knowledge/awareness about support available in the region
- Hard to identify suitable support, e.g., confusing criteria
- Duplication of support

Funding availability and accessibility (Rating: Medium)

Securing funding and investment presents a widespread challenge, whether public or private mechanisms/schemes, and for diverse purposes, e.g., innovation and non-innovation. Sub-challenges include:

- Limited innovation funding
- Lack of non-innovation grants
- Complex grant landscape and application process
- Limited private investment options
- Lack of funding awareness or readiness

Digital connectivity challenges (Rating: Medium)

The region's rural areas face challenges with inadequate digital connectivity infrastructure, adversely affecting business activities and productivity. This issue stems from infrastructure providers' economic motivations to focus on urban areas and a general lack of awareness and understanding of the best solutions for a given use case. Sub-challenges include:

- Urban vs rural connectivity disparities (urban better served than rural)
- Economic advantage of urban vs rural infrastructure deployment (return on investment for providers)
- Lack of awareness about alternative connectivity options amongst consumers
- Limited engagement between key stakeholders

Quality and experience levels of graduates (Rating: Medium)

For smaller businesses especially, the calibre and experience of graduates can hinder the growth and progress of the company. This is a result of the potentially significant time investment required to train and support the new start, oftentimes committed by the founder and, therefore, detracting from other critical business tasks, such as acquiring customers or raising capital. This issue is underscored by the previously mentioned retention problem, which contributes to skilled graduates opting for more appealing opportunities elsewhere. Sub-challenges include:

- Smaller companies lack the time required to invest in hands-on training / support
- Lack of hybrid or blended skills-sets, e.g., soft/hard, technical/commercial, technical/sector-specific
- Insufficient levels of experience
- Challenges placing/matching students with appropriate industry opportunities

Specific skills gaps (Rating: Medium)

Specific gaps have been identified in the region's talent pool. Additionally, there are some concerns regarding the availability of upskilling which would also help to plug these gaps. Sub-challenges include:

- Limited availability of skills in specialist (technical) areas, e.g., data engineers, LiDAR, etc.
- Lack of upskilling courses/programmes

Gaps in the support available (Rating: Medium)

Companies transitioning from start-up to scale-up, alongside companies that define themselves as scale-up, believed there is a scarcity of assistance to support their particular needs. Moreover, there is an absence of follow-on assistance from existing programmes and initiatives. Sub-challenges include:

- Gap in support for start-up to scale-up transition
- Lack of tailored support for scaling businesses
- Lack of follow-on support

Challenges collaborating with members of the ecosystem (Rating: Low-Medium)

Related to the previously mentioned challenge of poor engagement throughout the ecosystem, some participants have identified collaboration as a problem. Sub-challenges include:

- General lack of collaboration across the ecosystem (e.g., between companies, sectors, etc.)
- Specific lack of collaboration between industry and academia
- Lack of collaboration with other regional ecosystems in Scotland

Market access and expansion (Low-Medium)

For a sub-set of respondents, issues exist in their sales and marketing capabilities, as well as a relative lack of support or knowledge of existing support to help address these shortcomings. Sub-categories include:

- Weaknesses/limitations in sales, marketing and business development
- Obstacles to public sector procurement
- Limited awareness/availability of support for accessing new markets

Uncertainty about the region's strengths (Rating: Low)

A small portion of respondents shared the view that the region lacks clarity regarding its key strengths. This impacts any promotional activities that might be developed to, for example, attract talent to the region. Sub-challenges include:

- Lack of clarity regarding regional strengths

Lack of vision for the region (Rating: Low)

In line with the challenge regarding the uncertainty about the region's strengths, some respondents believed the region lacks leadership and a 'voice' which similarly impacts meaningful strategies and initiatives to develop and grow the region's tech sector. Sub-challenges include:

- Limited leadership / voice for the region

2.2.2 Industry Opportunities

The key opportunities that have been identified to foster industry growth and development are visualised here (Figure 15) and described further below.

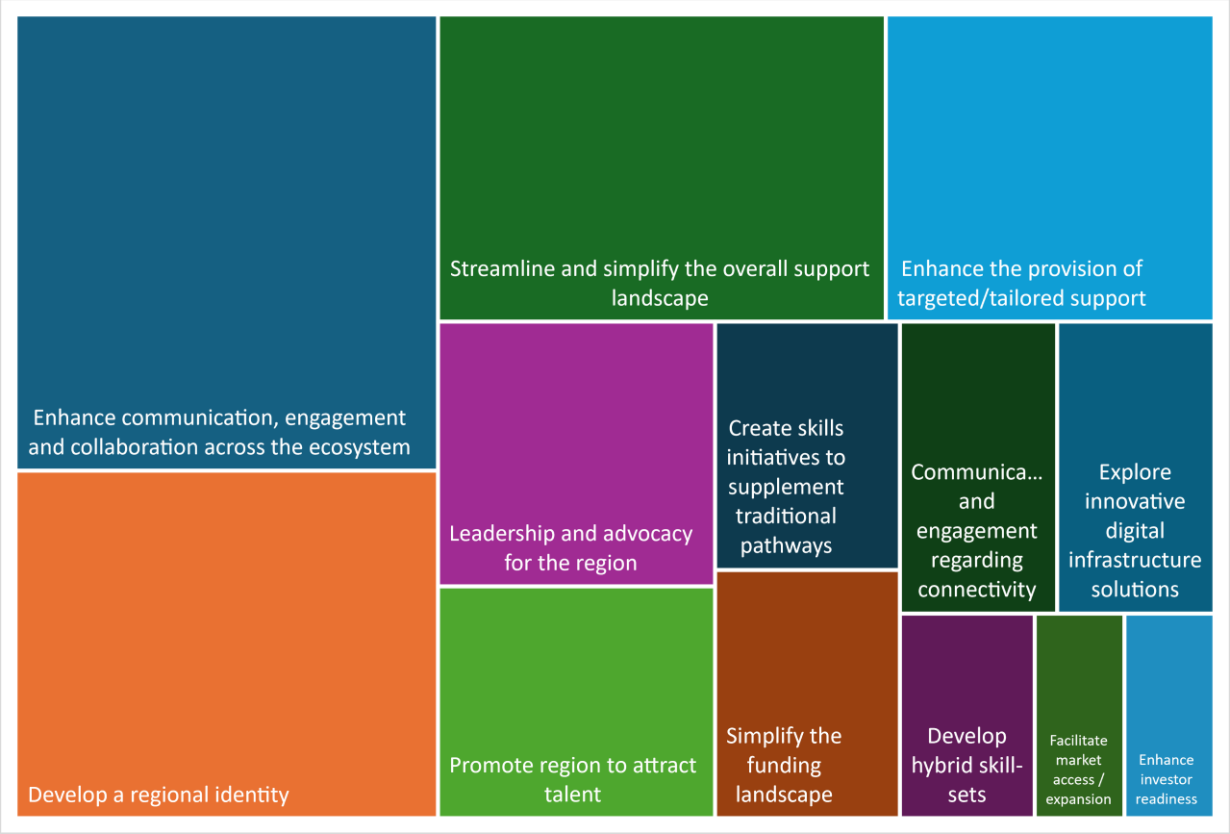


Figure 15: Opportunities for Industry Growth and Development

Enhance communication, engagement and collaboration across the ecosystem (Rating: High)

There is general consensus that engagement is lacking across the ecosystem, which adversely affects the level of collaboration. Potential significant opportunities exist to capitalise on key sector strengths, such as gaming, and cross-fertilising with other sectors, such as healthcare, to solve specific problems or explore specific use cases. Networking and events are also regarded as either in short-supply or hard to find. This opportunity is made-up of the following sub-opportunities:

- Create more relevant networking opportunities
- Raise awareness about opportunities and support measures available to businesses
- Strengthen collaboration through cross-sectoral innovation and collaborative models

Develop a regional identity (Rating: High)

While 'lack of vision for the region' was not regarded as a high priority challenge/barrier for businesses in the region, it is widely regarded as an opportunity that would have a knock-on effect on a number of other challenge areas. For example, by establishing a strong regional identity with key sectors of strength, there is an expectation that recruitment and retention of talent will improve. Sub-opportunities include:

- Leverage strengths of existing hubs/centres, e.g., cyberQuarter, CoSTAR, James Hutton Institute

- Bolster the heritage of gaming and promote the region as the cornerstone of the industry
- Explore emerging markets that show signs of high-growth potential (e.g., cybersecurity and AgriTech)

Streamline and simplify the overall support landscape (Rating: High)

A commonly recognised opportunity for improving support utilisation is the need to streamline the landscape, making it easier to find and access support services. Sub-opportunities include:

- Create a central hub / resource to efficiently highlight and direct businesses to the available support (possibly appoint an 'Delivery Lead' for the region to act as a single point of contact)
- Establish clear pathways of support (e.g., transition from start-up to scale-up)
- Map and learn from the existing/legacy support ecosystem
- Leverage the local ecosystem for support and adopt a "work local" approach

Enhance the provision of targeted/tailored support (Rating: Medium)

Improving the delivery of customised support can potentially address a key issue highlighted by a smaller group of study participants, specifically those who identify their businesses as in the 'scaling' phase. This tailored support is perhaps more beneficial for companies that have already achieved product-market fit and are in need of particular support for activities such as entering new markets, exploring alternative finance options, or other advanced business issues. Sub-opportunities include:

- Prioritise support for scaling businesses (e.g., targeting support at more advanced business issues such as sourcing alternative finance, accessing foreign markets, etc.)
- Establish tailored mentorship programmes (recruit mentors who were recently at the same/similar stage of growth and have succeeded in scaling further)
- Sustain support for longer / following the completion of a programme (aligns with support pathways opportunity above)
- Secure industry input at programme design as well as delivery

Establish leadership and advocacy for the region (Rating: Medium)

Alongside cultivating a regional identity, there is an opportunity to establish robust leadership for the region, with a vision that is supported by the industry-base. This would offer the sector a representative voice, championing ongoing improvement and growth. Sub-opportunities include:

- Establish strong leadership and tech sector advocacy for the region
- Engage local businesses and establish a shared vision for the region
- Promote the region's strengths

Promote the region to attract talent (Rating: Medium)

In response to the main challenge/barrier faced by the sector ('recruitment and retention'), there is a significant opportunity to enhance the promotion of the region in order to attract top talent. This activity would likely dovetail with the opportunities outlined above that focus on establishing a regional vision and identity, underpinned by strong leadership. Sub-opportunities include:

- Promote the attractiveness of the region
- Incentivise companies to re-locate (financial incentives, e.g., tax breaks)
- Incentivise talent to re-locate (financial and non-financial incentives)

Create skills initiatives to supplement traditional pathways (Rating: Low-Medium)

To resolve the issue of demand outstripping supply, there is some acknowledgment that the university pipeline will not be sufficient and other initiatives and programmes are required to fill the gap. Sub-opportunities include:

- Develop career change programmes
- Develop upskilling programmes

Simplify the funding landscape (Rating: Low-Medium)

By simplifying the funding landscape and making it easier for companies to identify and apply for funding, more companies will be able to invest in innovation and activities that support their growth and development. Sub-opportunities include:

- Centralisation of funding opportunities (regional as well as national)
- Advanced notification of funding opportunities
- Streamline the funding application process

Improve communication and engagement regarding digital connectivity (Rating: Low-Medium)

A problem expressed by industry support stakeholders and infrastructure providers is the lack of awareness about the various solutions available on the market amongst consumers (e.g., fixed fibre, wireless, satellite). By improving engagement with consumers, the most appropriate solutions can be identified based on use cases and the specific needs of the consumer. Sub-opportunities include:

- Understand demand and develop use cases for connectivity
- Raise awareness and educate consumers about connectivity solutions and alternatives

Explore innovative digital infrastructure solutions (Rating: Low-Medium)

In conjunction with the opportunity described above, there is an opportunity to trial novel connectivity infrastructure solutions, such as satellite communications, based on the use case and demand. Improved communication and engagement with the consumer market is critical to enabling this opportunity. Sub-opportunities include:

- Explore and trial LEO satellite, etc.

Develop hybrid skill-sets (Rating: Low-Medium)

A prevalent opinion is that graduates often do not possess a combination of the skills required by companies, especially in areas of soft and hard skills[8] (typically lacking the soft skills), or technical and commercial/entrepreneurial skills (typically lacking the commercial skills). Although this was not highlighted as a major opportunity by the participants of the study, it could represent a substantial chance to support the sector's long-term growth and development, and to retain the best talent within the region. Sub-opportunities include:

- Create or enhance mechanisms that foster hybrid soft and hard skills
- Create or enhance mechanisms that foster blended technical and entrepreneurial skills

[8] Soft skills relate to interpersonal or people skills (e.g., communication, teamwork, etc.) whereas hard skills relate to technical skills or specific competencies (e.g., computer programming, data analysis, etc.)

Facilitate market access / expansion (Rating: Low)

A specific sub-set of study participants identified accessing new markets as their biggest current challenge. They also agreed that there is a general lack of awareness about the sales and marketing support available to help penetrate new markets (some had engaged with Scottish Development International but were unfamiliar with any other similar offerings). Resolving this issue will likely benefit a far wider group of businesses, especially those which are aiming to scale their operations and expand but lack the knowledge to do so. Sub-opportunities include:

- Facilitate introductions to potential customers / enhance awareness about existing sales and marketing support
- Promote companies to new markets (e.g., missions)

Enhance investor readiness (Rating: Low)

In parallel with the efforts to simplify the funding landscape, mentioned earlier, there is an opportunity to make companies in the region more investor ready, to attract investment into the sector. This is likely to require enhancement of the investor readiness support already available. Sub-opportunities include:

- Make companies more investible through targeted support
- Create a young company investment scheme

In summary, there are a range of challenges/barriers that companies face. These vary depending on the nature and size of business, and its particular circumstances, plus its location in the region (specifically relating to connectivity challenges). Despite the challenges, the ecosystem recognises that there is a significant number of key opportunities that, if pursued, could have a lasting impact on the digital tech ecosystem in the Tay Cities region. Recommendations for pursuing these key opportunities are described later in this report (Section 5).

2.3 Digital Skills

Digital skills play an important role in enabling the growth of digital economies. The Tay Cities Digital Skills Mapping report[9] highlighted a range of potential interventions to support the development of digital skills in the region. These included, for example, leveraging the cyberQuarter as a centre of excellence for cybersecurity skills, investigating micro-credentials as a flexible upskilling route, and exploring distributed learning models to cater to the needs of the different types of learners across the region. These should be implemented as part of, or inform the actions of, the region's digital skills project, DigiTay[10].

Synergies have been identified between this ecosystem mapping study and the digital skills mapping research, as follows:

- **Structure of the sector:** The digital skills mapping report identified 23 digital industries ranging from the manufacture of consumer electronics to hosting web portals. This ecosystem mapping research, similarly, identified 23 industries, ranging from software/web/app development to sector-specific industries such as MedTech. While the taxonomies are different and the

[9] https://www.digitay.scot/wp-content/uploads/2023/10/231017-TCD-Digital-Skills-Project-Skills-Mapping-Report-Final.pdf

[10] DigiTay is a £20m project, funded as part of the Tay Cities Deal. It will run over a 3-year period, supporting regional economic growth and the digital labour market through the region.

approach to classification may be different, there is likely to be approximately 20+ digital industries in the region which helps to map skills and identify gaps and areas of strength and weakness.

- **Distribution of jobs and companies:** 48% of digital jobs are based in Dundee according to the digital skills mapping research. This ecosystem mapping research found that 51% of the total number of companies are based in Dundee; 30% of digital jobs and 28% of companies are based in Perth & Kinross; 13% of digital jobs and 9% of companies are based in Angus; 9% of jobs and 12% of companies are based in North East Fife. This basic comparison may be useful to validate the composition of the company-base and spread of digital jobs in the region (note: this study did not delve into the distribution of skills across the region).
- **Popular digital skills roles:** The digital skills mapping report identified programmers and software development professionals as the roles most in demand across the four local authorities in the region. This ecosystem mapping research identified software/web/app development as the industry with the most companies, indicating some alignment regarding digital job roles that will be in demand in the region.
- **Increasing demand for cybersecurity:** This ecosystem mapping research identified cybersecurity as the industry that should be prioritised in the region, among several other industries that show significant potential. The digital skills mapping report highlighted a growing demand for cyber roles and cited the cyberQuarter as an asset that can be leveraged further to support skills development.
- **Skills gaps:** Meta skills (e.g., communication, team-work, etc.) as well as blended technical and commercial skills were identified as lacking by the digital skills mapping research. Analysis carried out in this ecosystem mapping study similarly found that blended technical and commercial skills and hybrid 'soft' and 'hard' skills were lacking.
- **Talent shortage / local talent pool deficiencies:** Stakeholder feedback from the digital skills mapping research found that the local talent pool was viewed as less important now, despite most larger employers actively seeking to offer opportunities within the region. This ecosystem mapping study confirmed that digital tech businesses are prepared to recruit from outwith the region to access the talent required. This has been enabled by remote working conditions which have improved significantly in recent years. Also, larger employers did attest to the strong pipeline of local graduates in the region, which has been a valuable channel for filling junior roles. It is also important to consider the competition for local talent from elsewhere, which has meant the local employer-base may not always have access to the top talent in the region and is unable to compete with the higher salaries offered elsewhere. This is a particular issue when filling senior vacancies.
- **Attracting / retaining talent:** In line with the point above, both studies emphasised the importance of enhancing the appeal of the region to improve the attraction and retention of talent. The digital skills mapping report states that "better linking career pathways across sectors and employers within the Tay Cities region will help to growth the digital economy, create new jobs and make the region a more attractive place for people to work and live". This ecosystem mapping study recommends designing and implementing a programme to focus efforts on resolving this key issue for the sector (see Section 5).

Despite the overlaps between the studies, there are some key differences, as follows:

- **Research scope:** The digital skills mapping study concentrated on identifying the digital and data skills needs within the region, assessing the current skills landscape, and proposing interventions to bridge skills gaps and ensure the workforce is equipped to support the region's digital economy. In contrast, this ecosystem mapping study has focused on mapping the entire digital tech ecosystem (companies plus support landscape) and the connectivity infrastructure that underpins it. It also discusses the challenges and opportunities for businesses and the sector more broadly and provides recommendations to support sector development. As such, whilst skills emerged as a thematic area within the analysis it was not the sole focus of the research.
- **Sectoral focus:** The digital skills mapping study focuses on digital skills across the economy in the region, taking into account a range of sectors, such as manufacturing, ICT, publishing and media, financial services, construction, etc. This ecosystem mapping study is focused specifically on digital tech industries, such as software/web/app development, graphic design, gaming, telecommunications, AI, IoT, MedTech, AgriTech, etc.
- **Proposed interventions / recommendations:** The digital skills mapping study proposes interventions primarily focused on education and training, such as enhancing upskilling routes, linking career pathways, and leveraging regional assets for skills development. This ecosystem mapping study proposes recommendations for sector growth and development, covering a much broader remit than skills, education and training.

In conclusion, despite the obvious differences (e.g., scope and focus), both studies complement each other in aiming to bolster the Tay Cities digital economy by, for example, addressing skills gaps, enhancing digital career pathways, and improving the region's ability to attract and retain talent.

3 Tay Cities Connectivity Infrastructure

3.1 Scottish Infrastructure Overview

Connectivity across Scotland is improving, utilising a range of technologies

(Ofcom (2023) Connected Nations – Scotland Report 2023)

There are a range of initiatives that aim to improve digital connectivity in Scotland (including wider UK initiatives) focusing on extending high-speed internet access, enhancing digital infrastructure and ensuring inclusivity in digital access. These include:

- **Reaching 100% (R100) Program**[11]: R100 builds upon the successful Digital Scotland Superfast Broadband Programme, which connected more than 950,600 homes and businesses across Scotland. R100 is an ambitious Scottish Government commitment to provide every home and business in Scotland with access to superfast broadband speeds of at least 30 Mbps by the end of 2021. The programme focuses on the hardest-to-reach areas in Scotland, deploying fibre optic and other technologies to ensure comprehensive coverage. In addition, the R100 Scottish Broadband Voucher Scheme (SBVS) was launched in September 2020. SBVS ensures that any home or business not in scope of the R100 contracts or planned commercial build can get access through a voucher worth up to £5,000. As of 1 October 2023, over 3,500 R100 SBVS vouchers

[11] https://www.scotlandsuperfast.com/

have been used to provide access to superfast broadband in Scotland, with another 500 in the pipeline.

- **4G and 5G Mobile Coverage**: Both the UK and Scottish Governments support initiatives to improve mobile services across Scotland, including the rollout of 5G networks. The UK's Mobile Infrastructure Project (MIP) and the Shared Rural Network aim to eliminate mobile not-spots, particularly in rural Scotland. MIP [12] was announced in 2011 as part of the National Infrastructure Plan and it has delivered 2G, 3G and 4G mobile connectivity through 75 mobile masts to 7,199 premises which previously had no mobile signal, more than had been estimated in the most recent business case. It should be noted that only 1 MIP site was delivered in Scotland, and this was in the Scottish Borders. The SRN[13] is a deal with EE, O2, Three and Vodafone investing in a network of new and existing phone masts with the aim of providing guaranteed coverage to 280,000 premises and 16,000km of roads thereby tackling not-spots[14] and partial not-spots[15].
- **Building Digital UK (BDUK)[16]**: A UK Government department responsible for managing and delivering programs to bring superfast broadband and mobile connectivity to the areas of the UK that are hardest to reach. BDUK works in partnership with local authorities and the devolved administrations, including Scotland, to achieve its aims.
- **Gigabit Broadband Voucher Scheme[17]**: Part of the UK Government's wider investment in digital infrastructure, this scheme provides vouchers to support the cost of installing gigabit-capable broadband to homes and businesses in Scotland, particularly those in rural areas.
- **Scottish 4G Infill Program[18]**: Specifically targets areas with no mobile coverage by funding the infrastructure required to deliver 4G services, focusing on rural and remote parts of Scotland.
- **Project Gigabit[19]:** UK Government's flagship £5 billion programme to enable hard-to-reach communities to access lightning-fast gigabit-capable broadband. The fast, reliable connections delivered by Project Gigabit will level-up mostly rural and remote communities across the UK, as well as tackling pockets of poor connectivity in urban areas.

These initiatives, combining efforts from both Scottish and UK Governments, underscore a strong commitment to eliminating digital divides, fostering economic growth, and ensuring Scotland remains at the forefront of digital innovation and connectivity.

3.1.1 Broadband

A summary[20] of broadband coverage at a fixed location across the UK, including Scotland is as follows:

12 https://www.gov.uk/government/publications/mobile-infrastructure-project-impact-and-benefits-report
13 https://www.gov.uk/government/news/shared-rural-network
14 'not-spots' are areas where there is currently no mobile coverage available.
15 'partial not-spots' are areas which have coverage from one but not all four mobile network operators.
16 https://www.gov.uk/government/organisations/building-digital-uk/about
17 https://www.gov.uk/government/publications/gigabit-broadband-voucher-scheme-information
18 https://www.gov.scot/publications/scottish-4g-infill-programme-progress-update/
19 https://www.gov.uk/guidance/project-gigabit-uk-gigabit-programme
20 https://www.ofcom.org.uk/__data/assets/pdf_file/0023/273722/connected-nations-2023-scotland.pdf

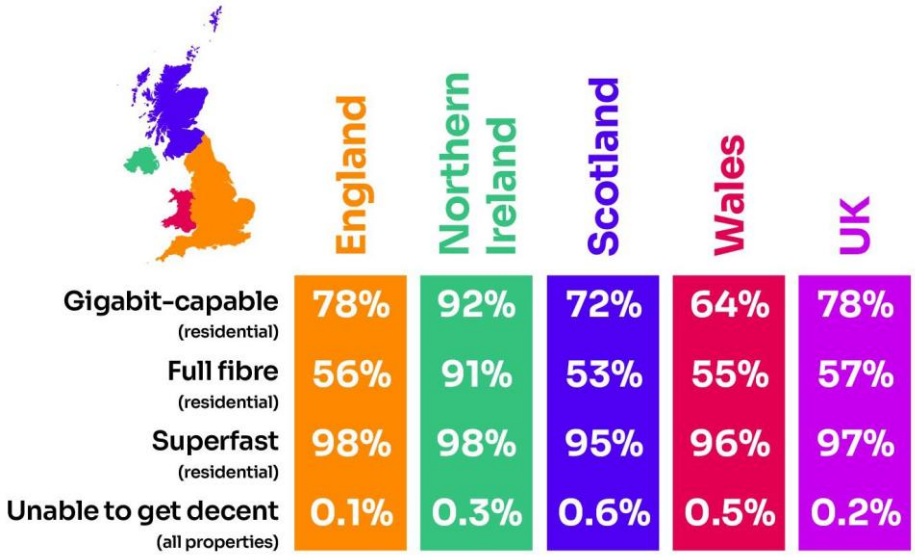


Figure 16: Summary of Broadband Coverage in UK, Including Scotland

In Scotland, efforts to expand broadband services are progressing, with full-fibre[21] and gigabit-capable[22] coverage reaching 53% and 72% of residential premises, respectively. Full-fibre availability increased by 13% points, and gigabit-capable broadband expanded by 8% points since 2022. Although take-up of full-fibre services is at 28%, up from 2022, superfast broadband covers 95% of residential premises, with speeds of 30 Mbit/s. Access to decent broadband has improved, leaving only 0.6% of premises without a decent connection. Monthly data use has risen to 542 GB per connection, surpassing the UK average of 535 GB.

[21] Fibre technology uses fibre-optic lines. Speeds are faster than ADSL. There are two main types: Ultrafast full fibre, which involves fibre optic cables running directly to homes, and Superfast fibre-to-the-cabinet (FTTC), which uses a mixture of fibre optic cables and copper wires. Most of the fibre broadband in the UK is FTTC or Cable. (Source: https://www.google.com/url?sa=t&source=web&rct=j&opi=89978449&url=https://www.ofcom.org.uk/__data/assets/pdf_file/0018/100755/UK-home-broadband-performance,-November-2016-Consumer-guide.pdf&ved=2ahUKEwjCrajzi6OFAxWka0EAHZuBB_wQFnoECBEQAw&usg=AOvVaw2skE_RsfrGShGrvCl7E1Fq)

[22] Gigabit-capable broadband means download speeds of at least 1 gigabit-per-second (1 Gbps or 1,000 megabits per second, Mbps). A 1 Gbps download speed would allow a high-definition film to be downloaded in under 1 minute. (Source: https://commonslibrary.parliament.uk/research-briefings/cbp-8392/#:~:text=Gigabit-capable%20broadband%20means%20download%20speeds%20of%20at%20least,film%20to%20be%20downloaded%20in%20under%201%20minute.)

3.1.2 Mobile

A summary of voice and data coverage across the UK, including Scotland, is as follows:

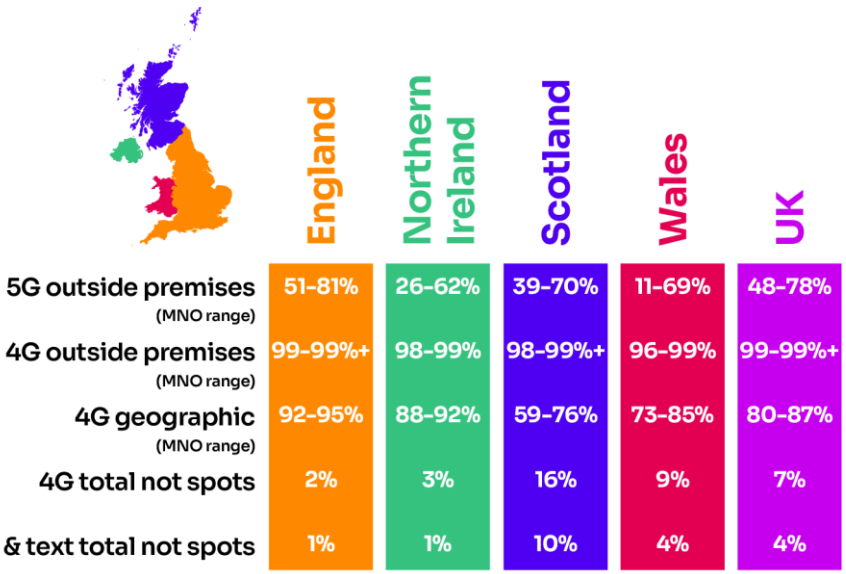


Figure 17: Overview of Voice and Data Coverage Across the UK, Including Scotland

In the mobile sector, 5G services are rapidly growing, with coverage levels in Scotland reaching 39-70%. This marks an increase from 29-51% in 2022, making Scotland the second-highest in 5G coverage among the UK nations. 4G remains crucial, with 84% coverage across Scotland's landmass by at least one mobile network operator (MNO). Rural connectivity initiatives, such as the Shared Rural Network and the Scottish Government 4G Infill Programme, are making headway. 4G outdoor premises coverage is high, ranging between 98-99+% for general areas and 90-98% for rural regions. The ongoing switch-off of 3G networks in Scotland, starting in Glasgow in July 2023, aims to enhance network efficiency and allocate more spectrum for 4G and 5G services across the country. Vodafone is the MNO to have completed its 3G switch off in early 2024[23].

3.1.3 Planned Deployments

Ofcom[24] has compiled its inaugural forward-looking report on anticipated network deployments to facilitate ultra-high-speed broadband services in the UK (including Scotland). Notably, all the examined fixed networks now exclusively rely on full fibre technology.

The following two figures (below) outline the planned deployment coverage in the UK for the next three years. Figure 18 encompasses plans at all stages and funding types nationwide whilst Figure 19 provides an overview of the planned deployment of very high-capacity networks (VHCN) for the next three years in the UK. Actual network deployment in 2023, along with revised future plans, is lower than the 2022 projections, influenced by economic changes in the UK from March 2022 to May 2023, such as increased borrowing costs and market consolidation. Despite these adjustments, significant network deployment

[23] https://www.standard.co.uk/news/tech/vodafone-uswitch-b1141877.html
[24] https://www.ofcom.org.uk/__data/assets/pdf_file/0028/248248/Connected-Nations-Planned-Network-Deployments-2022.pdf

is anticipated over the next three years, with full fibre coverage potentially reaching 80% in 2025 and 90% the following year.

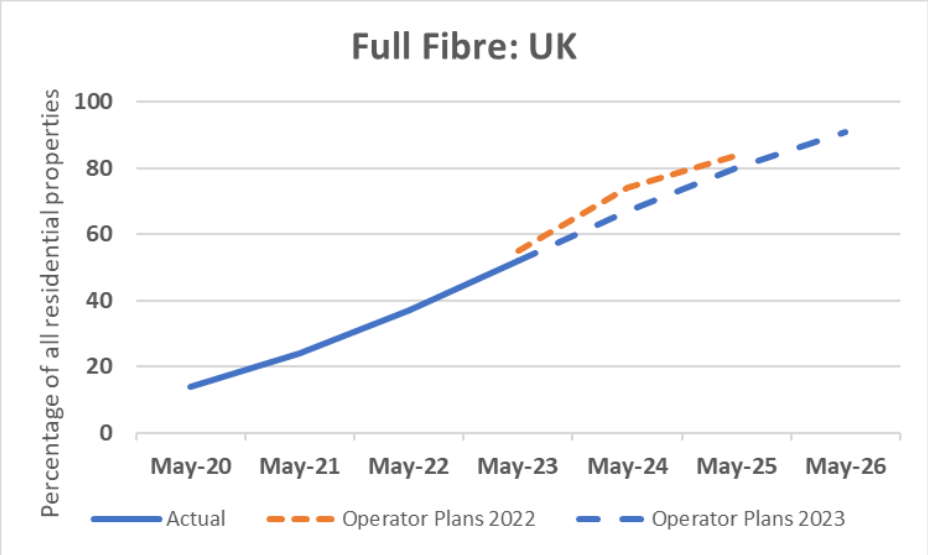


Figure 18: Plans for Full Fibre deployment in the UK from 2022 compared with actual build (as of May 2023) and planned deployments received in 2023.

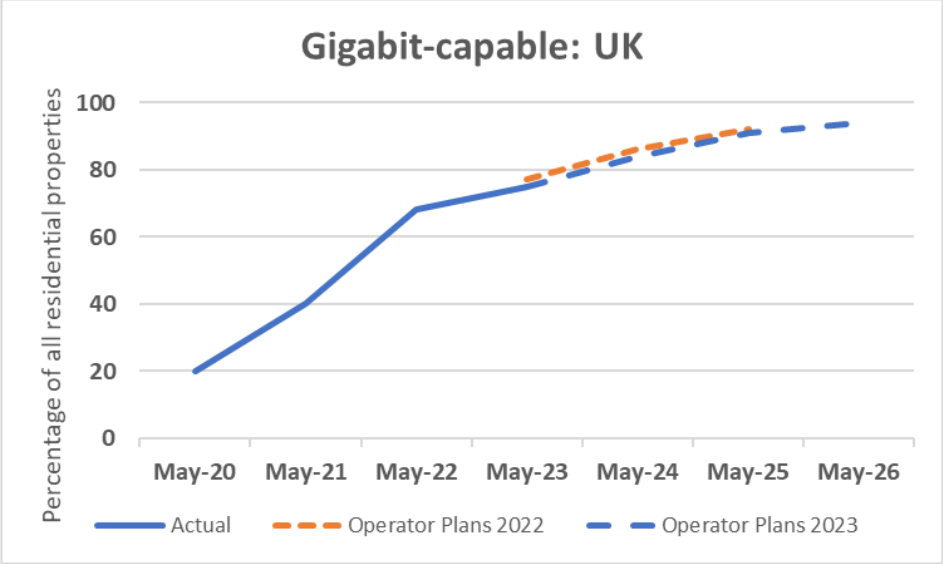


Figure 19: Plans for gigabit-capable network deployment in the UK from 2022 compared with actual build (as of May 2023) and planned deployments received in 2023.

Figure 20 demonstrates that there is an anticipated 34% increase in access to full fibre coverage in residential properties in Scotland (between May 2023 and 2026). This, in comparison to other nations within the UK, is the lowest level of increased planned deployments. Northern Ireland appears to be the most advanced in terms of current coverage (May 2023) and yet plans to increase coverage to 99% which is drastically higher than the 83% planned for Scotland.

Access to full fibre	Current (May 2023)	May 2024	May 2025	May 2026
UK	52% (-3ppt)	67% (-7ppt)	80% (-4ppt)	91%
England	51% (-3ppt)	66% (-7ppt)	80% (-3ppt)	91%
Northern Ireland	90% (-4ppt)	94% (-2ppt)	99% (+3ppt)	99%
Scotland	49% (-3ppt)	63% (-7ppt)	75% (-8ppt)	83%
Wales	50% (-9ppt)	69% (-10ppt)	89% (-3ppt)	93%

Figure 20: Summary of planned deployment of full fibre coverage as a percentage of residential properties over the next three years for all planning categories.

Likewise, Figure 21 shows that Scotland currently has the second lowest level of VHCN gigabit-capable coverage and also has the lowest level of planned deployment of VHCN gigabit-capable coverage to residential properties over the next three years across the UK despite having notable point increases over recent years and an overall projected increase of 16%. Therefore, there is significant opportunity for improvements of deployments to ensure Scotland is on par with other nations.

Access to Gigabit capable networks	Current (May 2023)	May 2024	May 2025	May 2026
UK	75% (-2ppt)	84% (-2ppt)	91% (-1ppt)	94%
England	76% (-2ppt)	85% (-2ppt)	91% (-1ppt)	95%
Northern Ireland	91% (-4ppt)	95% (-1ppt)	99% (+3ppt)	100%
Scotland	69% (-2ppt)	76% (-5ppt)	82% (-5ppt)	85%
Wales	60% (-6ppt)	75% (-7ppt)	89% (-4ppt)	93%

Figure 21: Summary of planned deployment of VHCN (gigabit-capable) coverage to residential properties over the next three years for all planning Categories.

However, the projected deployments noted by Ofcom indicate that investments in the network extend beyond urban areas. Although urban regions typically offer more favourable economics in terms of cost per property covered, numerous rural areas are also appealing. This appeal arises from factors such as the existing broadband service levels, indicating a potential interest in adopting new services if they were made accessible.

Urban/rural deployments (May 2026)	Number of urban properties covered	Number of rural properties covered	% Urban properties covered	% Rural properties covered
UK	25.0m (20.6m)	3.2m (1.8m)	98% (81%)	75% (42%)
England	21.3m (17.6m)	2.4m (1.3m)	98% (81%)	78% (41%)
Northern Ireland	0.6m (0.55m)	0.2m (0.19m)	100% (96%)	99% (78%)
Scotland	2.0m (1.7m)	0.3m (0.15m)	93% (78%)	51% (30%)
Wales	1.1m (0.7m)	0.2m (0.13m)	99% (67%)	73% (39%)

Figure 22: Urban and rural split (both absolute and percentage) of coverage plans to May 2026. Figures in brackets are current gigabit-capable (May 2023) figures.

Figure 22 demonstrates that whilst there is an increase in deployment planned for both urban (15% increase from 2023) and rural (21% increase from 2023) areas, Scotland is largely underperforming when compared to other nations.

3.2 Tay Cities Infrastructure Overview

The Tay Cities infrastructure has been analysed based on ward-level data from Ofcom[25] including Angus, Dundee, Fife[26] and Perth & Kinross. There are 196 wards across the Tay Cities region broken down as follows:

Tay Cities Region	Number of Wards
Angus	23
Dundee	35
Fife	105
Perth & Kinross	33
TOTAL	**196**

Figure 23: Number of Wards within Tay Cities Region

Ofcom defines gigabit availability as the percentage of premises that are capable of receiving speeds of 1 gigabit per second (1Gbps). Based on analysis of the ward-level data a scale was devised to consolidate the percentage of provision (see Figure 24).

The map below (Figure 24) illustrates the current deployment of gigabit fibre availability across the Tay Cities. At a glance, the extent of red indicates significant areas of poor coverage (0 – 20% coverage) within the Tay Cities region.

[25] Ofcom (2023) Connected Nations – Scotland Report 2023

[26] Note: the dataset referenced pertains to the broader region of Fife and is not exclusively representative of North East Fife. The data includes information on various wards within the entire Fife area, providing a comprehensive view of mobile coverage that encompasses but is not limited to North East Fife.

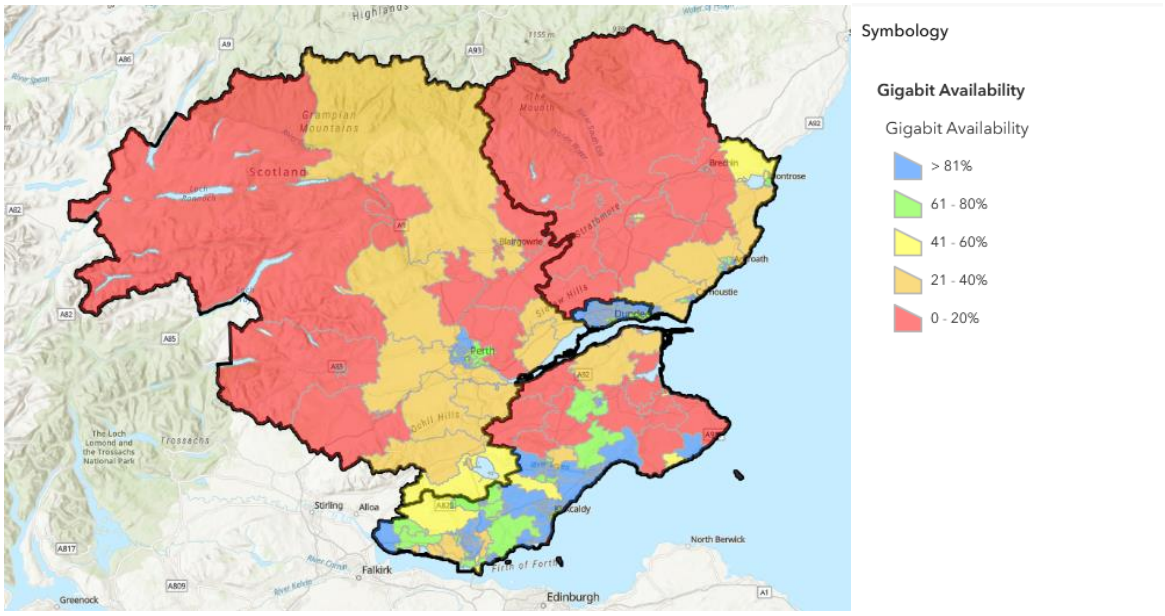


Figure 24: Tay Cities Gigabit Availability

This map is available as an interactive resource: [Tay Cities digital tech ecosystem Web Map (arcgis.com)]

Further analysis is presented below.

3.2.1 Broadband Deployment

Regional Provision

Based on this scale, analysis was completed to better understand provision across the whole of the Tay Cities region, as shown below (Figure 25).

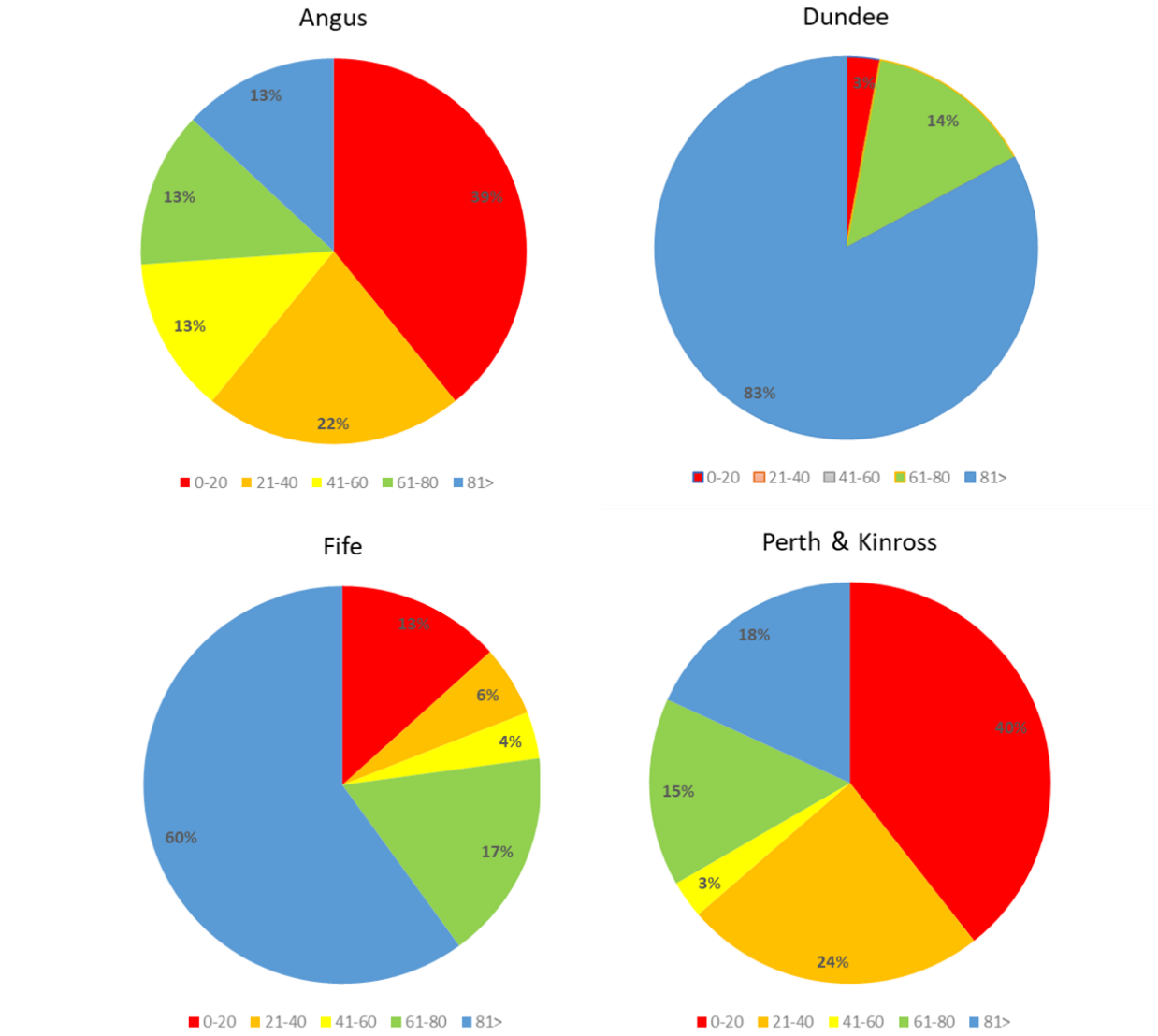


Figure 25: Comparative Analysis of Broadband Provision by Local Authority

Taking each local authority area in turn, the analysis of gigabit-availability by ward, shows that almost 40% of the wards in Angus have between 0 – 20% of premises capable of receiving speeds of 1 gigabit per second (1Gbps). Therefore, despite planned rural deployments (depicted in Figure 26), Angus remains underserved. This is illustrated by the swathes of red in the following geographical map.

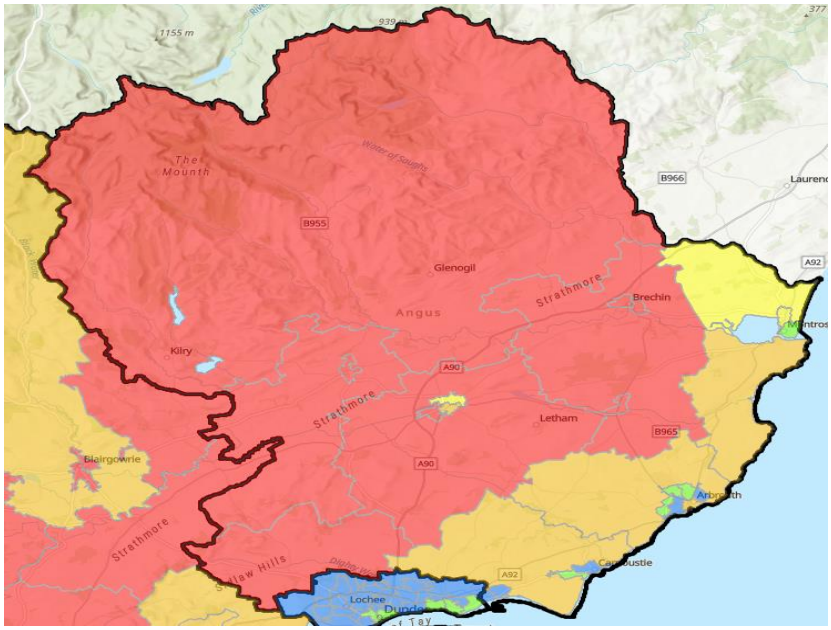


Figure 26: Angus - Gigabit Provision

Therefore, the average gigabit broadband availability in Angus is 34%, indicating a lower level of high-speed broadband coverage compared to Dundee and Fife. It has average download speeds of 75.30 Mbps, suggesting moderate internet speeds.

Comparatively, Dundee benefits from much greater provision with more than 80% of the wards in Dundee having more than 81% of premises that are capable of receiving speeds of 1 gigabit per second (1Gbps). This is illustrated by the extensive blue in the geographical map below and is, perhaps, not surprising given its central/urban location in the Tay Cities region.

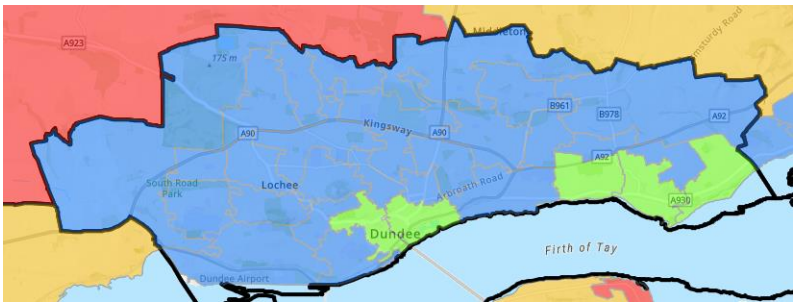


Figure 27: Dundee - Gigabit Provision

Therefore, Dundee benefits from significantly higher average gigabit availability across its wards (90%) suggesting extensive coverage of the highest-speed broadband. Likewise, it has much higher average download speeds of 179.49 Mbps.

Similarly, Fife also fairs reasonably well in comparison, with 60% of the wards in the region having more than 81% of premises that are capable of receiving speeds of 1 gigabit per second (1Gbps). However, it too has large areas of poor provision (0 – 20%) as illustrated by the areas of red, below.

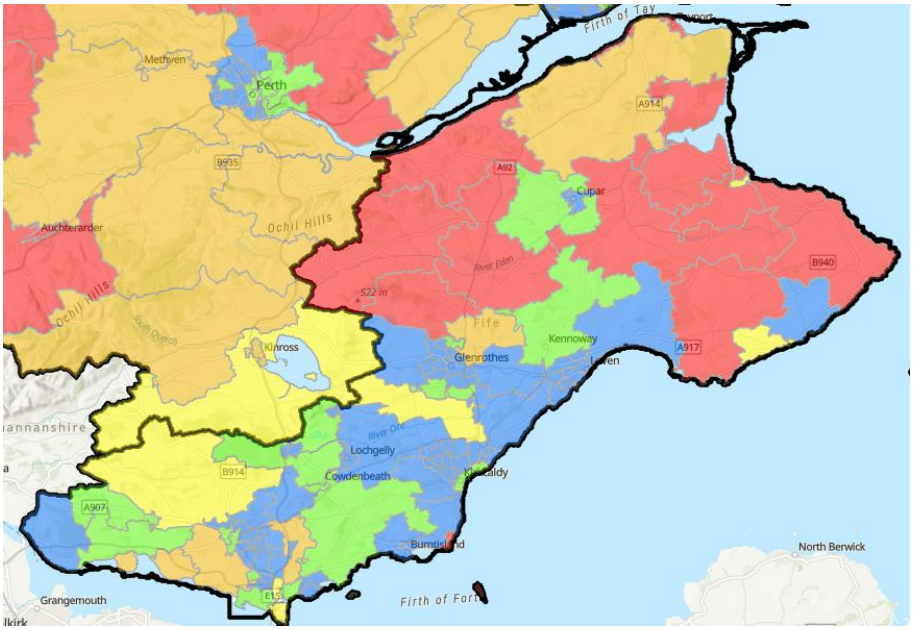


Figure 28: Fife - Gigabit Analysis

Fife experiences average gigabit availability of 73% which is robust albeit slightly lower than Dundee. It too has high average download speeds of 141.85 Mbps, indicating good internet speeds across the area.

Perth & Kinross is not dissimilar in provision to Angus as it also has 40% of its wards with between 0 – 20% of premises that are capable of receiving speeds of 1 gigabit per second (1Gbps). This is illustrated in Figure 29.

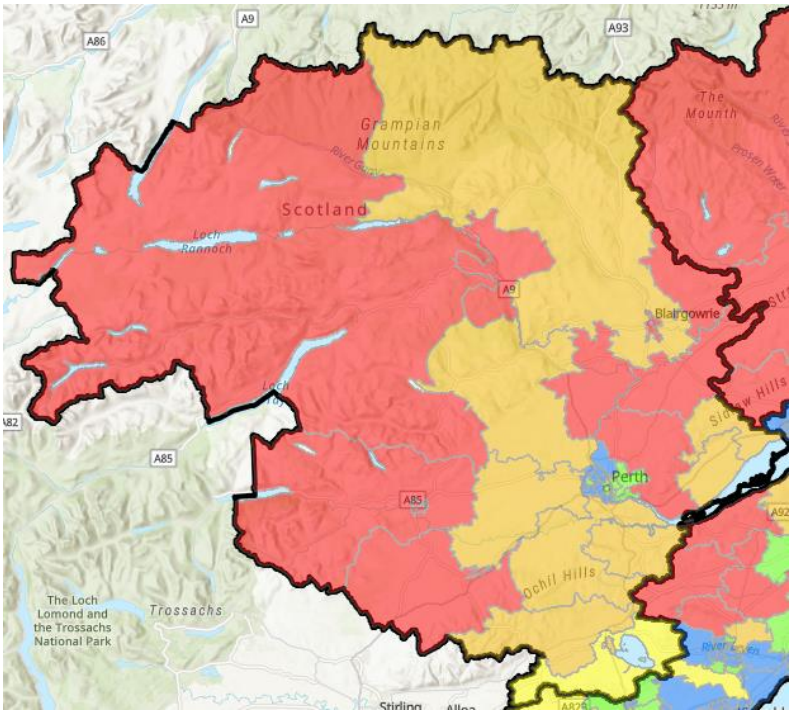


Figure 29: Perth & Kinross - Gigabit Provision

Therefore, Perth & Kinross has average gigabit availability of 49% with a significant range, reflecting varying levels of advanced broadband infrastructure across the wards. Likewise, it has an average download speed of 104.01 Mbps but with a wide range from 44.41 Mbps to 198.25 Mbps; this demonstrates the disparities in speeds across the different wards.

In summary, the analysis reflects the disparities in digital infrastructure and access to good connectivity across the Tay Cities with Dundee having the highest levels of gigabit availability and internet speeds followed by Fife, then Perth & Kinross, and Angus. The analysis, therefore, suggests that the more rural areas of Angus and Perth & Kinross are underserved in comparison to Dundee and Fife. As noted, this is perhaps not surprising given the rural nature of these parts of the region and the associated challenges stemming from factors such as geographical remoteness, sparse population density, and other economic factors. Therefore, there is scope for significant improvement in the region as gigabit provision serves as a catalyst for the growth of the digital economy by providing the high-speed and reliable connectivity necessary for a wide range of digital services and activities. It lays the groundwork for innovation, competitiveness, and sustainable economic development in the modern digital age.

3.2.2 Mobile Network Deployment

Ofcom data was also used to understand the current availability of 4G and 5G coverage across the Tay Cities region; this is outlined in the table below.

Tay Cities Region	4G Coverage (%)	5G Coverage (%)
Angus	55	32
Dundee	100	98
Fife	94	80
Perth & Kinross	51	43

Figure 30: 4G and 5G Coverage in Tay Cities

Again, analysis of this data indicates that Dundee has full coverage and the highest 5G coverage in the Tay Cities region. Fife also has high coverage whilst Angus and Perth & Kinross have just over half of their respective areas covered by 4G and a much lower level of 5G coverage compared to Dundee and Fife.

Mobile coverage can also be explored based on providers and provision for both indoors and outdoors coverage, as illustrated below.

Provider	Location	Angus		Dundee		Fife		Perth & Kinross	
		4G (%)	5G (%)	4G (%)	5G (%)	4G (%)	5G (%)	4G (%)	5G (%)
Three	Indoor	63	13	100	65	87	47	68	21
	Outdoor	63	13	100	65	87	47	68	21
O2	Indoor	93	28	100	83	98	36	96	27
	Outdoor	100	38	100	83	100	36	100	27
Vodafone	Indoor	91	13	100	61	97	9	94	4
	Outdoor	100	13	100	61	100	9	100	4
EE	Indoor	97	67	100	91	99	88	94	46
	Outdoor	99	67	100	91	100	88	99	46

Figure 31: 4G and 5G Coverage - Provider Analysis

This analysis presents a detailed picture of mobile network coverage across the Tay Cities region, showcasing the varying degrees of connectivity provided by Three, O2, Vodafone and EE. It shows disparities across the four areas of Angus, Dundee, Fife and Perth & Kinross. Angus shows moderate-good 4G coverage, but its 5G coverage is significantly lower, suggesting that the latest generation of mobile connectivity has yet to fully reach the area. Dundee, on the other hand, boasts nearly perfect coverage, with 4G effectively ubiquitous and 5G not far behind, indicating a strong technological infrastructure that supports the latest in high-speed mobile services.

Fife's coverage is strong for 4G, remaining consistently high across providers, reflecting a reliable and well-established network. Its 5G coverage, while not as universal as Dundee's, is still substantial, with most providers offering high percentages that suggest a rapidly expanding 5G infrastructure. Perth & Kinross experiences varied 4G coverage, and its 5G coverage, similar to Angus, lags behind the other regions, implying ongoing development is needed to catch up with the advanced mobile connectivity found elsewhere in the Tay Cities region. Overall, there is a spectrum of coverage levels across the region, with Dundee and Fife at the forefront of network connectivity, while Angus and Perth & Kinross are areas where future improvements could greatly enhance mobile connectivity.

However, the UK government's Shared Rural Network project should enable improvements for rural 4G coverage[27].

The SRN is expected to bring 4G coverage to 95% of UK landmass by 2025. The forecast geographic coverage after SRN completion, compared to coverage before SRN is illustrated below.

[27] https://researchbriefings.files.parliament.uk/documents/SN07069/SN07069.pdf

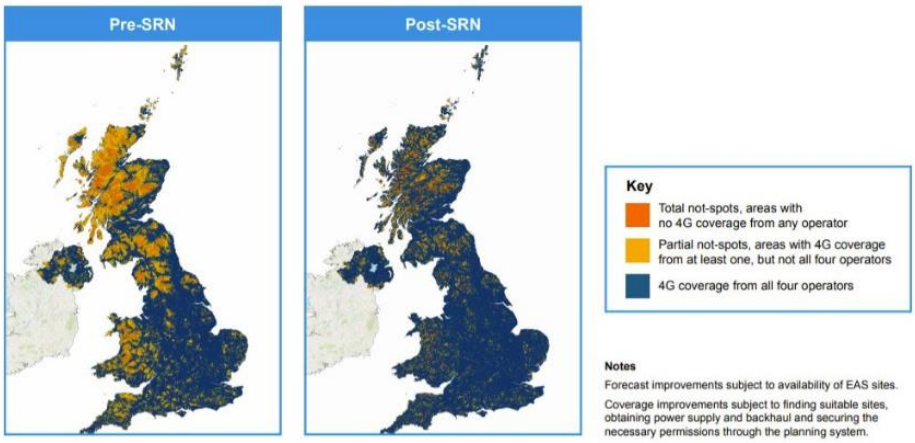
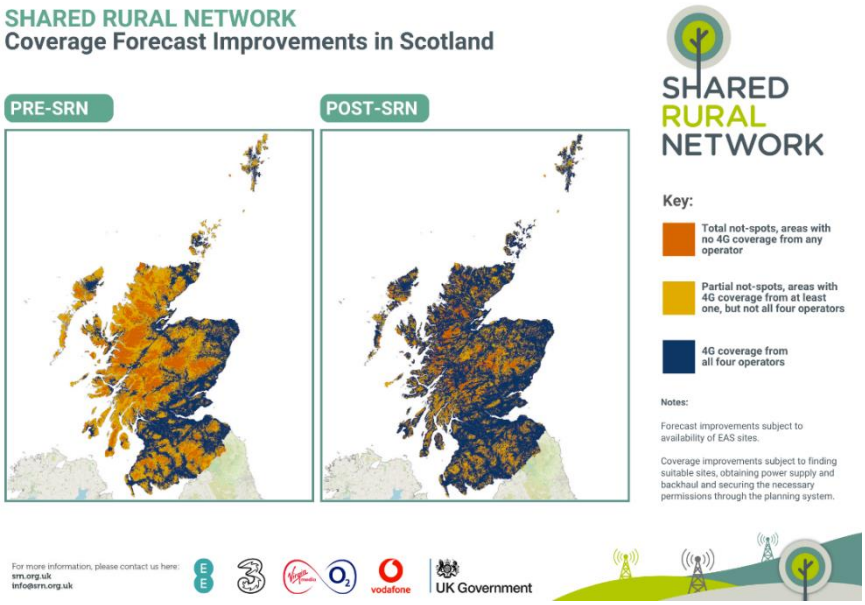


Figure 32: SRN - Pre and Post Coverage

This can be explored further at national level, as shown below. This indicates that coverage from all four operators will rise to a minimum of 74%, up from 44%. Coverage from at least one operator will increase from 81% to 91% by the end of the programme.



	4G Coverage from all MNOs		4G Coverage from at least one MNO	
Electoral Region	Pre-SRN	Forecast post-SRN	Pre-SRN	Forecast post-SRN
Central Scotland	87%	92%	99%	99%
Highlands and Islands	26%	68%	73%	91%
Lothian	88%	94%	99%	99%
Mid Scotland and Fife	53%	78%	80%	93%
North East Scotland	59%	79%	86%	94%
South Scotland	55%	81%	88%	97%
West Scotland	59%	82%	91%	98%

Figure 33: SRN - Coverage Forecast Improvements in Scotland

Progress on the SRN suggests significant advancements in mobile network coverage across the UK, including Scotland. By December 2023, Ofcom reported that Mobile Network Operators (MNO) had deployed a total of 190 new sites since 2020 and upgraded thousands more, enhancing their range or capacity. EE has announced that it has met its target of 88% geographic 4G coverage. However, the other MNOs, namely Vodafone, Virgin Media O2, and Three, are lagging behind EE's progress. As of September 2023, Vodafone's coverage was at 83.3%, Virgin Media O2's at 81.7%, and Three's at 80.5%. These operators are under pressure to make substantial progress in the coming months to fulfil their SRN obligations. Moreover, these three have sought a two-year extension to the 2024 target, citing delays due to the pandemic, yet they remain committed to reaching the overall target of 95% coverage by the end of 2026. However, a recent report by the National Audit Office[28] highlights that the partial not spots (PNS) part of SRN is behind schedule.

In Scotland, other projects have also sought to improve mobile coverage which align with the goals of the SRN. This includes the Scottish Government's 2016 Mobile Action Plan and the subsequent Scottish 4G Infill Programme[29] (S4GI). The S4GI, a £28.75 million project, specifically targets areas that are not commercially viable for operators, aiming to build masts in total not-spots. EE has completed its rollout of new masts under S4GI, with 55 new sites going live, although only 15 of these sites are used by other operators such as Virgin Media O2 and Vodafone. This highlights the ongoing challenges of enhancing mobile network coverage in Scotland's most rural and remote locations, which often struggle with site acquisition, power supply, and the economic viability of maintaining infrastructure.

In summary, the S4GI and SRN have made strides in advancing mobile coverage in Scotland, particularly in rural areas that have historically suffered from poor connectivity. This demonstrates the effect of a coordinated effort to bridge the digital divide between urban and rural areas, ensuring that remote communities in Scotland receive the benefits of modern connectivity. However, the successful implementation of programmes such as SRN is not just about technological achievements, such initiatives represent essential steps towards strengthening Scotland's social and economic composition.

3.2.3 Collaboration / Enabling Interventions

As outlined in section 3.1, there is range of enabling interventions already underway both at a Scottish and UK level. All of which play a crucial role in fostering social and economic development, bridging digital divides, and ensuring / improving connectivity. Through strategic policies, investments in infrastructure, and collaboration with private sectors, Governments can enhance digital literacy, stimulate innovation, and support the growth of digital economies. The importance of such interventions cannot be overstated, as they not only contribute to the immediate improvement of connectivity but also lay the foundation for economic development and the growth of digital economies.

There is evidence of collaboration and enabling interventions already taking place within the Tay Cities region to deliver connectivity including, for example, the collaborative project between Angus Council, SmartRural, and an Internet Service Provider[30]. This collaboration seeks to enhance broadband connectivity in Angus, through a new gigabit-capable fixed wireless access (FWA) network. This initiative is part of the Tay Cities Region Deal, receiving up to £1 million for the Rural Angus Project (RAP) aimed at delivering high-quality wireless connectivity to rural properties. Additionally, the UK Government's

28 https://www.nao.org.uk/press-releases/mobile-connectivity-programme-behind-schedule/#report
29 https://www.gov.scot/publications/scottish-4g-infill-programme-progress-update/
30 https://www.ispreview.co.uk/index.php/2020/12/new-project-bringing-wireless-broadband-to-rural-parts-of-angus.html

investment of up to £2 million supports this project alongside the Rural Perth & Kinross High Speed Broadband scheme, with both efforts further backed by £5.9 million from the Local Full Fibre Network programme for gigabit Dark Fibre network development connecting public sector sites.

The RAP intends to leverage new fibre optic infrastructure to establish a fixed wireless network across over 100 square miles. Local farms hosting network links receive free broadband and the opportunity to join SmartRural's network to deploy smart IoT devices, enhancing agricultural operations.

This collaboration underscores a proactive approach by Angus Council to improve rural broadband independently of the Scottish Government's £579 million R100 FTTP rollout via Openreach, the S4GI and the SRN initiatives. Through partnerships and innovative technology deployment, the project aims to significantly boost rural connectivity and digital inclusion in the Tay Cities region; thus, demonstrating the importance of working in partnership at a local level to develop enabling interventions that improve connectivity.

Therefore, this collaboration demonstrates the importance of working with the market and utilising existing assets within the local authority to deliver gigabit-capable broadband and mobile coverage for the region. Based on industry engagement we understand that this model was warmly received by farmers in the region, but that it stalled after the first phase. There is, therefore, an opportunity to gather feedback from those farms taking part in the initial phase to inform necessary iterations / adaptations to the model with the potential further roll-out in the future. There is the potential to replicate this type of collaboration across the wider Tay Cities region and scale this proven model as it is an example of collaboration that leverages assets within a local authority to improve connectivity.

Similarly, further instances include the successful completion of the Department for Digital, Culture, Media and Sport (DCMS) funded Local Full Fibre Network project in Perth, facilitated by Neos Networks alongside Perth & Kinross Council[31]. This project, which saw the fibre network link three pivotal council data centres to 31 public buildings and community hubs across Perth, was finalised two months earlier than the planned end date in late September 2021. Extending over 19.5km, this newly established, comprehensive fibre network encompasses central city sites such as educational institutions, council buildings, leisure centres and sheltered housing, as well as key public buildings such as Perth fire station and the CCTV monitoring centre. It stretches out to the west of the city, close to the new 3,000-home Perth West housing development. The Neos Networks project team was tasked with integrating buildings in proximity to a pre-existing 10km duct system utilised for traffic signals and CCTV, managed by the council, making use of available SSE ducts and constructing new ones as needed. This effort exemplifies the strategic use of local assets to bolster and expand regional connectivity infrastructure. However, it was noted that, whilst there are opportunities to improve the infrastructure in the Tay Cities region, there are challenges for commercial enterprises in relation to limited return on investments, limited capacity, as well as the need to educate consumers on alternative connectivity solutions.

Nonetheless, working with the market to deliver gigabit-capable broadband and mobile coverage in the Tay Cities region, supported by enabling interventions at local and national levels, is essential for several reasons:

[31] https://neosnetworks.com/resources/press-releases/neos-networks-transforms-perth-kinross-councils-infrastructure-with-the-completion-of-its-dcms-funded-local-full-fibre-network-project/

Market Efficiency: The telecommunications market comprises various private entities, each with its own strategies and resources. Collaborating with these market players can ensure the most efficient use of resources and avoid duplication of efforts, leading to faster and more cost-effective network deployment.

Innovation and Competition: Market involvement spurs innovation and competition, leading to better services and technology advancements. By working with the market, local and national governments can encourage service providers to develop innovative solutions tailored to the unique needs of the Tay Cities region.

Private Investment: The high costs associated with deploying gigabit-capable infrastructure often requires substantial capital investment, which private companies are well-placed to provide. Public-private partnerships can unlock this investment, thereby accelerating the pace of network rollout.

Expertise Utilisation: Market players possess specialised knowledge and experience in deploying and managing broadband and mobile networks. Leveraging this expertise is crucial for addressing the complex technical challenges associated with establishing a robust telecommunications infrastructure in both urban and rural areas within the Tay Cities region.

Tailored Solutions: The Tay Cities region has its own geographical, demographical, and economic characteristics. Working with the market allows for the development of tailored solutions that consider these local factors, ensuring that the infrastructure meets the actual needs of the community and businesses.

Policy and Regulatory Support: Government interventions at local and national levels, such as regulatory reforms, tax incentives, or direct funding, can address market failures and incentivise providers to extend services to less profitable areas, thereby ensuring coverage is comprehensive and inclusive.

Strategic Alignment: Collaboration between the market and the public sector can ensure strategic alignment with broader economic and social goals, such as promoting digital inclusion, supporting remote education, and enabling smart city initiatives.

Sustainable Development: Enabling interventions can ensure that network development aligns with environmental and sustainability goals, reducing the ecological footprint of infrastructure projects and promoting green technologies.

To conclude, in order to enhance the digital economy of the region and ensure that digital connectivity is not a barrier to location or growth of businesses in the area and to ensure that connectivity is future-proofed, a collaborative approach is required between the private and public sector.

This collaboration should focus on prioritising and speeding up the deployment of ultrafast broadband and advanced mobile networks, particularly in underserved rural areas. This will rely on private telecommunications companies (both fixed fibre and wireless) advancing their roll out plans where the mapping from this study shows there to be a need and for the public sector to advance speedily the interventions (whether UKG Project Gigabit or SG R100 and the Shared Rural Network programme for 4G/5G coverage).

Aligning public investment with private sector investment more closely will ensure efficient and impactful deployment as for example where Openreach are connecting communities as 'overspill' to

R100 build nearby. Similarly, the use of Broadband Vouchers can often connect premises quickly with willing local suppliers, again potentially where there is other build nearby.

Local forums are essential for identifying and addressing connectivity challenges, identifying specific demands, and increasing awareness of alternative technological solutions. Additionally, integrating build plans whether public or private within the digital tech roadmap will ensure that infrastructure developments are adaptable and scalable, meeting the evolving demands of the regions businesses and supporting sustainable growth.

Both Dundee and Perth have been part of the EU supported 8th City ERDF Programme[32] on smart cities supported by SG and all the four local authorities in the region have been progressing the smart and connected places agenda within the Tay Cities utilising the connectivity that is available. All areas in the Tay Cities are now deploying smart city and IoT solutions.

Several use cases funded through the Tay5G project have a strong Internet of Things (IoT) focus, including the usage of an existing private 5G testbed located at Dundee's Central Waterfront area. In order to scale up the deployment of solutions beyond trials and demonstrators, there is a clear requirement for quality digital infrastructure to act as an enabler.

There remain huge opportunities for the Tay Cities region to grow the digital economy of the region and this report helps to highlight the challenges of doing this in a diverse and largely rural area. As technological advances continue and with an aspiration to be a modern, forward-thinking and connected region, this report we hope will help drive the city regions digital future.

4 Analysis

4.1 SWOT

A summary of the digital tech ecosystem's strengths, weaknesses, opportunities and threats can be found in the graphic below. This has been informed by the challenges and opportunities identified earlier in the report and validated through further engagement with study participants.

[32] https://scottishcities.org.uk/smart-cities/

Figure 34: SWOT Analysis of the Tay Cities Digital Tech Ecosystem

To further prioritise the strengths, weaknesses, opportunities, and threats, we considered not just the frequency of the feedback but also the strength and strategic importance of the feedback.

Strengths

1. **Academic strengths of the region:** The presence of four universities and a college provides a solid foundation for innovation, creativity, expertise, and a steady flow of skilled graduates, especially in core disciplines like software engineering.
2. **Growing and diverse tech ecosystem:** The range of digital tech industries in the region signifies a healthy and dynamic landscape that can capitalise on new trends and emerging technologies, best demonstrated by the cluster of niche industries forming across the region. There is also a significant strength in the industries associated with digital design, creation, and marketing.
3. **Reputation of the region / Scotland:** Inextricably linked to the academic strengths, the region has developed a reputation for technology development and innovation, particularly in industries like gaming. The wider Scottish context also contributes to this reputation when considering global talent and investors.

Weaknesses

1. **Attracting and retaining talent:** Despite the region's academic strengths, the digital tech sector still struggles to attract and retain the necessary skilled workforce to sustain and grow the sector.
2. **Complex and fragmented support landscape:** The variety of support measures has created complexity, making it difficult for businesses to navigate and access the support they require. Without highly efficient avenues to access support, businesses often neglect to seek out support.
3. **Challenges engaging members of the ecosystem:** A lack of networking opportunities and difficulties establishing cross-sectoral relationships has inhibited collaboration and, ultimately, sector growth and development.

Opportunities

1. **Enhance engagement and collaboration:** There is a significant opportunity to strengthen the tech community through improved networking and collaboration, leading to greater innovation and market opportunities.
2. **Develop a regional identity and promote strengths:** Capitalising on the region's reputation and defining a clear tech sector identity could attract significant investment and attract talent to the region, bolstering the region's competitiveness.
3. **Streamline and simplify access to support:** Simplifying the support landscape and creating clear, easy-to-navigate pathways to, e.g., funding opportunities, business support programmes, mentorship, etc. can help accelerate growth and development.

Threats

1. **Competition from elsewhere:** A major threat to the success of the tech sector in the region is competition from elsewhere, principally for talent, including the "first pick" graduates and also senior roles. Competition for funding and investment also falls into this threat category.
2. **Slow deployment of connectivity infrastructure:** The slow deployment and/or limited uptake of connectivity solutions, especially in rural areas, pose a threat to not only the current

company-base's productivity but also the attractiveness of the region to prospective members of the ecosystem.

3. **Over-reliance on legacy sectors / complacency longer term:** There is a risk that the region only focuses on its legacy sectors, e.g., gaming, and neglects other emerging sectors or sectors that require support; at the same time, there is a risk that the region becomes complacent and neglects to invest in the legacy sectors like gaming under the assumption that they require no further support, when in fact they do.

4.2 Prioritisation of Key Industries

The substantial number of companies in the digital design, creation and marketing sector represents a significant opportunity for economic growth and continued innovation. This sector encompasses a wide range of sub-sectors including software/web/app development, web & graphic design, artificial intelligence/machine learning, blockchain/crypto/Web 3, gaming and entertainment, screen & media, digital marketing and E-commerce. These align with the key industries identified as being of interest to Scottish Enterprise and partners, which include 'cyber, gaming, E-sports, MedTech, AgriTech, software / app development, and FinTech'. This analysis focuses on prioritising these key industries using the criteria and a ranking system outlined in the following table.

Criteria	Description	Scoring		
		5	3	1
Market Growth	Predicted future growth in demand	High	Medium	Low
Ease of Market Access	The ability of Scottish companies to access the market	Easy	Moderate	Challenging
Time to Market	Timescale for market development	Short	Medium	Long
Regional Capability	Existing regional industry capability	Strong	Moderate	Weak
Ease of Developing Capability	The ability of the regional industry to develop relevant new capability	Easy	Moderate	Challenging
Alignment with Strategy	Consistency with National Strategies/Policy	Strong	Moderate	Weak
Alignment with Regional Assets	Existence and suitability of regional infrastructure and assets to support growth	Strong	Moderate	Weak

Figure 35: Opportunity Selection Criteria

Using these criteria, the ***most attractive industries*** can be presented as follows (Figure 36); this prioritisation matrix could be used by Scottish Enterprise, and partners, to inform, define and drive future actions.

Digital - Sub-Sector	Market Attractiveness			Capability		Strategic Fit		Score
	Market Growth	Ease of Market Access	Time to Market	Regional Capability	Ease of Developing Capability	Alignment with National Programmes	Alignment with Regional Assets	
Cyber	5	4	3	4	4	5	5	**30**
Gaming (and E-Sports)	4	3	3	5	4	5	5	**29**
AgriTech	4	4	3	4	4	4	5	**28**
Software / App Development	4	3	4	5	5	3	3	**27**
MedTech	4	3	2	4	4	4	5	**26**
FinTech	4	3	3	3	4	4	4	**25**

Figure 36: Prioritisation of Key Industries

Based on our analysis, cybersecurity emerges as a leading opportunity for the Tay Cities region. Significant market growth in recent years is reflective of the increasing global demand for cyber solutions, driven by increasing cyber threats and the need for secure digital infrastructure. This has increased demand for innovative solutions and, as a result, positions the sector at the forefront of a growing digital economy. The region benefits from several strategic initiatives and investments, such as the Abertay cyberQuarter which provides a focal point for cyber activities and facilitates easier access for businesses and startups to enter the market and collaborate with academia and other businesses. There is also a strong base of expertise with the region's educational institutions offering specialised programmes and producing talent which enhances the region's capabilities. Likewise, it is aligned with national programmes as cyber resilience is a strategic priority at a national level.

Gaming (and E-Sports) is a legacy industry for the region, which should continue to be supported. Dundee is well known for video game development, gaining the reputation as the video game capital of Europe. Despite competitive market pressures, the industry's legacy standing in the region, existing studios, and educational institutions focusing on game design and development, creates a supportive environment for new entrants. The foundational strength within academia ensures a pipeline of talent with the requisite technical skills. This emphasis on education aligns with the need to continue nurturing the necessary skills to keep the gaming sector innovative and competitive. The presence of key assets including CoSTAR and the Scottish Games Network, as well as Scottish Government's recent announcement backing a national games strategy, further reinforces the opportunity for the region to bolster its footing as a globally-leading gaming cluster.

AgriTech in the Tay Cities region reflects the transformation of a traditional sector through the application of advanced technologies. This growing sector recognises the importance of technology in advancing agricultural efficiency, sustainability and productivity, especially regarding crop production[33]. Angus and Perth & Kinross have a long tradition of agricultural innovation leading to excellence in food production and, with a supportive ecosystem and existing assets including the James Hutton Institute (includes the Advanced Plant Growth Centre and International Barley Hub) and the Centre for Agricultural Sustainable Innovation (CASI), there is the potential to further growth to strengthen the region's agricultural innovation.

Software/web/app development remains a key digital industry in the region. As illustrated earlier in the tech ecosystem analysis, it is the industry with the largest number of companies. This, however, creates

[33] Tayside and Fife account for 31% of the total farming area devoted to crop production in Scotland, behind Grampian at 32%. (source: https://www.taycities.co.uk/sites/default/files/tay_cities_res_2019.pdf)

a degree of saturation and poses challenges for new entrants into the market. Moreover, while there is a national digital strategy[34] for Scotland, the emphasis on general software development is less of a focus compared to bolstering other parts of the sector, such as cybersecurity or AI. Similarly, there are discrete assets in the region that serve other digital industries, such as the cyberQuarter (for cybersecurity), James Hutton Institute (for AgriTech), and the MedTech Research & Development Unit at the University of Dundee (for MedTech). However, there is a strong base and pipeline of software development capability in the region and the time to market for launching solutions is comparably favourable.

MedTech companies have a significant opportunity to tap into the region's existing strengths in life sciences and healthcare, with world-renowned teaching hospital, Ninewells, representing a key asset in the region alongside the MedTech Research & Development Unit. There are, however, significant regulatory constraints which impact the time to market for solutions and, feedback from companies in the region, indicates that establishing commercial relationships with key players in the region, e.g., the NHS, can preclude new entrants to the market. Despite this, there is an emerging cluster of MedTech companies in the region which is encouraging and presents an opportunity to foster closer ties with NHS Tayside and other key stakeholders.

FinTech is perhaps best represented in the region by NCR, a global company that is split into NCR Atleos for ATM and other self-service transaction technologies and NCR Voyix for point-of-sale solutions. While the presence of at least one global player and a number of smaller entities is encouraging, there are regulatory constraints (imposed by the Financial Conduct Authority) which slow down the time to market for solutions. Compared to the other industries (e.g., software/web/app development or gaming), there is less obvious capability in the region but this will likely improve with the launch of the Abertay University MSc FinTech programme. Competition also exists with the Scottish central belt (in particular, Edinburgh), which is internationally recognised for its FinTech cluster. There may, however, be an opportunity to specialise in financial solutions that require superfast 5G, such as wearables, which the Tay Cities region could be poised to capitalise on as a result of its 5G testbeds.

More broadly 5G represents a significant opportunity for the region as a cross-cutting technology (although not a sector per se but rather an enabler for the tech ecosystem). Tay5G[35] is a project within the Tay Cities Deal which is trialling 5G mobile communications with use cases across a range of digital industries and technologies, such as AgriTech, Industry 4.0, AR/VR and virtual production in film, amongst several others. It is core to the connectivity infrastructure which underpins the digital economy and, therefore, poses substantial opportunity for innovation, growth, and job creation.

In conclusion, a targeted focus on the prioritised key industries could foster a vibrant ecosystem that supports innovation, attracts investment, and nurtures talent within the Tay Cities, propelling these industries to the forefront of the region's digital economy.

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34 https://www.gov.scot/publications/a-changing-nation-how-scotland-will-thrive-in-a-digital-world/

35 Tay5G is a partnership between The Scotland 5G Centre, Scottish Futures Trust, the region's councils, universities, and other regional stakeholders. (https://scotland5gcentre.org/tay5g/)

5 Recommendations

The following recommendations are informed by our detailed examination of the Tay Cities' digital tech ecosystem, taking into account the challenges and opportunities for growth and development, as well as an analysis of the local ecosystem's strengths, weaknesses, opportunities and threats.

Implement Industry-backed Vision and Strategy

- Establish a vision for the sector that is backed by strong leadership and appoint an Ecosystem Leader who will act as an advocate and voice for the sector. The leadership should have a vision for the sector which tech businesses and the wider stakeholder community supports and adopts.
- Secure industry backing for the roadmap that is in development by collaborating with businesses (and academic institutions and local authorities). The roadmap should serve as a detailed plan for the sector that ultimately meets industry's needs. This should include specific goals, timelines, and metrics for success. It should also align with the broader regional economic strategy that is in development.
- Ensure that all programmes, whether for skills and talent development, digital infrastructure, etc., align with the strategic vision to reinforce the region's objectives.

Establish a Central Ecosystem Engagement Platform

- Develop an online platform/portal that serves as a central hub for the Tay Cities digital tech ecosystem, facilitating easier navigation of the support landscape and enhancing engagement among ecosystem members. This platform should, for example, include directories of businesses and case studies showcasing capabilities; it should provide details of support services and list funding opportunities; and it should promote networking events and opportunities for collaboration; this will enhance the accessibility of support resources and increase the visibility of opportunities more broadly.
- Appoint a Delivery Manager that co-ordinates communication between the various support organisations, liaises closely with industry and academia, and raises awareness of the range of support measures available to businesses.
- Implement a targeted outreach programme to increase platform adoption and encourage active participation amongst key stakeholders, including businesses, academic institutions, and other members of the industry support landscape.

Launch a Comprehensive Talent Attraction and Retention Programme

- Implement a regional marketing campaign that highlights the benefits of living and working in the Tay Cities region, emphasising the diverse and vibrant tech sector, quality and affordability of life, and potential career opportunities.
- Partner with the universities, college network, and other relevant training providers to develop skills pathways and programmes (e.g., internships, apprenticeships/Graduate Apprenticeships, upskilling, career-change programmes) that ensures the level of supply is plentiful and the quality is of a high calibre, ideally equipped with the hybrid/blended skill-sets highlighted by companies as being beneficial. These pathways will also ensure a diverse pool of talent is developed across a range of levels required by industry.
- Develop relocation packages or incentives for skilled professionals and businesses to move to the region.

Simplify, Streamline and Tailor Support

- Design tailored support measures for businesses based on specific requirements, particularly for businesses that qualify as a 'scale-up'. The criteria for which should be devised and agreed prior to designing any support measures. Scaling businesses typically require specialised support, for example, access to specific markets or support with accessing alternative funding options.
- Develop pathway programmes that link support measures across the lifetime of a company's journey, supporting the transition from start-up to scale-up and potentially beyond. This sustained support is crucial to ensure companies access the support they require at a particular stage of growth.
- Encourage the formation of more local investment networks or funds that specifically target the Tay Cities tech sector, promoting more private investment into start-up and scaling companies.

Foster Sector-Specific Clusters and Cross-Sectoral Innovation and Collaboration

- Direct support at high-growth potential clusters, such as AgriTech which has been identified alongside gaming and cybersecurity as key sectors for the region. Other clusters that are emerging in the region include MedTech in Dundee, Industry 4.0 in Angus, telecommunications in Perth & Kinross, and potentially data & analytics in North East Fife.
- Create relevant networking events that are purpose-driven, e.g., to meet end users or other organisations with a view to catalysing collaboration and future innovations. Secure engagement from larger companies to enhance the appeal of attending.
- Establish cross-sectoral innovation projects that leverage strengths in one sector and apply them to solve a challenge in another, e.g., gaming technologies applied to solve the challenges of operating a healthcare setting (e.g., a large hospital). Facilitating partnerships like this could be key to unlocking innovation across the diverse range of tech sectors in the region.

Improve Digital Connectivity Infrastructure

- Facilitate engagement between national government, local authorities, and private sector partners to prioritise and accelerate the deployment of connectivity infrastructure, in particular, ultrafast broadband and 4G/5G mobile network coverage, especially in underserved rural areas. Ensure alignment between public policy objectives and private sector investment strategies to ensure efficient and effective deployment programmes are rolled out.
- Organise stakeholder forums to discuss and address connectivity challenges, identifying use cases and establishing demand for particular solutions. This should also be used as a forum to educate and raise awareness about the alternative solutions available on the market.
- Explore innovative infrastructure solutions, such as low Earth orbit satellite to address connectivity challenges in hard-to-reach locations.

In summary, these recommendations are designed to address the key challenges/barriers discussed earlier in the report as well as capitalise on the opportunities that exist for sector growth and development. The recommendations should be considered in line with the sector roadmap that is currently in development.

6 Conclusion

This Tay Cities Digital Ecosystem Mapping report provides a comprehensive overview and detailed analyses of the digital technology ecosystem in the Tay Cities region. Based on in-depth research, consisting of interviews, a workshop, and extensive classification/mapping and analysis activities, the report outlines the ecosystem's composition, state of infrastructure, barriers to growth, and sector development opportunities.

Ecosystem Overview – Challenges and Opportunities

The digital tech ecosystem in the Tay Cities region is vibrant and diverse, with companies ranging from software/web/app development to data & analytics, gaming to telecommunications, screen & media to AgriTech, cybersecurity to Industry 4.0, and a variety of digital industries in between. However, businesses face challenges such as attracting and retaining talent, navigating a complex support system, and insufficient engagement across the ecosystem. While there are barriers to sector growth, there is also an abundance of opportunities, many of which aim to address the challenges that the tech sector faces. Key opportunities include actively promoting the region to attract talent, enhancing engagement across the ecosystem, fostering cross-sector collaboration, and simplifying the support landscape to allow companies to better identify and access the support they require.

Strengths and Weaknesses of the Ecosystem

Strong academic institutions underpin the region's digital economy, offering substantial opportunities for growth through innovation and a skilled graduate pipeline. There is also, as alluded to previously, a diverse array of capabilities across the region with clusters of specific capabilities, for example, software development and video-game design in Dundee, telecommunications expertise in Perth & Kinross, Industry 4.0 capabilities in Angus, and data analytics in North East Fife. Conversely, talent acquisition and retention, complexities navigating the support landscape, and lack of ecosystem engagement present significant weaknesses, in line with the challenges/barriers identified during the engagement phase of the study. External threats to the ecosystem include competition for talent and investment, slow deployment of infrastructure, and potential stagnation due to the over-reliance on legacy sectors.

Digital Infrastructure Development

Crucial infrastructure projects like R100, Shared Rural Network, and Local Full Fibre Network mark significant advancements in connectivity. Despite this, digital service provision disparities, especially in rural areas, call for further investment and innovative approaches to ensure comprehensive coverage. Evidence obtained from discussions with businesses suggests that, broadly speaking, digital connectivity is not perceived as a major issue in the region. Those from poorly covered areas that provided input to this study, however, reported issues such as slowed productivity as a result of poor connectivity. Engagement between stakeholders, including local authorities, infrastructure providers, and businesses (i.e., consumers) remains crucial to ensure that all parts of the region are served with broadband and mobile network coverage. This is also important to both attract businesses to the region but also to retain businesses in the region.

Strategic Recommendations

Recommendations include creating a centralised digital platform for ecosystem engagement, launching talent attraction and retention initiatives, streamlining support access, nurturing industry-specific

clusters, and enhancing digital infrastructure. These recommendations should inform and complement the roadmap which is in development for the region.

Tay Cities is at a pivotal point, with its digital tech ecosystem poised for further growth and development as a result of key initiatives such as the sector roadmap. The proposed recommendations aim to address industry challenges and strengthen the region's potential, underscored by the need for a cohesive approach to capitalise on key opportunities and sustain growth longer term.

7 Next Steps

Scottish Enterprise and Tay Cities partners have ambitious plans to develop the digital economy across the region by increasing the number and scale of digital tech companies, improving the digital skills pipeline, creating new opportunities for digital innovation, and attracting more investment into the region. Cohesion and unity between industry and wider stakeholders is essential to ensure the sector moves in a direction that is aligned with industry's needs and ambitions in a fair and equitable way.

Next steps following the publication of this ecosystem mapping report include:

- **Roadmap Launch Event**

  The sector roadmap will be informed by the findings and recommendations of this report. It is scheduled to be released in summer 2024 at a launch event where widespread coverage is anticipated, demonstrating intent, and aiming to galvanise industry and wider stakeholders in the region to support the roadmap's implementation.

- **Feedback Channel**

  A feedback mechanism will be setup to allow stakeholders to provide feedback on the strategic actions that are being taken to advance the sector.

- **Online Engagement**

  A dedicated section will be setup on the DigiTay website bringing together all regional news, updates, and job opportunities for the sector to enable a 'one stop shop' of regional digital activity.

Call to Action

Scottish Enterprise and the Tay Cities partners need your help. You are encouraged to support and participate in the implementation of this roadmap to drive positive change in the region. Your involvement will help promote innovation, improve efficiency, and establish the region as a digital tech cluster. This is an opportunity to work together to make this transition smooth and successful for everyone involved.

Do you want to be updated about the implementation of the roadmap? Please register your interest by emailing sarah.forbes@scotent.co.uk

Appendices

Appendix A – Briefing Information for Industry & Stakeholder Engagement Programme

Scottish Enterprise (SE), in partnership with Dundee City Council, Angus Council, Perth & Kinross Council, and The Scotland 5G Centre, is seeking to develop a map of the digital ecosystem in the Tay Cities region.

Key objectives of the study are as follows:

- Develop a Digital Ecosystem Map. This will cover companies, assets, educational institutes, digital networks and events, and investors / investment with a digital focus.
- Develop a Digital Infrastructure Map. This will provide a visual image highlighting areas of good coverage and areas where there are gaps in terms of both fixed fibre and mobile network.
- Identify key barriers and opportunities to enhancing the digital economy in Tay Cities and provide recommendations for growth.

The Tay Cities region comprises Dundee, Angus, Perth, and the north-east part of Fife. Tay Cities demonstrates a growing opportunity for the digital and wider economy, backed by £150m investment each from UK and Scottish governments into the Tay Cities Region Deal, which has the potential to secure over 6,000 quality jobs and lever in £400m of investment over 15 years. Digital projects which have emerged from the deal include the launch of the Cyberquarter, Perth Creative Exchange and Just Tech. The Tay Cities Regional Economic Strategy highlights Digital & Creative industries as a key business sector for the region yet emphasises the need for a stronger pipeline of digital skills, incubation support, and opportunities for the region's infrastructure.

The results of this mapping study will inform a digital roadmap, developed by SE and partners, that aims to enhance the digital economy across Tay Cities by increasing the quantity and scale of digital tech companies, improving the digital skills pipeline, creating new opportunities for digital innovation and attracting more investment into the region.

Scottish Enterprise · TAY CITIES · Angus Council · Dundee CHANGING FOR THE FUTURE · Perth & Kinross Council · The Scotland 5G Centre

Optimat Ltd has been appointed by SE and partners to undertake identification and mapping of the digital ecosystem in the Tay Cities region. This involves research to identify members of the company-base as well as supporting stakeholders and infrastructure. Engagement with key members of the ecosystem is therefore important to enable successful delivery of the study objectives outlined above.


How can you help?
We are commencing a programme of engagement and would like to invite you for a short online discussion to share your experience and views on the digital tech ecosystem in the Tay Cities region, focusing on the following:
Barriers preventing digital businesses from scaling and the support required to enable them to scale
Awareness of existing ecosystem assets, infrastructure and stakeholders and experience/views on their effectiveness
The availability, cost and adequateness of gigabit-capable broadband to support business activities
Access to skills, talent and capabilities in the region
Areas where support is lacking / more support is required to enable the sector to grow
Levels of engagement / collaboration between companies and stakeholders in the region
Views on how the Tay Cities can distinguish itself as a key digital ecosystem from other regions in Scotland
Identifying key opportunities for the digital sector in the short term
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Appendix B – Interviews Completed

BT / Openreach
4J Studios
Ace Aquatec
Business Gateway Tayside
Cambric Systems
Codebase
CoSTAR (Abertay University)
cyberQuarter (Abertay University)
Denki
Dreamality Interactive
Digiflec
Fellowship Film
Fife Council / Tay Cities Digital Skills Project
Horisk
InGAME (Abertay University)
Ivanti
JustTech (University of Dundee)
M3 Networks
Michelin Scotland Innovation Parc
Miconex
MTC
NCR Atleos
NCR Voyix
Neos Networks
Ofcom Scotland
Onorach
Perth & Kinross Council
Platinum Informatics
Rapier Systems
Scotland 5G Centre
ScotlandIS
Scottish Enterprise
Scottish Futures Trust
Soil Essentials
The Data Lab
We Are Cunningly Good

Appendix C – Workshop Participants

Business Gateway Tayside
Codebase
cyberQuarter (Abertay University)
Fife Council / Tay Cities Digital Skills Project
NCR Atleos
Onorach
Platinum Informatics
Scottish Futures Trust
The Data Lab
We Are Cunningly Good

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