Swindon and Wiltshire Digital Capabilities Strategy

Evidence Base

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Contents

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1. Introduction

Background

1.1 Swindon and Wiltshire has important digital assets. Corsham is home to a major presence in defence-related telecommunications technologies and the area hosts international IT corporates (such as Intel), successful indigenous information technology and communications businesses and national institutions (such as the Research Councils). As the adoption of advanced digital technologies become increasingly important across the economy, Swindon and Wiltshire's existing capabilities in these areas, as well as in sectors such as automotive engineering, are likely to be important strengths.

1.2 The Swindon and Wiltshire Strategic Economic Plan therefore identifies 'digital capability as a key priority, highlighting that *"we need to deliver excellence in digital connectivity and cyber transformation to achieve business growth, innovative public services and influence societal change"*[1]. As part of this objective, the SEP sets out an ambition both to deliver the infrastructure needed to underpin an increasingly digitised economy (superfast and ultrafast broadband and better mobile coverage), and to drive competitiveness through business growth, increased technology adoption and better digital skills.

1.3 Much has already been achieved, not least in the delivery of superfast broadband: by the end of 2017, around 90% of premises had access to download speeds of at least 30 Mbps, with ultrafast provision currently being rolled out in Swindon. But given the pace of technological change, Swindon and Wiltshire's future strategy needs to prepare for further, extensive, digital transformation. In this context, SWLEP decided to prepare a **Digital Capabilities Strategy** to understand the scale and nature of economic activity in Swindon and Wiltshire linked with digital technology, and how it can be grown and supported. This will, in turn, support the preparation of Swindon and Wiltshire's forthcoming Local Industrial Strategy.

1.4 To support the Strategy, this document sets out an evidence base considering:

- the scale of Swindon and Wiltshire's **digital sector**, looking at employment, business composition, skills base and support infrastructure
- the area's **digital infrastructure**, setting out in the current and planned extent of superfast broadband and mobile coverage
- a review of the **smart cities** agenda, focusing on measures being taken in a number of comparator locations to use technology to support public service improvements and drive demand for new solutions

1.5 This comes together to inform an overall assessment of the **strengths, weaknesses, opportunities and threats** for Swindon and Wiltshire's digital economy, summarised below:

[1] Swindon and Wiltshire LEP (2016), *Swindon and Wiltshire Strategic Economic Plan* p.15

Table 1-1: Summary SWOT assessment

Strengths	**Opportunities**
• Good and improving digital infrastructure • Good connectivity and access to markets and labour supply • Slightly greater than average employment and business concentration in digital sector • Proximity to major centres of digital innovation in Bristol, Bath, Thames Valley and Oxfordshire • Some larger businesses helping to generate demand for advanced digital technology • Relative cost advantages • 'Quality of life' cited as an attraction to entrepreneurs and investors • Proactive support from local partners	• Rapid pace of technological change driving new products and business models • Business enthusiasm for greater collaboration • Business-led investment in skills (e.g. Dyson Institute and engagement in recruiting new entrants to labour market) • Greater access to local talent as changes in university market/ cost reduces number going away to study • New investment (e.g. in Carriage Works and Corsham Mansion House) • Use of public investment to drive demand • Range of programmers to attract talent and investment
Weaknesses	**Threats**
• Lack of clear 'sector identity': diverse and with few 'anchors' • Limited sector networks • Local strengths not always well communicated (particularly given competing offer of neighbouring large centres)	• Recent deterioration in relative productivity • Risk of outflow of talent to neighbouring centres • Loss of competitiveness among businesses failing to adopt new technology • Ageing workforce/ challenges in up-skilling/ re-skilling • Public scepticism in light of data ethics controversies, etc.

Evidence base structure

1.6 The remainder of this volume is structured in eight main sections:

- **Section 2** provides a definition of 'digital capabilities' and sets out an overall framework for analysis
- **Section 3** outlines the technology trends and drivers and the national and local policy context for the development of the area's digital capabilities, and sets out an overview of the Swindon and Wiltshire economy
- **Section 4** analyses employment and business stock data relating to Swindon and Wiltshire's 'digital sector' (using the formal definition set out in Section1), identifying local concentrations of activity
- **Section 5** builds on Section4 by considering the digital business base in more detail, looking at a series of sub-sectors, the 'drivers for growth' associated with them and specific firms in Swindon and Wiltshire; as well as the broader assets relevant to the sector and opportunities for public sector intervention

- **Section 6** considers the 'digital' labour market, the supply and demand for digital skills and efforts underway to respond to identified gaps
- **Section 7** considers digital infrastructure provision, looking at fixed broadband and mobile coverage
- **Section 8** reviews the 'smart cities' agenda and considers examples of initiatives taken in a number of comparator locations
- **Section 9** sets out our SWOT assessment and its implications for the Digital Capabilities Strategy.

1.7 In addition, four annexes are attached:

- **Annex A** defines the 'digital' sector
- **Annex B** provides a summary of the Swindon and Wiltshire economy (supplementing the analysis in Section 4).
- **Annex C** provides further data relating to Swindon and Wiltshire's digital infrastructure (supplementing the analysis in Section 8)
- **Annex D** provides a list of stakeholders consulted during the Strategy development process

2. Framework and definitions

Introduction

2.1 To support the development of the Digital Capabilities Strategy, this Section sets out:

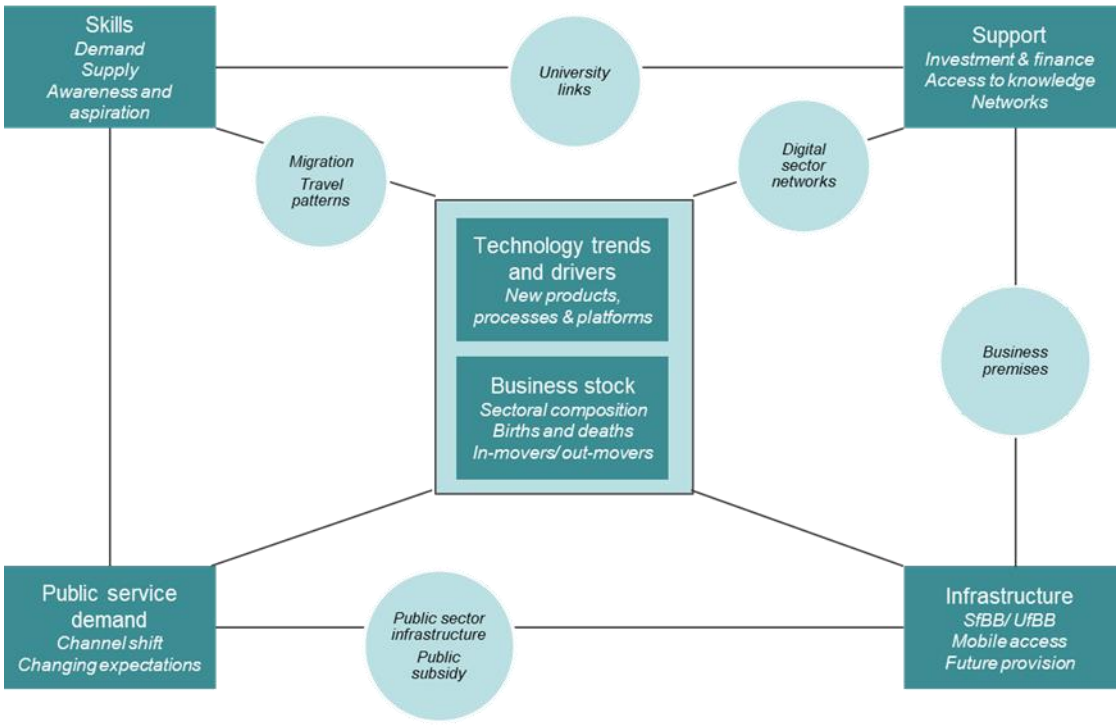
- a definition of the concept of 'digital capabilities', together with a high-level framework for analysis on which the Strategy will be based
- an operational definition of the 'digital economy', recognising both the concept – and limitations – of the concept of a 'digital sector' and the transformational impacts of digital technology across the wider economy

What do we mean by 'digital capabilities'?

2.2 For the purposes of developing the Strategy, we have broadly defined 'digital capability' as those factors that (ideally) work together to promote technology-driven productivity growth. Illustrated in Figure 2-1 below, these include:

- the composition of the **business base**: the combination of large and small firms, inward investors and indigenous businesses, the sectoral composition of the economy and the extent to which different firms will be impacted by digital technology
- the 'hard' **digital infrastructure** that contributes to growth, including existing and planned broadband provision and the potential for new infrastructure to both respond to and drive changing business and consumer demand
- the local workforce **skills supply and demand picture**, taking into account current provision (particularly at advanced technical level) and current and future business requirements as business models evolve and disruptive technologies emerge
- the nature of the **support infrastructure** that exists to facilitate business growth and development. This includes business-to-business links through supply chains, associations and informal networks, the investment and finance community, specialist professional services and privately backed business support provision; as well as access to and interaction with the knowledge base
- the role of the **public sector** in driving demand for new technologies and realising both savings and public service improvements

Figure 2-1: Digital capabilities: A high-level framework for analysis



Source: SQW

2.3 All of these factors constitute and contribute to Swindon and Wiltshire's 'digital capabilities'. To be successful, the Strategy will need to respond across the board – which will also mean influencing other strategies and action plans (including any forthcoming local industrial strategy) as they emerge.

… and what do we mean by the 'digital economy'?

2.4 As the framework above suggests, digital capabilities run throughout the economy. In this context, it is impossible to accurately define a 'digital sector' as a sub-set of the economy as a whole. However, it can be useful to draw comparisons between different places and analyse business and employment growth over time – so within emerging evidence base, we propose to refer to a 'digital tech sector' and, more broadly, to 'digital in the wider economy'.

'Digital tech'

2.5 We have defined the **'digital tech sector'** as "those businesses that generate most of their value from the development of new products and services that are reliant on the exploitation of digital technologies – in other words, those firms for which digital innovation is at the core of their business"[2].

2.6 As a (very) rough approximation and to calculate scale, growth, relative specialisation and so on in a consistent way, we have adopted the 'digital tech' definition used by Tech City UK in its annual *Tech Nation* reports. This definition builds up a defined 'digital sector' from a series of Standard Industrial Classification (SIC) codes, and contains activities including software

[2] SQW definition

publishing, computer games, telecoms, data processing and computer programming[3]. A full definition is set out in 9.6Annex A:**Error! Reference source not found.**.

2.7 Although widely used, this definition is imperfect: where data are limited, we have used different definitions to give a 'best approximation', and we have supplemented it with further analysis of sub-sectors and individual businesses.

Digital within the wider economy

2.8 Beyond the 'digital tech' sector, advanced digital technology is important to *all* parts of the UK economy. Increasingly, digital technologies are 'converging', as the acquisition, storage and use of vast amounts of data leads to new processes (and sometimes products) in almost all sectors[4]. Within this report, we therefore consider the impact of digital technology on the wider economy, particularly from the perspective of Swindon and Wiltshire's ability to adapt to change and future implications for skills and infrastructure provision.

[3] Tech City UK (2017), *Tech Nation 2017*, p.114. In addition to the Tech Nation definition, a number of other definitions have been assembled, also based on SIC codes. These include a definition adopted by DCMS, which is also widely used, although the differences between this and the Tech Nation definition are quite minor.
[4] Government Office for Science (2017), *Technology and Innovation Futures 2017*, p.13

3. Technology, policy and economic context

Introduction

3.1 Swindon and Wiltshire is not the only LEP area seeking to understand and develop its digital capabilities: the impact of digital technologies will be transformational across sectors, business models and places. This Section sets out the broad economic and policy context within which the Digital Capabilities Strategy is being developed. First, it looks at the major technology trends and drivers. It then considers how they are reflected in policy commitments at national, regional and local levels, describing the general policy backdrop to the Strategy. Finally, it provides a brief outline of the Swindon and Wiltshire economy as a whole, summarising the overall economic environment and the opportunities and challenges that it faces.

Transformation and disruption: the key drivers of 'digital growth'

3.2 Successive reports have highlighted the potential economic benefits that local economies can gain through digital innovation. According to the most recent Tech Nation report, the growth rate of digital jobs was more than double that of non-digital jobs between 2011 and 2015, with the GVA of a digital tech worker more than twice that of a non-digital worker, and productivity is high[5]. The UK's relative strengths are also widely quoted: in the five years to 2016, Britain's digital tech sector attracted £28 billion in venture capital and private equity investment, more than double the amount attracted to the sector in any other European country[6]

3.3 Much of this growth is being driven by the disruptive effect of *digitisation*[7]. Digitisation is impacting across the economy as the volume of data and the development of technologies to store and analyse it grows. In some sectors, the effects of digitisation have already been profound: for example, in media and entertainment, where new online formats and products have already become dominant; retail (with the market dominance of Amazon as both an online retailer and the provider of a platform for a wide range of other businesses); and transport and travel (with the rapid growth of 'sharing economy' platforms such as Uber and Airbnb). In other sectors, the change remains emergent: connected autonomous vehicles are the subject of extensive research and investment, but remain some way off the general market. However, when they become

> *"Digitisation at its simplest means the conversion of analogue information into digital information. As digitisation capabilities extend, virtually every aspect of life is captured and stored in some digital form, and we move closer towards the networked interconnectedness of everyday objects"*
>
> Ernst & Young (2011), *The Digitisation of Everything: How organisations must adapt to changing consumer behaviour*

[5] TechCity UK (2017), *Tech Nation 2017*, p.13. 'Digital jobs' are defined by Tech Nation according to a set of Standard Occupational Classifications
[6] TechCity UK (2017), *Tech Nation 2017*, p.15
[7] *"At its simplest, digitisation means the conversion of analogue information into digital information. As digitisation capabilities extend, virtually every aspect of life is captured and stored in some digital form, and we move closer towards the networked interconnection of everyday objects"* – Ernst and Young (2011), *The Digitisation of Everything: How organisations must adapt to changing consumer behaviour*

widespread, they will have significant implications for urban planning and management, vehicle use and standards, as well as manufacturing.

3.4 As digitisation proceeds, more businesses will become digital businesses (even if their origins long pre-date digital technology). But as technology advances, it presents opportunities for new entrants, as well as challenges for incumbent businesses. Looking to the future, Accenture identifies five 'digital business' trends that will be important over the next few years[8]:

- first, the **expansion of artificial intelligence**, its impact on a much wider and more sophisticated range of customer interactions and the ability of machine learning to replace a wide range of tasks and decisions that are currently carried out manually. The impact of this is cross-sectoral: in manufacturing, innovation in the development of intelligent products will change *what* is produced as well as *how* it is produced; in areas such as financial and legal services, the automation of complex decision-making will have significant cost and workforce implications.

- second, the continued **development of digital platforms** and the relationship between providers of goods and services and the providers of their routes to customers. Potentially, this has two effects: first, an increase in the significance of digital platforms themselves (possibly reducing costs to new market entrants reaching customers over them); and second, a changed relationship between producers of physical goods and suppliers of services as – for instance – rental models are made more viable by new technology.

- third, **changes in the nature of the workplace**, as online work management and the development of 'on-demand' labour platforms (such as LinkedIn's pilot freelance matchmaking service, currently being trialled in the United States) disrupt 'conventional' employment structures. Potentially, this could accelerate the trend towards businesses with smaller 'cores', drawing on larger pools of flexible talent.

- fourth, **use of data to affect behaviour change**, for example in monitoring customer feedback and gaining a better understanding of how people use or respond to particular products. This will be as significant in public services (for example in understanding how patients respond to certain treatments) as in the commercial sector.

- finally, the **development of new technologies and standards.** Many of the products and services highlighted earlier did not exist 10-15 years ago, and regulatory standards frequently lag behind the introduction of new service models (see, for example, the controversies regarding Uber's operations in several cities). As technology moves forward, so will the standards that will influence new business models.

3.5 These trends are potentially far-reaching, and will have downsides for specific firms, people and places, even if they offer general advantages. But those places that are best able to innovate in the exploitation of digital technologies, ensure the resilience of historically 'non-

[8] Accenture (2017), *Technology Vision 2017: Technology for People – The era of the intelligent enterprise*

digital' firms and generate a supply of people with the capabilities to drive forward and adapt to change are likely to benefit the most.

Looking beyond the UK: What can we learn from the most digitally-advanced locations?

Section 7 of this Evidence Base sets out Swindon and Wiltshire's digital infrastructure capacity, finding that compared with other parts of the UK, there is good access to superfast broadband and mobile connectivity and there has been very good progress in rolling out ultrafast to Swindon. However, the UK lags some way behind a number of competitors in delivering advanced digital infrastructure.

South Korea has the world's fastest average internet connection, partly as a result of early efforts dating back to the 1980s to develop a national broadband deployment plan with the aim of driving the ICT industry, alongside early attempts to stimulate demand through the computerisation of government services.

However, according to Telstra's recent report on digital transformation, South Korea's current public policy focus is on skills and entrepreneurship, to drive the greatest value from its infrastructure assets. In particular, the government has invested heavily in R&D, particularly in areas such as artificial intelligence, with a focus on driving the number and capacity of new and 'disruptive' businesses, beyond the country's traditionally strong industrial conglomerates. As well as government support, recent years have also seen an increase in the diversity of informal peer-to-peer business organisations, mirroring a global trend, with business associations and events highlighted as among the most important local resources for digital transformation.

Source: Telstra (2018), Digital Transformation in South Korea (https://www.telstraglobal.com/uk/insights/blogs/blog/digital-transformation-in-south-korea-a-focus-on-digital-skills-and-entrepreneurship)

Digital capabilities and the national policy context

Building on strengths: the Industrial Strategy and sector deals

3.6 This understanding has made the development of the 'digital economy' a national priority for Government. The **Industrial Strategy White Paper** published in November 2017 sets out four 'grand challenges' to "put the UK at the forefront of the industries of the future", all of which have innovation in, and the exploitation of, digital technologies at their heart, and in which the UK is seen as having relative advantages[9]. These are: artificial intelligence and the data economy; the future of mobility (linked, for instance, with autonomous vehicles); clean growth and decarbonisation; and the ageing society (linked with the potential for technology to promote independence and reduce the costs of health and care).

3.7 Among the commitments set out in the Industrial Strategy, four are particularly relevant to Swindon and Wiltshire in the context of digital capabilities:

- first, the development of a series of **sector deals**, including (of particular relevance to Swindon and Wiltshire) artificial intelligence, automotive and life sciences. The implications of these for the development of advanced digital technologies within key sectors of the Swindon and Wiltshire economy will be set out in more detail in Section 5

[9] HM Government (2017), *Industrial Strategy: Building a Britain fit for the future*

- second, additional investment in **digital infrastructure**, including in the further trialling and testing of 5G infrastructure and in "creating the conditions for full-fibre connectivity". An overview of current digital infrastructure provision is set out in Section 7

- second, new investment in **"driving up digital skills"**, including both a new entitlement for adults lacking basic digital skills and support for professional skills development. This will explored further in Section 6

- finally, the development of **local industrial strategies**, developed between Government and local enterprise partnerships. Given the focus within the Industrial Strategy on innovation and technology adoption, the Digital Capabilities Strategy should form an important basis for the development a local industrial strategy in due course.

Driving digital adoption: the 'Made Smarter' Review

3.8 Alongside the development of the Industrial Strategy, the Government commissioned Jürgen Maier, the chief executive of Siemens UK, to lead the ***Made Smarter* review**, which published its findings in October 2017. The review focuses on how manufacturers can use digital technology to make things "smarter, better and faster", in the context of the convergence of 'industrial digital technologies' (IDTs) such as artificial intelligence and robotics. The Maier Review highlights the *potential* of the UK to become a world leader in the 'fourth industrial revolution', but identifies three key constraints that hold it back[10]:

- **Lack of effective leadership**, including fragmented capacity for diffusion of technology and a limited understanding of the potential for industrial digital technologies

- **Poor levels of adoption**, particularly among SMEs, and partly linked with skills shortages and the national business support offer

- **Under-leveraged innovation assets**: despite world-class research strengths, these are insufficiently focused on commercialisation and support for IDT start-ups

3.9 To address these limitations, the *Made Smarter* review outlines a series of recommendations, which include:

- Developing a new **National Adoption Programme**, to accelerate the diffusion of IDTs to small and medium enterprises by strengthening the capability and capacity of advisory services at regional level. The review proposes that the programme would be owned by LEPs at local level

- Developing a **National Innovation Programme** via the network of Digital Innovation Hubs to address the challenges of the local business community

- Creating a network of **Digital Research Centres**, to bring together research expertise in relation to artificial intelligence, additive manufacturing, robotics and automation,

[10] *Making Smarter Review* (2017), http://industrialdigitalisation.org.uk/wp-content/uploads/2017/10/Made-Smarter-Review-Final-Report-2017.pdf

virtual reality and augmented reality, and the industrial internet of things. While there are no potential DRC 'candidate' locations within Swindon and Wiltshire itself, there are several in relatively close proximity[11]

- Establishing a **programme to improve digital skills capabilities**, targeted at people who are at risk of being displaced by digitalisation, or whose skillsets need to evolve to adapt to next generation technologies; and to develop future technical leaders

Focusing on digital capabilities across the economy: The UK Digital Strategy

3.10 Prior to the publication of the Industrial Strategy and the *Made Smarter* review, the **UK Digital Strategy** was published in March 2017. The Digital Strategy contains an ambition to *"make the UK the best place to start and grow a digital business",* highlighting Britain's existing strengths in artificial intelligence, cyber security, fintech, gaming and virtual reality, as well as the fusion of digital and creative expertise. At the same time, the Strategy contains aspirations to *"help every British business become a digital business"*, recognising, as we have highlighted above, that competitiveness will depend on the widespread adoption and access to digital skills. A summary of the key actions and priorities set out in the Digital Strategy is set out below:

The UK Digital Strategy

The UK Digital Strategy is a cross-departmental strategy, which aims to:

- invest in **digital infrastructure**, including a proposed 'universal service obligation', giving every individual and business the right to an affordable high speed broadband connection, and the acceleration of 5G infrastructure
- 'Give everyone access to the **digital skills** they need', including:
- establishing a new **Digital Skills Partnership** intended to play "a crucial role in helping people access digitally-focused jobs at a local level", bringing together technology companies, local businesses and local government to identify digital job vacancies and help local people into them
- encouraging more young people to consider **careers in digital**, by piloting new ways to include digital skills and careers in National Careers Service programmes
- offering free access to **basic digital skills** training for adults
- developing the pipeline of specialist skills, including taking forward the recommendations of the recent Shadbolt Review into industry-relevant skills for computer science graduates
- 'Make the UK the best place to **start and grow a digital business'**, including through support for Tech North and a planned review of how the UK can create the right conditions for the growth of the artificial intelligence industry
- Support **all businesses to become digital businesses**, including through the work of the Productivity Council in supporting the take-up of digital technologies
- Invest in **cyber security capabilities**, including through the expansion of cyber security apprenticeships

Increase digital government and implementing strengthened data protection standards

[11] Including the University of Bristol (in respect of artificial intelligence and machine learning, 5G/IoT/ cybersecurity, and AR/VR); University of Oxford (5G/IoT/ cybersecurity), University of Bath (AR/VR) and Bath Spa University (AR/ VR)

Regional and local strategy

Science, innovation and digital technology

3.11 Two Science and Innovation Audits (SIAs) are directly relevant to Swindon and Wiltshire's digital capabilities. The **South West England and South East Wales SIA**, published in 2016, focused on strengths in five technology and industry 'themes', highlighting 'digital innovation' as a cross-cutting factor[12]. Across the region, it noted strengths in (*inter alia*) microelectronics, data analytics, autonomous systems and cyber security, and proposed the establishment of a network of 'digital innovation hubs' to bring together academic and industry expertise. While two of these were specifically identified in the SIA linked with the universities at Bristol and Exeter, locations were also indicatively identified at Corsham, Salisbury and Swindon[13].

3.12 Swindon and Wiltshire is also part of a more thematically targeted SIA, focused on **cyber resilience** capabilities and which has been developed in conjunction with Gloucestershire, Worcestershire and The Marches LEPs. This focuses on the cybersecurity strengths emerging from the area's concentration of defence-related activities and the potential for innovation and commercialisation.

3.13 Reflecting Swindon and Wiltshire's generally well-connected location, two science and innovation audits focused on neighbouring areas are also relevant. First, the **Innovation South SIA** (which includes the adjacent Dorset, Enterprise M3 and Thames Valley Berkshire LEP areas) explicitly assessed the South's strengths in 'digital enabling technologies': of particular relevance to Swindon and Wiltshire, these included capabilities in advanced telecoms along the M4 corridor and substantial strengths in advanced engineering, especially associated with defence-related industry[14]. Second, the **Oxfordshire Transformative Technologies Alliance SIA** also focused on strengths in four "large scale, disruptive, inevitable technologies", considering both assets in Oxfordshire itself and links with other areas, including the neighbouring M3 corridor to the south and Cambridgeshire[15].

3.14 Two points are worth making from this brief overview of science and innovation audits in the vicinity of Swindon and Wiltshire:

- first, all four focus on digital strengths and opportunities, with some consistency in areas of technology specialism and a general recognition that *"convergence of ubiquitous computing power, cloud data storage and advanced decision making algorithms with mass consumer acceptance of increasingly smart digital devices, will continue to transform society"*[16]: the 'big picture trends are clear.
- second, based on the evidence presented in the SIAs, **Swindon and Wiltshire is at the centre of a wider 'region' with a substantial digital technologies asset base**. The area's position at the intersection of the M4 and Cambridge – Milton Keynes –

[12] BEIS (2016), *South West England and South East Wales Science and Innovation Audit*, Executive Summary. The four themes are: aerospace and advanced engineering; new energy systems; next generation microelectronics; digital living innovation; and resilience, and sustainability
[13] BEIS (2016), *South West England and South East Wales Science and Innovation Audit*, p.37
[14] BEIS (2017), *Innovation South: A powerhouse of world class strengths in digital enabling technologies*
[15] Oxfordshire Transformative Technologies Alliance (2017), *Science and Innovation Audit Summary Report*, p.2. Oxfordshire's four themes are: digital health, space-led data applications, autonomous vehicles, and technologies underpinning quantum computing.
[16] Oxfordshire Transformative Technologies Alliance (2017), *Science and Innovation Audit Summary Report*, p.2

Oxford (CaMKOx) corridors is potentially important: the Industrial Strategy notes the potential of the CaMKOx Corridor to be "Britain's Silicon Valley"[17], and the Government is aiming to develop an early local industrial strategy with partners in the CaMKOx Corridor by March 2019. Swindon and Wiltshire LEP has already expressed an interest in being part of this process.

Local strategy in Swindon and Wiltshire…

3.15 Swindon and Wiltshire's current **Strategic Economic Plan** was prepared in 2016, before the development of any of the regional and national plans referred to above. The SEP identifies the area's competitive advantage as based on its "pivotal central southern location" and an economy with strengths in sectors including digital and ICT, and sets out digital capability as a key strategic theme[18].

… and future investment in infrastructure and economic growth

3.16 Looking to the future, while the Industrial Strategy set out a commitment to "different policies for different places" and announced a series of funding pledges, there is some uncertainty on mechanisms for delivery. However, LEPs are encouraged to develop Local Industrial Strategies, and work is underway in Swindon and Wiltshire on a suite of strategy documents (including the Digital Capabilities Strategy) to inform a LIS. The future LIS may also influence the design of the Shared Prosperity Fund planned (without much detail yet) as the replacement for European Structural Funds after Brexit. In this context, understanding Swindon and Wiltshire's specific digital capabilities and priorities, and how they complement those of its neighbours, will be important.

The wider economic environment

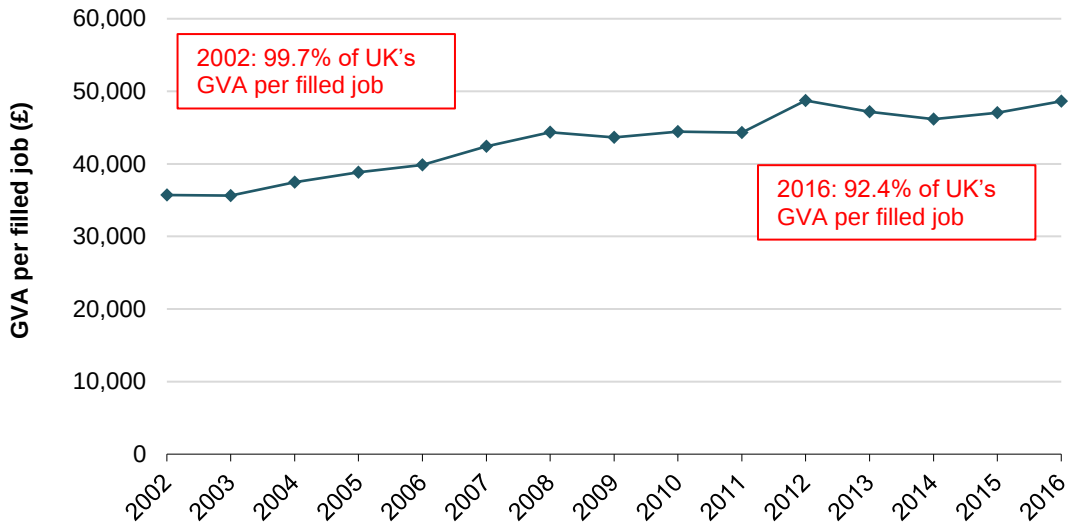
3.17 On the whole, Swindon and Wiltshire has a generally buoyant economy, albeit one that tends to underperform some of its neighbours.

3.18 Swindon and Wiltshire had an economy worth around £17.8 billion in 2016. GVA per head – at around £24,600 in 2015 - was slightly below the UK average (£25,600).

3.19 Swindon and Wiltshire's labour productivity (measured as GVA per filled job) was £48,315 in 2016, around 92% of that of the UK as a whole, and somewhat lower than in EM3, Thames Valley Berkshire, Oxfordshire, Gloucestershire and the West of England. Despite gradual growth over the past 15 years, there has been some deterioration in the area's productivity performance relative the UK as a whole:

[17] HM Government (2017), *Industrial Strategy: Building a Britain fit for the future*, p.232
[18] SWLEP (2016), *Swindon and Wiltshire Strategic Economic Plan*, p.4

Figure 3-1: Nominal (unsmoothed) GVA per filled job (£) in Swindon and Wiltshire 2002 to 2016



Source: ONS "Subregional Productivity: Labour Productivity (GVA per hour worked and GVA per filled job) by Local Enterprise Partnership"

3.20 Looking to the future, forecasts by Oxford Economics and Cambridge Econometrics each anticipate average productivity growth across Swindon and Wiltshire of around 1.6% per annum between 2016 and 2030 (higher than the historic 1.1% annual growth in 2000-13)[19].

In the short run: The current economic outlook

3.21 In the shorter term, the potential for growth will be influenced by the broader economic outlook. Nationally, industry surveys for TechCity UK show optimism about the outlook for growth in the 'digital tech' sector over the next couple of years, reflecting recent growth performance (although it should be noted that Tech City's role is partly promotional).

3.22 Looking at the national economy more broadly, modest GDP growth of around 1.5% is forecast in 2018 – below that of the United States or the Eurozone, and reflecting general economic uncertainties associated with the UK's exit from the European Union[20]. While the UK's strengths in 'digital tech' are widely recognised (and are referred to above), recent commentary has suggested some vulnerability (at least in the short term) to Brexit-related impacts, given the industry's strong international orientation and reliance on cross-border data flows[21].

[19] Hardisty Jones Associates for Swindon Borough Council and Wiltshire Council (2016), *Swindon and Wiltshire Functional Economic Area Assessment*, p.29
[20] *The Economist* (2018), February poll of forecasters (average)
[21] Frontier Economics/ Tech UK (2017), *The UK's digital sectors after Brexit*

Implications for the Digital Capabilities Strategy

3.23 This overview of the general economic and policy context suggests that there is much to be gained from a focus on Swindon and Wiltshire's digital capabilities. For the development of the Strategy, two points are particularly worth highlighting:

- first, there is a strong focus in national strategy on developing strengths at the 'leading edge' of innovation through digital technology – both in the 'digital tech' sector as defined in the Tech Nation reports, and in relation wider science and innovation capabilities. However, **the UK's future productivity growth will also depend on the widespread *adoption* of existing – but 'new to the firm' technologies within industry.** This 'dual focus' on both the leading edge and the wider economy may be particularly relevant to Swindon and Wiltshire, given the area's relatively weak productivity growth in recent years

- second, the relevance to Swindon and Wiltshire of strategies relating to a variety of regional geographies, and the proximity of key assets (such as the universities at Bath) just beyond the area's boundaries highlights the value of working together with neighbouring LEP areas. In this context, the Cyber Resilience SIA and the digital strategy currently being planned by the Mayor of the West of England are relevant, and the Digital Capabilities Strategy (and its implementation) should have regard to these.

4. Digital employment and business stock

Introduction

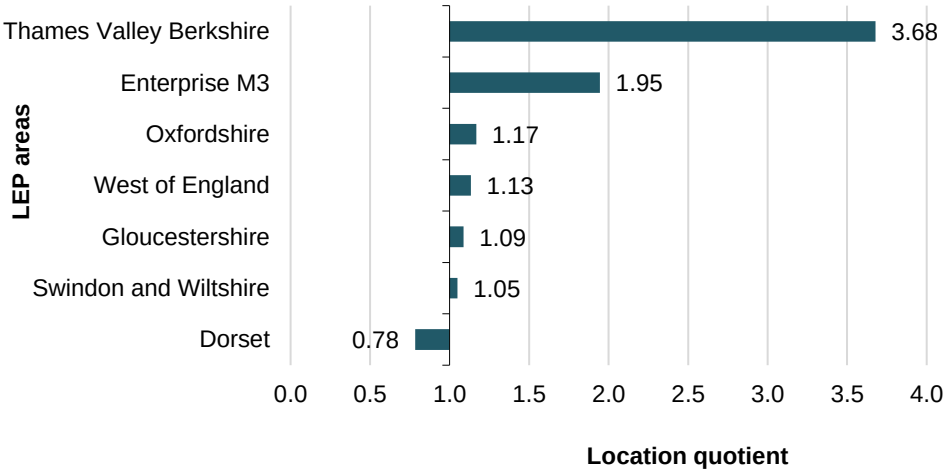
4.1 This Section provides an overview of the scale and performance of Swindon and Wiltshire's 'digital tech' sector, using the Tech Nation definition set out in Section2. It looks first at the pattern of employment in the sector, before considering the area's business stock and key sub-sectors.

Employment in the 'digital tech' sector

4.2 **There were around 12,000 people employed in the 'digital tech' sector in Swindon and Wiltshire in 2016** (using the Tech Nation definition described in Section2), accounting for around 3.7% of all employment.

4.3 Compared with the rest of the country, **the 'digital tech' sector is of broadly average size in employment terms**. The location quotient for the sector in Swindon and Wiltshire is 1.05 (meaning that the local concentration of employment is slightly greater than in the sector nationally[22]). However, the sector is relatively modest compared with some of Swindon and Wiltshire's neighbours, particularly Thames Valley Berkshire (which includes the major concentration of telecoms and IT businesses around Reading) and the Enterprise M3 area:

Figure 4-1: Employee concentration in the digital technology sector by LEP area (2016)



Source: SQW analysis of Business Register and Employment Survey: open access, ONS Crown Copyright Reserved [from Nomis on 5 March 2018]

Employment change

4.4 Due to changes in the way in which employment data is calculated, it is not possible to straightforwardly analyse medium to long term changes in 'digital tech' employment.

[22] The location quotient (LQ) is a measure of the relative concentration of employment within a local area, compared with the national data. On this measure, a LQ of 1 means that the level of concentration is the same locally as it is nationally. A LQ greater than 1 means that the local concentration is greater; a LQ of less than 1 means that it is lower.

However, nationally, employment in the sector has tended to grow at a faster rate than employment generally, albeit with some losses in those parts of the industry particularly susceptible to the automation of relatively routine tasks (such as, for example, in parts of the IT outsourcing sector)[23].

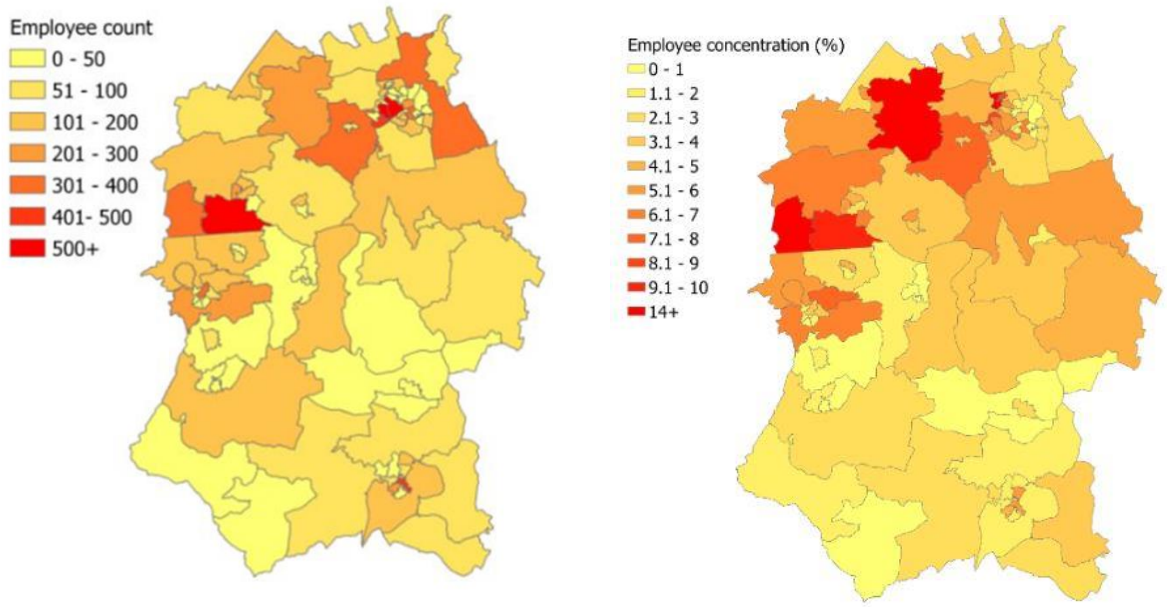
4.5 Looking to the future, forecasts by both Oxford Economics and Cambridge Econometrics both indicate strong growth in 'digital and ICT' over the period 2016-26, particularly in Wiltshire, linked with ambitions to develop the IT sector around Corsham[24].

Spatial patterns within Swindon and Wiltshire

4.6 The two maps below illustrate the distribution of employees in the digital sector across Swindon and Wiltshire. Figure 4-2 shows first the *number* of employees in the sector by 'middle layer super output area' (MSOA; a standard population-based unit of analysis); then digital sector employees as a *percentage* of all local employees:

Figure 4-2: Employees in the digital sector by MSOA, 2016

a) Count of employees in the digital sector ***b) Digital employees (% of all employees)***



Source: Produced by SQW 2018. Licence 100030994, Contains OS data © Crown copyright [and database right] [2017]

4.7 In terms of absolute numbers, digital sector employment is greatest in the areas around Corsham, Wootton Bassett and Swindon, with further concentrations in central Trowbridge and Salisbury. In the case of Corsham, this probably reflects employment in the large data centre operations and associated activities locally (described in Section5); elsewhere, the concentrations of digital employment broadly track the main general employment centres. As a proportion of overall employment, the distribution is somewhat different: the areas around Corsham and Wootton Bassett have a high proportion of digital employment, but the sector is less visible in Swindon, given the town's much larger overall employment base.

[23] SQW (2017), based on analysis of historical employment data using the DCMS definition of the digital sector
[24] Hardisty Jones Associates for Wiltshire Council/ Swindon Borough Council (2016), *Swindon and Wiltshire Functional Economic Market Area Assessment: Appendix 7 – Baseline Forecast Analysis*. Employment growth of around 10% is forecast in Swindon, and of between 11% (Oxford Economics) and 28% (Cambridge Econometrics) in Swindon.

Digital businesses

4.8 There were **around 2,500 enterprises in the digital tech sector in 2017**. While Swindon and Wiltshire contains some larger businesses (discussed in the next chapter), the sector is **overwhelmingly dominated by micro businesses**, which account for 96% of the business stock – a somewhat higher proportion than in the economy as a whole[25]. As with employment, the 'concentration' of digital businesses is slightly higher in Swindon and Wiltshire than in the UK as a whole (with a location quotient of 1.07).

4.9 However, it should also be noted that **freelancing** is widespread in the digital sector. The importance of freelancing is often overlooked, and data sources are limited, although there is increasing evidence that freelancing and 'casual' employment is becoming more significant in the economy overall, but especially in 'digital' trades. A recent study of freelancers in the digital sector in Brighton (based on interviews and focus groups with digital freelancers) demonstrated that freelancers were an important part of the local digital ecosystem, tended to contract with other freelancers and generally regarded freelancing as a preferable to (rather than a substitute for) paid employment[26].

4.10 **There has been reasonably strong growth in the business stock in recent years.** Between 2010 and 2017, the number of digital tech businesses increased by 35% (or 655 enterprises). This was almost exactly the same as the increase in the number of enterprises in the economy as a whole, although somewhat less than the 50% England-wide increase in digital business stock and the growth achieved in some of Swindon and Wiltshire's neighbours:

Table 4-1: Change in the number of enterprises operating in the digital sector, 2010-17

	Count	%
Swindon and Wiltshire	655	35%
Dorset	320	20%
Enterprise M3	2,235	34%
Gloucestershire	650	42%
Oxfordshire	400	20%
Thames Valley Berkshire	2,455	51%
West of England	1,135	45%
England	55,630	50%

Source: SQW analysis of UK Business Counts - enterprises by industry and employment size band, ONS Crown Copyright Reserved [from Nomis on 5 March 2018]

4.11 **There is some indication that the sector is maturing as well as growing**, reflecting the national picture. Growth in the business stock was strongest between 2010 and 2017 among micro businesses, both within the digital sector and across all industries. However, the number of digital businesses classed as 'small' and 'medium' has increased at a faster rate than the number of small and medium businesses in the economy overall. This indicates that over the past few years, a number of firms have scaled up, growing from micro, to small, to medium over time: this seems to be borne out by the consultation evidence of businesses that have

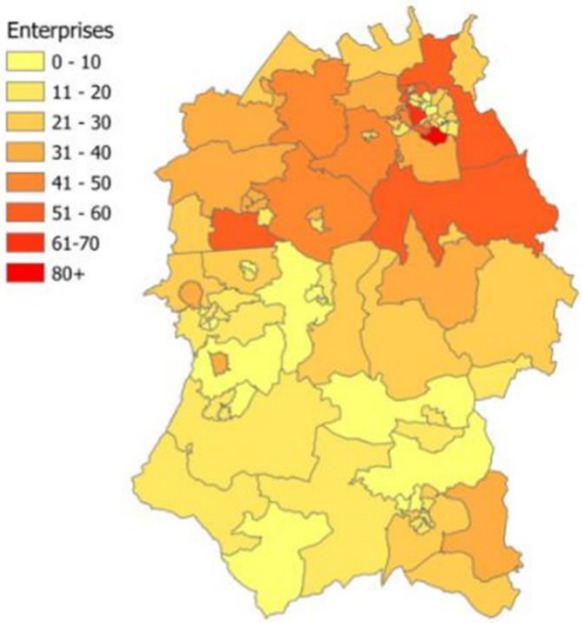
[25] ONS, UK Business Counts
[26] University of Brighton/ University of Sussex/ Wired Sussex (2015), *Brighton Fuse 2: Freelancers in the creative digital IT economy*

seen rapid growth in recent years as they have developed new products and services. It suggests that efforts to 'scale up' the sector would – on the whole – be following the general direction of travel.

Spatial patterns in Swindon and Wiltshire

4.12 Figure 4-3 shows the distribution of digital sector enterprises across Swindon and Wiltshire. The concentration is greatest in the area around Corsham and around the edge of Swindon. In Swindon, it appears to be the case that digital businesses tend not to just 'cluster' in the town centre, perhaps reflecting the lack of a university or similar anchor in the centre, as well as the relatively high supply of business space on the periphery[27]. However, the development of the Carriage Works in the town centre offers an opportunity to create new space to attract businesses in the tech sector.

Figure 4-3: Count of digital sector enterprises by MSOA



Source: Produced by SQW 2018. Licence 100030994, Contains OS data © Crown copyright [and database right] [2017]

Implications for the Digital Capabilities Strategy

4.13 While the Tech Nation definition of the digital sector is imperfect, analysis of the data above gives us an indication of the scale and distribution of the digital sector. For the Digital Capabilities Strategy, three broad conclusions may be drawn:

- first, we are looking at a sector which is **strongly dominated by micro businesses** (to a greater extent than the economy overall). While there is evidence that businesses are 'scaling up' (from micro to small), the implication is that growth is likely to be generated within the large stock of smaller businesses
- second, **while the stock of digital businesses has grown steadily in recent years, it has not expanded as rapidly as in England as a while, or as rapidly as Swindon**

[27] This point was also reflected by businesses in consultation

and Wiltshire's neighbours in the West of England or Thames Valley Berkshire. It is growing – but broadly in line with the economy overall, rather than with the digital sector nationally

- third, spatially, **there is a high concentration of employment and business stock around Corsham and (broadly) in the 'greater Swindon' area**. However, in respect of latter, the sector appears to be distributed, rather than concentrated in the town centre. Across the rest of Swindon and Wiltshire, there are modest concentrations in the other main urban areas, reflecting Wiltshire's polycentric geography.

5. Digital sub-sectors: Analysing the business stock

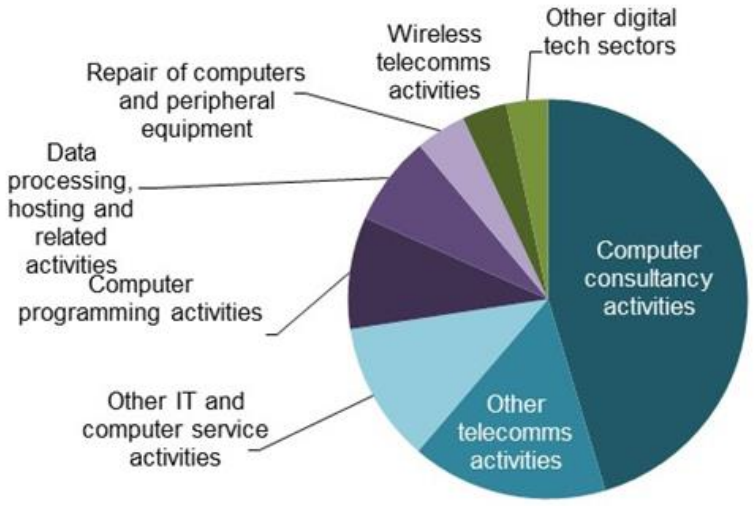
Introduction

5.1 Building on the analysis contained in Section4, this Sectionlooks in more detail at the sub-sectoral composition of Swindon and Wiltshire's digital sector, identifying where there are areas of relative strength and growth potential. It starts by breaking down the employment data presented in the previous Sectionusing the Tech Nation definition. However, recognising that the digital sector extends beyond this narrow definition, it then identifies a number of sub-sectors and analyses Swindon and Wiltshire's key business assets and potential in relation to each.

Digital sub-sectors using the Tech Nation definition

5.2 Figure 5-1 shows the distribution of employee jobs by digital sub-sector across Swindon and Wiltshire. "Computer consultancy activities" account for over 40% of employee jobs within the sector; "other telecoms activities" account for a further 15%; and "other IT and computer service activities" for 12%:

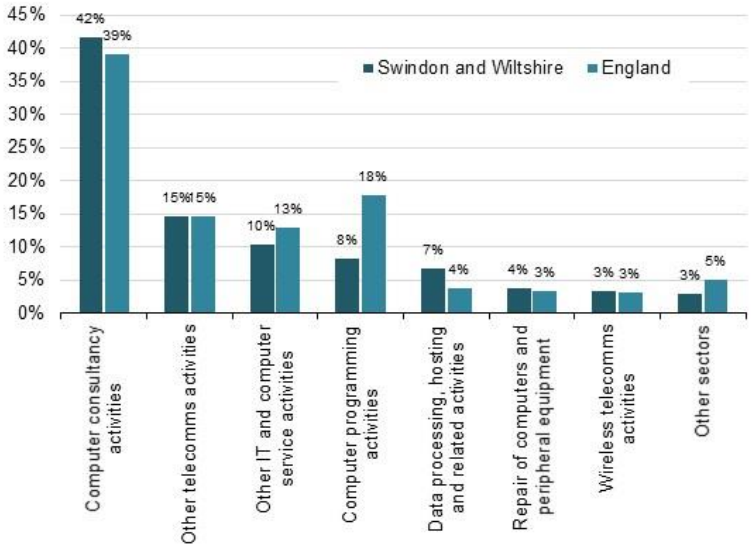
Figure 5-1: Distribution of employee jobs in the digital sector, 2016



Source: SQW analysis of Business Register and Employment Survey: open access, ONS Crown Copyright Reserved [from Nomis on 5 March 2018]

5.3 This distribution is broadly similar to the average across England as the chart below shows. The one real exception to this is in relation to "*computer programming activities*" which appears to be under-represented in Swindon and Wiltshire. Conversely the incidence of "*computer consultancy*" and "*data processing and related*" is higher than the national average.

Figure 5-2: Distribution of employee jobs within the digital technology sector in Swindon and Wiltshire and England, 2016



Source: SQW analysis of Business Register and Employment Survey: open access, ONS Crown Copyright Reserved [from Nomis on 5 March 2018]

5.4 If this is true – and BRES data need to be treated with caution – it might suggest that Swindon and Wiltshire has a *relatively* low incidence of the higher knowledge content activities within the digital technology sector; and *relatively* high number of consultants.

Taking a broader view of Swindon and Wiltshire's digital sub-sectors

5.5 However, analysis of official data only tells part of the story. Since it relies on the exploitation of new technology, which is always changing, the digital sector is inherently dynamic, and forms of business activity are evolving considerably faster than national statistics – so some sub-sectors that would be recognisable to the industry are not always captured in the data. This section looks beyond the formal statistics to explore Swindon and Wiltshire's digital sub-sectors and the key businesses within them, drawing on business consultations, analysis of a range of databases and published reports and web-based research. For each sub-sector, it considers market trends, the scale of the sector in Swindon and Wiltshire and its business composition and issues that local partners may wish to consider in future strategy development.

5.6 The sections that follow consider business assets and opportunities in relation to seven sub-sectors:

- Telecoms and digital infrastructure
- Digital marketing and e-commerce
- Fintech
- Cybersecurity
- Digital health

- Digital entertainment and games
- Manufacturing.

5.7 It should be noted that these sub-sectors are not formally defined. In practice, they overlap substantially, in some cases because the 'definition' is determined by the market in which the customer is situated (for example, a firm developing software to support records management in the health service is a 'digital health' business, but it could also develop a similar product for use in (say) the financial services sector). **Technological convergence** also reinforces sub-sector overlap: there is increasing convergence between (for example) providers of infrastructure, providers of platforms and providers of content - and plenty of 'traditional' sectors now gain a substantial amount of their value from the exploitation of digital technologies. The headings used below therefore provide a useful way of explaining sub-sector composition, but they are to some extent arbitrary.

Telecoms and infrastructure

The sector – and key market trends

5.8 Section 7 sets out the provision of digital infrastructure across Swindon and Wiltshire, including the rollout of superfast broadband and (in Swindon) ultrafast, as well as 4G mobile coverage. However, telecoms and 'digital infrastructure' are important as digital sub-sectors in their own right. The pace of change in telecoms infrastructure has been rapid, and has underpinned the other sub-sectors and their business models analysed in this report, and this has driven high levels of growth for the telecoms industry itself. However, over the coming years, a number of disruptive trends are likely to impact on the sector, including[28]:

- **integration between telecoms providers and content providers**. Telecoms operators (such as BT and Virgin Media) gain an increasing share of revenue from content
- **the expansion of connected devices**, leading to a vast increase in connected data sources
- **increasing concerns over security risks**. This will lead to an increase in demand for cybersecurity solutions (see above): as they are 'custodians of the network', these will particularly impact on telecoms providers.

The sector in Swindon and Wiltshire

5.9 Swindon and Wiltshire is in close proximity to a very large concentration of major telecoms operators in Berkshire (including the headquarters of Vodafone at Newbury), the tech industry in Swindon and Wiltshire itself is dominated by small and medium enterprises. One of the larger telecoms businesses in the area is **Excalibur Communications**, which has evolved its business model as technology has developed:

[28] Zubair Labbi (2018), *Looking at telecom industry trends by 2020 and beyond*, CapGemini industry report (https://www.capgemini.com/2015/08/looking-at-telecom-industry-trends-by-2020-and-beyond/)

Excalibur Communications

The company story…

Based in Swindon, Excalibur Communications was established in 1992 as the Mobile Phone Centre (MPC), a retail operation selling mobile phones to the private customer market, through a franchised chain of shops across the South of England. Rebranded as Excalibur in 2000, the firm sold the MPC chain to Vodafone as mobile phones became ubiquitous, concentrating instead on the 'business to business' market.

Over time, Excalibur has moved from being a retailer of telecoms hardware to being a provider of business IT services, expanding into fixed-line telephony and acquiring a number of business IT solutions providers (including Warminster-based Bridge Solutions). In 2017, Excalibur entered the *Sunday Times* 'top 100' employers list, and earlier this year was subject to a management buy-out. Currently, around 60% of the firm's business is linked with mobile telephony, although as services are converging, it remains committed to expansion across the wider range of digital channels.

… and the importance of Swindon and Wiltshire

From the start, Excalibur has been based in Swindon, and since its refocusing on the business market, it has consolidated its operations in the town. While the decision to locate in Swindon was made by the founder, who already lived in the area, Excalibur considers Swindon to be a convenient, central and accessible location. It offers a labour market with sufficient 'critical mass' to recruit, with (in general) success in local recruitment.

Source: Interview (April 2018); Excalibur (www.excaliburcomms.co.uk)

5.10 In addition to Excalibur, other telecoms providers include **Horizon Telecom and Data**, based in Swindon; and **Berry Telecom**, based in Salisbury, which provides business phone services to a national market. Like many of the businesses highlighted in this report, Berry's growth story has been relatively rapid, with the firm established in 2011 as a home-based start-up. Based in Chippenham, **Vysiion** is a longer-established provider of IT and telecoms services, mostly to the public sector.

5.11 Swindon and Wiltshire also has a particular asset in the **Ark data centre campus** near the Ministry of Defence site at Spring Park, Corsham. Ark provides secure and large scale data centre services to Government (through its Crown Hosting joint venture) and to the private sector.

Digital marketing and e-commerce

The sector – and key market trends

5.12 'Digital marketing' refers to the promotion of brands through various digital media, including web design, use and management of social media, search engine optimisation and marketing through mobile channels. While all advertising and marketing businesses have become 'digital' to a large extent, the advance of technology has led to much greater potential to exploit insights into consumer behaviour alongside 'creative digital' capabilities. Key digital marketing trends include[29]:

[29] *Forbes* (2017), 'How digital marketing will change in 2018: 15 top trends' (https://www.forbes.com/sites/forbesagencycouncil/2017/12/18/how-digital-marketing-will-change-in-2018-15-top-trends/#21de192c2d9a)

- the **integration of augmented reality and social media:** as mobile devices become more powerful and social apps can better integrate with AR, there is greater potential for brands to use location information and consumer preference data to trigger 'location specific' content
- the **greater integration of different types of content**, as improved devices and greater download speeds offer increased potential to utilise visual effects and video marketing
- **increased personalisation**, with more targeted advertising and messaging linked with customer data, and the increased use of artificial intelligence in determining marketing strategies
- **greater use of conversational user interfaces**, as facilities such as Alexa and Google Assistant become increasingly integrated into customers' lives, and as the increasing sophistication of chatbots enable brands to more easily 'converse' with consumers.

5.13 All this points to a digital marketing sector that is becoming increasingly sophisticated and likely to use (and perhaps pioneer) new artificial intelligence and data analytical techniques. Nationally, the sector is quite diverse, ranging from firms that are heavily engaged in the development of new software through to a large number of independent consultancies and web design services; given widespread business demand, the sector is also quite broadly distributed geographically.

The sector in Swindon and Wiltshire

5.14 Estimating the scale of the digital marketing sector is difficult: the sector is not defined according to any one SIC code (firms tend to fall into a variety of definitions, including advertising agencies, consultancy activities and 'other IT and computer service' activities), and there is no central business database. However, Swindon and Wiltshire is home to a large number of mid-sized digital agencies. These include **Corvita Digital** based in Chippenham, which, in addition to branding and website design, develops e-commerce and learning platforms (including a distance learning platform for King's College London); and **Infinity Nation** based in Royal Wootton Bassett, which offers design, search engine optimisation and e-commerce services. Following the national picture, the sector tends to be quite widely distributed, although a number of managed workspace schemes have been successful in growing 'clusters' of mainly marketing-oriented tech businesses – examples include the **Old Glove Factory** at Holt, near Bradford-on-Avon, which currently has plans to expand[30].

5.15 The sector includes digital agencies that have grown from 'traditional' information and marketing companies. **Dentons Digital**, based in Westbury, designs and builds e-commerce platforms, and is co-located with the dentons.net online business directory. While the firm is now almost entirely 'digital', it evolved from (and is a part of) Dentons Directories Ltd, a conventional provider of business directories established in the 1960s.

5.16 On the other hand, as technology – and the market for digital solutions – have expanded rapidly, there have been opportunities for newer businesses to develop new products. The

[30] Glove Factory Studios (http://www.glovefactorystudios.com/members/)

case study below provides an example of a digital agency in Swindon that has shown strong growth, and which has needed to adapt its strategy as it has expanded:

Render Media

The company story…

Based on the Groundwell industrial estate in Swindon, Render Media is described as an 'immersive innovation agency', using its expertise in virtual reality (VR) and augmented reality (AR) to help enterprises "turn data into scalable, immersive solutions", with clients including Intel and Airbus.

Originally, Mark Miles set up the business as a freelance creative 'lifestyle' enterprise, working from home. After securing work with a direct client in 2012, he set up Render as a digital agency, focused on CGI, 3D animation and filming.

Since 2014, with the advent of new technological possibilities, Mark expanded the business into augmented reality, recruiting a new developer with expertise in the field and involving existing clients in R&D projects. The following year, Render secured an initial contract to design VR scenarios for Airbus, having made an initial contact at a trade fair. Airbus remains a client: since then, Render has expanded its VR and AR operations, and recently prepared a 'white paper' for Intel on the future of virtual reality.

Render has expanded through organic growth, recruiting steadily since 2013. However, it has benefited from (privately secured) business strategy advice, which helped in refocusing the business as it moved towards new technology

… and the importance of Swindon and Wiltshire

Render's client base is widely dispersed, although it retains a number of clients in Swindon and Wiltshire (including Intel and the Devizes-based manufacturers MSA Latchways). However, Swindon also offers a convenient strategic location at the 'centre of the South', and it has successfully recruited locally and from universities along the M4 (including University of the West of England and University of South Wales). Talent retention has generally been good (a view reflected by a number of other businesses in consultation), and "not being in Bristol or London actually makes us stronger".

While based on the edge of Swindon, an informal and unplanned 'cluster' of related businesses has emerged around Render's base at Gemini House, with a number of other tech/creative businesses located in the vicinity. Looking to the future however, access to the 'right' business space could be a challenge, particularly as office accommodation is redeveloped for other purposes.

Source: Interview (May 2018)

5.17 'Digital marketing' overlaps with the wider creative sector. For example, **Create Studios CIC**, a not-for-profit company based in Swindon delivers digital marketing services to the private and third sectors on a commercial basis – but it also delivers digital arts projects with an emphasis on social inclusion, and offers a programme to support young people in developing digital production skills[31].

[31] Create Studios (http://createstudios.org.uk/about/)

Fintech

The sector – and key market trends

5.18 The term 'fintech' "is used interchangeably to describe both technology-driven innovation across financial services and to define a specific group of firms that combine innovative business models with technology to enable, disrupt and enhance the financial services sector"[32]. Linked with the scale of the UK's financial services sector, fintech is seen as an area of significant national advantage and potential: according to EY, around 61,000 people are employed in fintech nationally (about 5% of the total financial services workforce)[33]. Key trends in the use of technology in financial services include an increasing shift away from 'technology-enabled human relationships' towards fundamentally digital relationships, the increasingly sophisticated use of data analytics, and the development of new payment systems and electronic wallets[34]: particularly with regard to the latter, there are significant overlaps between fintech and cyber security. Looking to the future, funding to firms engaged in the exploitation of blockchain (electronic ledger) technology is increasing substantially, although familiarity with the technology remains limited[35].

5.19 Overwhelmingly, fintech is focused on London, in which around 80% of fintech firms are based[36], although in the South West, there is some concentration of activity in Bristol (reflecting the presence of a number of financial services firms, including Lloyds Bank and Hargreaves Lansdown) and in Exeter[37].

5.20 Earlier in 2018, the Government prepared a new *Fintech Sector Strategy* to support the growth of the sector. This is a high-level strategy, which focuses on regulatory support and measures to improve skills (including the Institute of Coding referred to in Section 6). It also refers to efforts to promote sector growth outside London, "with a specific focus on the adoption of fintech by regional banks and building societies"[38], although the mechanisms for this are not clearly defined.

The sector in Swindon and Wiltshire

5.21 Swindon and Wiltshire has an established financial services presence, particularly through the headquarters of **Nationwide** in Swindon. Nationwide is not a 'digital business' on the Tech Nation definition. However, it is a major employer of people with advanced digital skills: the firm's demand for software engineers in increasing even though Nationwide has seen an overall reduction in headcount in recent years, and there has been a need to recruit nationally to meet skills demand[39]. Beyond its own demand for skills, Nationwide also appears to be important as a *generator* of talent which can be redeployed in the local economy: during the

[32] HM Treasury (2018), *Fintech Sector Strategy: Securing the future of UK fintech*, p.3 (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/692880/Fintech_Sector_Strategy_web.pdf)
[33] HM Treasury/ EY (2016), *UK Fintech: On the cutting edge* (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/502995/UK_FinTech_-_On_the_cutting_edge_-_Full_Report.pdf)
[34] PwC (2017), *Global Fintech Report 2017: Redrawing the lines – fintech's growing influence on financial services* (https://www.pwc.com/jg/en/publications/pwc-global-fintech-report-17.3.17-final.pdf)
[35] PwC (2017), *Global Fintech Report 2017*, p.12
[36] HM Treasury (2018), *Fintech Sector Strategy: Securing the future of UK fintech*, p.17
[37] Neil Ainger (2017), 'Fintech outside London', *Banking Technology* (https://www.bankingtech.com/2017/05/fintech-outside-london-part-2/)
[38] HM Treasury (2018), *Fintech Sector Strategy: Securing the future of UK fintech*, p.17
[39] Consultation

workshops and consultations carried out as part of this study, several digital SME leaders referred to previous employment at Nationwide before starting their own businesses.

5.22 Among newer businesses, there is some overlap between fintech, cybersecurity, general business software and consultancy. For example, Swindon-based **Appsbroker** has a significant market in aggregating trading data for the financial services sector (as well as providing data and software solutions for a wider business market) and recently acquiring Sycamore Financial Technology, an electronic platform developer for financial markets. Marlborough-based **Foregenix** has a significant presence in the civilian cybersecurity market, focusing on digital security for the payments industry: with a presence in several world markets, the firm joined the *Sunday Times*/ Lloyds Bank SME Export Track 100 in 2018[40].

Cybersecurity

The sector – and key market trends

5.23 The digital opportunities associated with all of the sub-sectors identified above are dependent on the aggregation and use of data, through increasingly connected devices. Data security is therefore a key theme running through all of them – and we have cited above companies that are concerned with ensuring digital security in relation to key areas of activity (such as Foregenix in relation to electronic payments).

5.24 Unsurprisingly, demand is therefore rising for cybersecurity skills, as attacks become increasingly sophisticated and data volumes grow, at the same time as organisations continue to rely on (complex and difficult to decommission) legacy computer systems[41].

5.25 Nationally, the Government sees cybersecurity as an area in which the UK has significant strengths, linked with its military and intelligence capabilities as well as a civilian business base. The Department for International Trade identifies around 800 cybersecurity companies in the UK, with UK cybersecurity exports anticipated to be worth around £2.6 billion by 2021[42].

The sector in Swindon and Wiltshire

5.26 There are 14 cybersecurity organisations in Swindon and Wiltshire registered on the Government-sponsored Cyber Exchange[43]. Most of these are smaller consultancy businesses, and include **Networkology**, based in Corsham, which brings defence industry expertise to a number of other sectors (such as oil and gas and finance), and **Torchlight**, a counter-threat company based in Swindon.

5.27 Beyond these individual businesses, Swindon and Wiltshire has a strong heritage in the defence industry. MoD Corsham is home to the Ministry of Defence Global Operations Control Centre (GOSCC) and is the location for the new Cyber Security Operations Centre (CSOC)[44],

[40] Foregenix (https://www.foregenix.com/whitepapers)
[41] Alex Manea (2018), 'Four cybersecurity trends to look out for in 2018), *Computer Business Review* (https://www.cbronline.com/in-depth/four-cybersecurity-trends-look-2018)
[42] Department for International Trade (2018), *Cyber Security Export Strategy* (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/693989/CCS151_CCS0118810124-1_Cyber_Security_Export_Strategy_Brochure_Web_Accessible.pdf)
[43] Cyber Exchange (https://cyberexchange.uk.net/#/cyber-map)
[44] Ministry of Defence (April2016)

while Porton Down, near Salisbury, is a major Dstl research centre and is the headquarters of Dstl's commercialisation arm, **Ploughshare Innovations**, which supported a number of spin out businesses and licensing deals associated with the cybersecurity sector[45]. Earlier in 2018, the MoD also announced the establishment of a new **Defence Cyber School** at the Defence Academy of the United Kingdom at Shrivenham, while the UK and the United States also announced in 2018 the creation of a new **Artificial Intelligence Hub** based at Dstl's laboratories at Porton Down. The AI Hub is intended to co-develop "disruptive technologies for defence and security applications", modernising procurement systems at the same time as developing the new laboratory[46].

5.28 To assess the prospects of the area's cybersecurity sector and to identify opportunities for commercial growth, a **Cyber Resilience Alliance Science and Innovation Audit** is being prepared, covering Swindon and Wiltshire and neighbouring LEP areas in Gloucestershire, Worcestershire and The Marches. Emerging recommendations include proposals for a (potentially multi-site) 'National Cyber Lab'[47].

Digital health

The sector – and key market trends

5.29 'Digital health' is concerned with the development and marketing of software and/ or devices that rely on software for their key functionality, and which are used in hospitals and GP surgeries or in the home to manage health and deliver services, as well in the process of clinical trials and data analysis[48].

5.30 The Office for Life Sciences identifies over 400 digital health businesses across the UK, most of them engaged in providing either hospital and GP information systems and e-health analytics. The sector is seen as offering strong potential for growth – given rising demand for health services in the context of an ageing population and the potential for technology to drive down costs[49] – and overlaps with the medtech and general business software sectors.

The sector in Swindon and Wiltshire

5.31 The OLS identifies four digital health businesses in Swindon and Wiltshire. These include **UK Cloud Ltd**, based at Hartham Park in Corsham, which is a provider of cloud services to the public sector (especially to the health market) and **Quicksilva Ltd**, based at Chippenham, which is also a provider of IT services to the public sector, with a specialism in delivering software solutions to the NHS and care sector. Outside Swindon and Wiltshire – but originally established in Chippenham – Bath-based **Mayden** provides digital records systems, particularly for the mental health and psychological therapies sector.

[45] Such as the Cyber Defence Capability Assessment Tool (CDCAT), developed by Dstl and licensed to APM Group. Ploughshare Innovations (https://www.ploughshareinnovations.com/license-or-invest/case-studies)
[46] EEF (2018), https://www.eef.org.uk/ndi/news-and-blogs/2018/jun/uk-announce-defence-space-strategy-and-artificial-intelligence-hub
[47] Cyber Resilience Alliance (2018), *Science and Innovation Audit* (unpub.)
[48] Office for Life Sciences (2017), *Strength and Opportunity 2016: The landscape of the medical technology and biopharmaceutical sectors in the UK*, p.29
[49] Office for Life Sciences (2017), *Strength and Opportunity 2016*. Research commissioned by the OLS indicated a doubling of the global market for digital health in 2014-18

Quicksilva

Established in 1999 and based in Chippenham, Quicksilva provides data solutions to the public sector, and specialises in care record and information management solutions for the Health Service. Products include Spinal Tap, which is a 'broker' between local information systems held by GP surgeries, pharmacies and other providers with the central NHS 'spine'. The firm has also developed products to speed up the flow of information between health and social care providers, with the aim of reducing delays in discharge dates and enabling data to be shared securely between organisations.

Source: Quicksilva (www.qxlva.com)

5.32 The OLS database probably under-counts the scale of the digital health sector, as it is focused on those digital services and systems that carry a high degree of clinical content (such as medical records or health data). The definition excludes those firms that provide health-related marketing and information services: in Swindon and Wiltshire, companies active in this area of activity include **Silicon Practice**, based in Swindon, which provides website design and development and enquiry management systems to NHS and private healthcare providers.

5.33 Recognising the potential for growth within the sector, the **Swindon and Wiltshire Health and Life Science Innovation Hub**, supported by the West of England and Wessex Academic Health Science Networks and Wiltshire Council and funded by the European Regional Development Fund offers support to SMEs in bringing healthcare innovations to the market, with a focus on *(inter alia)* firms in the digital and 'information economy' sector[50].

Digital entertainment and games

The sector – and key market trends

5.34 The UK's entertainment and media market is worth around £68 billion in 2018: PwC forecasts this to increase to £76 billion by 2022, with the fastest growth anticipated in 'digitally driven' segments, such as 'e-sports' (competitive, multi-player video games) and virtual reality entertainment[51]. While the entertainment industry has already been transformed by digital technology (for example, with the replacement of physical recorded music and video products with online, on-demand equivalents), new technology has led to considerable growth in the games sector: PwC forecast that by 2020, annual UK spend on video games will exceed spending on books[52].

5.35 The UK has a strong market presence within the interactive entertainment sector: it is the world's fifth largest video games market[53] and contains a number of major firms and internationally successful products. Looking to the future, future product development will depend both on the exploitation of new technology (connecting more players and developing products across a range of formats), and on the ability to develop products appealing to a wide

[50] West of England Academic Health Science Network (https://www.weahsn.net/what-we-do/bringing-innovation-into-practice/innovation-hub/)
[51] PwC (2018), *Perspectives from the Global Entertainment and Media Outlook, 2018-22* (https://www.pwc.com/gx/en/entertainment-media/outlook/perspectives-from-the-global-entertainment-and-media-outlook-2018-2022.pdf)
[52] Ibid.
[53] Ukie, 2018 (http://ukie.org.uk/research#Report)

range of markets (given that – for example – China now accounts for around 50% of the world games market)[54].

5.36 Historically, the games sector has been readily open to new entrants, although globally, the industry is dominated by a number of major firms (such as Electronic Arts) and the market trends described above suggest a tendency to consolidation as costs of entry rise. Within the sector, businesses frequently expand and contract depending on the project development cycle: demand for freelance and temporary employment tends to be high as a result, and there is a tendency within the sector for businesses to cluster.

The sector in Swindon and Wiltshire

5.37 Nationally, the games sector tends to be concentrated in the major cities (such as London and Manchester) and university centres[55]. Generally, there is a correlation between games industry clustering, university provision and the presence of a wider broadcasting and advertising sector[56].

5.38 **Within this context, the sector in Swindon and Wiltshire is modest.** UK Interactive Entertainment (Ukie), the main trade body for the sector, identifies 14 games businesses in 2018, half of which are in Swindon. Of these, all but one have been established since 2008, and all are independent; some of the more prolific games developers include **Glowing Eye Games** based at Baildon, near Chippenham and **GeekBeach**, based in Swindon.

5.39 However, while relatively small within Swindon and Wiltshire itself, the sector is quite prominent in adjacent areas: the Enterprise M3 (especially around Guildford and Aldershot), Oxfordshire and West of England LEP areas all have concentrations of games companies.

Manufacturing and 'Industry 4.0'

The sector – and key market trends

5.40 While manufacturing is not conventionally seen as a 'digital' sector, digital technology is becoming increasingly fundamental to the manufacturing process. The *Made Smarter Review* of industrial digitalisation highlights the importance of the UK becoming an early adopter of industrial digital technologies (IDTs), noting that while technology breakthroughs in artificial intelligence, robotics and the Internet of Things are important in their own right, it is *"the convergence of these IDTs that really turbo-charges their impact"*[57]. The Review states that potentially, the exploitation of IDTs could contribute £455 billion to UK manufacturing over the next decade, potentially reversing the long-term trend towards reduced manufacturing employment. However, successful exploitation will depend on:

- **flexibility**, including the need to produce at high and low volumes while keeping costs low (particularly important given that new technology will lower the barriers to entry for smaller, newer manufacturers)

[54] Innovation South/ BEIS (2017), *Innovation South Science and Innovation Audit*
[55] Juan Mateos-Garcia, Hasan Bakhshi and Mark Lenel (2014), *A map of the UK games industry*, Nesta/ Ukie (https://media.nesta.org.uk/documents/map_uk_games_industry_wv.pdf)
[56] Ibid.
[57] HM Government (2017), *Made Smarter Review*, p.7

- **adaptability to changing workforce demands**, particularly the need to recruit people with more advanced digital skills
- data **accuracy, privacy and security**, an area in which manufacturing is seen as particularly vulnerable.

The sector in Swindon and Wiltshire

5.41 Swindon and Wiltshire has a substantial advanced manufacturing sector with strengths at the 'leading edge' of digital technology – particularly given the automotive sector's presence in Swindon (**Honda** and **BMW**).

5.42 **Dyson** maintains its main R&D campus at Malmesbury, which it plans to expand[58]. It recently announced a major investment in developing a new electric vehicle, with the core of the R&D work to take place at Malmesbury[59]. To support its future requirements for skilled staff, Dyson has established the **Dyson Institute of Engineering and Technology**, which offers 'immersive engineering' degrees accredited by the University of Warwick[60]. This represents a new approach to higher-level skills development, and has substantial advanced digital content: the first cohort of 33 undergraduates started in 2017.

5.43 Of specific relevance to digital technology, Swindon hosts **Intel**'s main UK base. The firm's 'core business' is in R&D, design and production and the Swindon base is largely a sales, marketing and general management centre. However, one of its **'Ignition Labs'** is based there, intended to support innovators in collaborating with Intel to develop new internet of things solutions. The Swindon Ignition Lab focuses on transportation (perhaps reflecting Swindon's automotive strengths), retail and smart cities[61].

5.44 Elsewhere, Swindon and Wiltshire has an established manufacturing sector, especially linked with the wider automotive sector (for example Cooper Tyre and DTR). While for some branches of the manufacturing sector, the immediate gains from the exploitation of IDTs may be less obvious than in some 'leading edge' sub-sectors, there will still be competitive advantage in the adoption of digitally-driven business processes and opportunities for prototyping and small scale production[62].

5.45 Associated with the wider engineering sector, **Zircon Software**, based in Trowbridge, develops operational software for the industrial, defence and transport (rail and highways) sectors, providing engineering systems for clients including Siemens, Network Rail and Cobham Aviation Systems[63]. **Callen-Lenz**, based in Salisbury, develops advanced control systems for use in aviation platforms, and also develops unmanned and autonomous aviation systems for military and civilian application[64]. Callen-Lenz offer consultancy, product development and R&D and operational support, illustrating the increasing overlap between

[58] Dyson (http://www.dysonmalmesbury.co.uk/PlanningApplication.aspx)
[59] *Financial Times* (14 February 2018), 'Dyson bets on electric cars to shake up industry' (https://www.ft.com/content/564aa742-0cac-11e8-8eb7-42f857ea9f09)
[60] Dyson (https://www.dysoninstitute.com/)
[61] Intel (https://www.intel.co.uk/content/www/uk/en/internet-of-things/iot-ignition-labs.html). Swindon is Intel's only UK Ignition Lab (there are eight worldwide).
[62] Interview (April 2018)
[63] Zircon Software (https://www.zirconsoftware.co.uk/our-clients/defence)
[64] Callen-Lenz Group (https://callenlenz.com/services/operations/)

definitions of manufacturing and services as advanced software accounts for an increasing share of product value and capability.

Business links and networks

5.46 While the digital sector is diverse, there are areas in which businesses have shared concerns and objectives, such as in ensuring a strong technical skills base (discussed further in the next chapter) and in responding to the common challenges associated with the process of business growth and scaling up. As the sub-sector analysis above demonstrates, there is also evidence of links between digital businesses emerging on an informal basis.

5.47 However, **the sector as a whole is poorly 'networked'**. In general, businesses consulted as part of this study expressed the view that there is no real 'digital cluster' in Swindon and Wiltshire, and that individual firms tend to be rather dispersed. In part, this is likely to be a function of geography. Wiltshire is polycentric and connectivity between the north and west and the south is weak. Swindon has significant urban scale (it is larger, for instance, than Bath or Oxford), but its digital businesses are distributed around the borough, rather than concentrated in the town centre, and the town tends not to act as a 'regional centre'.

5.48 However, there was interest from business consultees in developing a stronger network. Bristol Media was cited as an example of the type of structure to which Swindon and Wiltshire could aspire (and potentially link with):

Bristol Media

Bristol Media is an industry-led organisation, which aims *"to facilitate collaboration and growth within our region, delivering projects, events and opportunities for those working in the creative sector"*. Established in 2005, it currently has 600 members (with membership managed on a subscription basis), across the 'creative digital' sector, including marketing, animation and design. It is managed on a voluntary basis by business people active in the industry, and is constituted as a Community Interest Company.

Source: Bristol Media (https://www.bristolmedia.co.uk/about.php)

5.49 At the same time, there are opportunities to develop 'focal points' for the digital sector. In particular, Corsham contains a concentration of digital businesses (as set out in Section4) and contains business space geared to the sector at Hartham Park. To support the development of a 'digital cluster', work is underway to bring forward **Corsham Mansion House** to provide business incubation space for digital entrepreneurs, alongside teaching and event space[65]. In Swindon, the development of the **Carriage Works** provides a further opportunity to support a greater concentration of digital businesses at the core of the town. However, businesses highlighted the need for any new digital network to recognise Swindon and Wiltshire's complex and extensive geography.

[65] SWLEP (2018), *Corsham Mansion House: Outline Business Case* (https://swlep.co.uk/docs/default-source/programmes/local-growth-fund-lgf/outline-business-cases/corsham-mansion-house-outline-business-case-march-2018.pdf?sfvrsn=51151572_4)

Opportunities for inward investment

5.50 As the sub-sectoral analysis above highlights, there are several areas in which Swindon and Wiltshire has a growing digital business base. Some of these (such as digital marketing) are significant and appear to be driven by indigenous growth (i.e. the expansion of locally-based businesses), although access to external finance and markets is critical: for businesses such as these, building 'critical mass' within the SME base – for example, through the development of schemes such as the Carriage Works at Swindon – is likely to be central to future strategy.

5.51 However, some other sub-sectors are likely to offer potential for direct inward investment. Three stand out:

- first, **defence-related and cybersecurity**. Swindon and Wiltshire has significant assets in this area, particularly associated with the defence operations at Corsham and Porton Down, both of which have seen recent announcements of substantial new investment in advanced digital technology. There is also an infrastructure (via Ploughshare Innovations) to support commercialisation, and a local talent pool associated with defence-related activity, as well as proximity to both a significant university presence (especially at Oxford, Bristol and Bath) and the wider concentration of 'tech' businesses in the Thames Valley. Given good connectivity (particularly to Heathrow and London), Swindon and Wiltshire could be an attractive proposition for smaller cybersecurity businesses looking to set up operations in the UK. The recent work by TechSpark for Swindon Borough Council highlights the potential for an inward investment focus on this area, possibly associated with the development of a 'cyber security hub'[66].

- second, **'Industry 4.0'**. As indicated above, there is a significant presence in Swindon and Wiltshire of advanced manufacturing businesses, with some major 'leading edge' investments (for example, Dyson's commitment to developing a new electric vehicle at Malmesbury, and its current investment in specialist higher education provision). While Swindon and Wiltshire's manufacturing base is potentially vulnerable to global investment decisions (given a small number of relatively large employers and the extent to which the sector is internationalised, digitalisation will be a major driver of future growth, and there should be opportunities to attract investment in OEMs and the supply chain (with likely positive spin-offs in the promotion of digital adoption across the wider manufacturing base)

- finally, the broader **'service' sector**, particularly in areas such as financial services and telecommunications, where Swindon and Wiltshire offers cost advantages and existing business base within the context of a substantial industry presence in neighbouring sub-regions (notably, in the case of telecommunications, in the Thames Valley). It should be noted however that 'back office' operations are subject to substantial technology-driven competitive pressures.

5.52 More generally, during consultation on the Digital Capabilities Strategy, several business owners highlighted their previous experience of working in London, Bristol and other locations outside Swindon and Wiltshire: the 'driver behind investing locally was often cited

[66] Swindon Borough Council (2018), *Swindon and Wiltshire Digital Tech Inward Investment Report* (draft)

as a commitment to the area (for family or personal reasons and for 'quality of life', alongside ready access to wider markets. Business starts and expansions by people previously working outside the area are a form of inward investment, and perhaps one with potential for growth, particularly given forthcoming improvements in rail connections (from Swindon and North Wiltshire) and generally (although not universally) good digital connectivity.

Implications for the Digital Capabilities Strategy

5.53 This overview of Swindon and Wiltshire's digital business stock highlights three issues that are relevant for the development of the Digital Capabilities Strategy:

- first, **the sector is diverse and it is changing as technologies converge**. There are examples of successful businesses which have changed their business focus as technology and market opportunity have evolved. Among the sub-sectors, there are some in which current local activity appears to be very limited (such as games and interactive entertainment), and others where there is a stronger relevant asset base (such as cybersecurity). There are also examples of digital businesses that do not fit into any of the sub-sector categories identified above[67]. In a dynamic and diverse industry, a 'market-led' and open approach is appropriate, actively encouraging collaboration and networking, rather than an approach focused more narrowly on one or two specialisms

- second, **there is significant overlap between firms that could be described as 'digital' and the wider economy.** For example, Nationwide is a long-established mainstream provider of financial services and operates a 'traditional' branch model. But it has very substantial requirements for sophisticated digital technology, its business model is changing rapidly and – anecdotally – it has been important in generating a supply of people with technical skills who have subsequently established new businesses. In terms of future strategy, this suggests an opportunity to link digital SMEs and established firms in developing new solutions and a need to ensure a supply of advanced digital skills both to meet demand and drive 'adoption' within the wider economy. Section 6 considers this further.

- third, **there is an opportunity to build a stronger digital sector network**, and there appears to be interest from the business community in taking this forward, perhaps building on current initiatives to create physical 'hubs' for the sector.

[67] For example, Nautoguide, based in Swindon, provides web-based geospatial analytics, integrating a wide range of data with the Ordnance Survey product set. The firm is clearly 'digital' and clearly innovative – and its products have a wide range of applications, But it is difficult to categorise in sub-sectoral terms (Nautoguide, www.nautoguide.com, and interview, April 2018).

6. Digital skills and labour market insights

Introduction

6.1 Digital technology will drive new business and employment opportunities, both within the 'digital sector' and within the wider economy. However, skills shortages and gaps present a significant threat. This Section sets out an overview of some of the issues impacting on future skills supply and demand, drawn from published data and a series of consultations with businesses and skills providers. It is structured in four main sections, setting out:

- an overview of the 'digital skills challenge' and the national policy response
- the occupational profile and projected demand requirements within the digital sector, drawing on official data and analysis of job postings
- changing digital skills demand across the wider economy
- key issues associated with skills supply in Swindon and Wiltshire.

What do we mean by 'digital skills'?

6.2 The definition of 'digital skills' is problematic. The term covers a wide spectrum of capabilities, ranging from advanced 'digital authoring', through to the basic ability to access goods and services through digital channels. The latter is important in planning for public service transformation: a lack of digital literacy will limit 'channel shift'. However, for the purposes of the Digital Capabilities Strategy (and therefore for this analysis), we are primarily focused on digital skills as they apply in the labour market, with a particular focus on those higher-level skills which will help to drive and sustain new business growth and levels of technology adoption.

Context: The digital skills challenge

6.3 In 2016, the House of Commons Science and Technology Committee referred to a national 'digital skills crisis'[68]. A series of reports over the past few years have highlighted the challenges that the UK faces in developing the skills base that it needs to respond effectively, and have led to some significant policy responses:

- the Government-sponsored Wakeham and Shadbolt reviews both highlighted the **mismatch between significant reported high-level digital skills shortages alongside relatively high unemployment rates among STEM and computer science graduates** respectively[69]. These resulted in recommendations to increase collaboration between industry and higher education in digital curriculum design to

[68] House of Commons Science and Technology Committee (2016), *Digital Skills Crisis*, Second Report of Session 2016-17 (HC270)
[69] BIS (2016), *Shadbolt Review of Computer Sciences Degree Accreditation and Graduate Employability*; BIS (2016), *Wakeham Review of STEM Degree Provision and Graduate Employability*

improve graduate employability skills in the light of technological change and the wider demands of working in a multi-sector environment[70]

- recognising the need to develop the supply of higher level technical skills, the **Sainsbury Review of technical education** proposed a set of fundamental changes to FE to streamline and increase the status of courses and qualifications. The Review proposed 15 'technical education routes' (one of which is Digital, encompassing job roles such as IT business analyst/systems designer, programmer, software developer, IT technician, web designer and network administrator): these are currently being developed by Government to shape FE provision and apprenticeship design from Level 2 to Level 5 with 54 colleges now selected to deliver T Levels in subjects areas including 'digital' in the academic year 2020 to 2021[71]

- to develop a 'pipeline' of talent from school to employment, two main challenges need to be addressed:

  - first, **embedding digital technology within the school curriculum,** across all subjects and implementing the recent replacement of 'ICT' with the new computing curriculum. In this context, the challenge of recruiting sufficient qualified teachers is significant, especially given high market demand for people with relevant skills[72]

  - second, **ensuring that enough young people continue to pursue STEM subjects** in general (and computing in particular) through college or sixth form to take them into employment or into related higher education courses. The Department for Education's new Careers Strategy calls for greater engagement between schools and employers to increase young people's awareness of the skills that employers value and the job opportunities that will emerge when they are ready to enter the labour market

- within the existing workforce, at all levels and across all sectors there is a need to **improve digital skills within the existing workforce**. This has been especially highlighted as a challenge facing SMEs, given the difficulty that smaller firms often face in investing in new technology and developing the capacity to support workplace training[73]

- finally, cutting across all of these elements is the need to promote greater **equality of opportunity** and access to digital employment. In particular, the UK Digital Strategy places a significant emphasis on enabling a more diverse digital workforce, noting that just 17% of those who work in the tech sector and only 9.5% of students taking Computer Science A Level courses are female[74].

6.4 Alongside these policy responses, and following the publication of the UK Digital Strategy in 2017, the Government has established a **Digital Skills Partnership Board**, chaired by Phil Smith (the former CEO and Chair of Cisco in the UK and Ireland), and with ministerial

[70] House of Commons Science and Technology Committee (2016), *Digital Skills Crisis*, p. 19
[71] https://www.gov.uk/government/news/new-t-levels-mark-a-revolution-in-technical-education
[72] University Alliance/CaSE (2016), *Standing out from the IT crowd: How do we make Britain a world leader in digital skills?*
[73] Tinder Foundation and GoON.UK (2015), *The economic impact of basic digital skills and inclusion in the UK*
[74] DCMS (2017) *UK Digital Strategy*. See also Tech Advocates London (2017), *Diversity in Tech: A manifesto for London*

representation. The DSP is focused on improving the coherence of digital skills provision at national level, encouraging businesses and third sector organisations to be more 'digitally mature' and to increase their digital capability, and supporting teachers in gaining the knowledge and skills to teach the new computing curriculum effectively[75].

6.5 To support its work, the DSP is supporting the establishment of **Local Digital Skills Partnerships,** intended to *"identify digital skills needs, meet those needs in a targeted way and share best practice"*. Two Local DSPs have been established – in Lancashire and, more recently, Heart of the South West – with support from DCMS.

Lancashire Digital Skills Partnership

Lancashire's Local Digital Skills Partnership was launched with a Digital Skills Summit in April 2018. However, it has evolved from longer term work in developing the Lancashire Skills and Employment Strategic Framework, which contains a strong emphasis on digital skills as a priority for the Lancashire economy. The Framework identified a 'typology' of digital skills, set out as:

- ***Essential skills***, ensuring that Lancashire residents have essential online skills and the confidence to access digital technology to live and work well
- ***Intermediate skills,*** so that Lancashire employees have the right digital skills to enable Lancashire businesses to thrive
- ***Expert skills***, so that Lancashire businesses have access to skilled people to enable them to drive digital innovation and be at the forefront of Industry 4.0

The Partnership is still in its early days, although it has secured some 'early wins', with commitment from private sector partners to offer digital skills training. The Digital Skills Partnership is part of a wider suite of digital investments made by Lancashire LEP and is integrated with the existing Lancashire Skills Hub; potentially it provides a model to test ideas and promote better coordination from which other areas can learn.

Source: Lancashire Skills Hub (https://www.lancashireskillshub.co.uk/news/uks-first-digital-skills-partnership-launched-lancashire/); DCMS (https://digitalskillspartnership.blog.gov.uk/2018/06/06/guest-post-lancashire-enterprise-partnership-developing-the-first-local-digital-skills-partnership-local-dsp/)

Digital occupational and qualifications profile

6.6 Because of the challenges in defining the 'digital' sector, accurately identifying an occupational and qualifications profile can be challenging[76]. However, using the Working Futures dataset and taking the 'information technology' sector as an (imperfect) proxy, a number of key themes emerge:

- around **three-quarters of people working in the sector (both nationally and regionally) are employed in technical, managerial and professional occupations**. This compares with less than 45% of employees working in these occupations in the economy as a whole
- consistent with this, **workers in the sector are substantially better qualified than in the economy overall**. In Swindon and Wiltshire, 59% of information technology

[75] DCMS, Digital Skills Partnership (https://digitalskillspartnership.blog.gov.uk/2018/01/26/introducing-the-dsp-delivery-groups/)
[76] It is not possible, for example, to analyse occupational data within the Tech Nation defined 'digital tech' sector

workers are qualified to QCF Level 4 or higher, compared with 38% in the economy overall[77]

- looking to the growth of the sector, data from the *Working Futures* programme anticipate a **total requirement for some 5,000 new workers in information technology in Swindon and Wiltshire over the decade from 2014-24. Around 2,000 job openings over the period are accounted for by the expansion of the sector**, a particularly high ratio of expansion to replacement demand:

Table 6-1: Changing labour demand: selected sectors 2014-24 (thousands of workers)

Sector	2014	2024	Composition of demand, 2014-24			Expansion as % of total
			Expansion	Replacement	Total requirement	
Engineering	5	4	-1	2	0	0
Other manufacturing	23	25	2	8	10	20
Construction	23	27	4	9	13	31
Wholesale and retail	54	56	3	21	24	13
Transport and storage	15	15	0	6	6	0
Accommodation & food	28	33	6	13	18	33
Media	2	1	0	1	0	0
Information technology	**10**	**11**	**2**	**4**	**5**	**40**
Finance and insurance	18	18	0	7	7	0
Professional services	29	34	5	12	17	29
Support services	26	28	2	10	12	17
Public admin & defence	19	17	-2	7	5	0
Education	28	28	0	12	12	0
Health & social work	42	45	3	17	20	18
All industries	**363**	**386**	**24**	**145**	**168**	**17**

Source: UKCES/ Warwick Institute for Employment Research/ Cambridge Econometrics (2014), Working Futures 2014-24

Labour market demand in the digital sector: Vacancy data insights

6.7 Further insight into employment demand and skills requirements in the digital sector can be gained by looking at 'live' job vacancies. Table 6-2 sets out data relating to advertised job vacancies in the six months to July 2018 for all identified information technology job openings advertised on recruitment websites, alongside those directly relevant to the digital sub-sectors analysed in Section 5.

[77] QCF (Qualifications and Credit Framework) Level 4 is broadly equivalent to HNC or Foundation Degree level. The QCF has been replaced by the Regulated Qualifications Framework in England, but QCF levels are still used within the latest Working Futures data.

6.8 It should be noted that these data are subject to significant caveats: not all job vacancies are openly advertised, the information that adverts contain will obviously be inconsistent and (in the digital sector especially) freelancing and self-employment is an increasingly common alternative to paid employee work. Nevertheless, vacancy data allow us to drill down into sectors that are not visible in official statistics, and they provide some insight into the specific type of skills and qualifications that employers are looking for.

6.9 Job vacancy data in the six months to July 2018 shows that:

- there were **1,715 permanent IT vacancies** advertised in Swindon and Wiltshire (of which 819 – around 48%) were advertised in Swindon)
- **average advertised salaries are relatively high**. The median advertised salary for IT jobs requiring 'generic IT skills' was £43,125 in Swindon and Wiltshire, compared with £42,500 across the South West (and £51,000 across England – although national median salary levels are skewed upwards by London)
- there appears to be quite a lot of **consistency in the skills required across different specialisms**, at least at the more 'generic' level.

Table 6-2: Jobs vacancy data, Swindon and Wiltshire (6 months to July 2018)[78]

	Permanent jobs advertised		Median annual salary	Top requirements referenced
	Number	as % of all permanent IT jobs		
Telecoms	44	2.57	£43,000	Security clearance, finance, electronics, SAP, business intelligence
Digital marketing	43	2.51	£40,000	Business intelligence, electronics, finance, prog mgt, SAP
Fintech	23	1.34	£45,000	SaaS, Agile, HTML, PHP, MySQL, CSS
Cybersecurity	17	1.00	£56,000	Security clearance, VMWare, ITIL, SQL, SharePoint
Digital health	2	0.12	£35,700	Oracle, ITIL, Unix, Solaris,Linux, SLA
Games and digital entertainment	1	0.05	£43,000	Agile, C#, JavaScript, TDD, .NET, SQL, MVC, HTML
Manufacturing	80	4.66	£47,500	Microsoft, electronics, Cisco, ITIL, telecoms, prog mgt, marketing
All IT jobs	1,715	-	£43,125	-

Source: IT Jobs Watch

6.10 Across all 1,715 job vacancies, most job roles and skill requirements are generic (e.g. 'developer', 'Microsoft'), with common requirements for problem solving and analytical skills.

[78] Data is derived from IT Jobs Watch (www.itjobswatch.co.uk), which aggregates real-time job vacancy data. Data are presented by job role, rather than by sector and are based on key words (so are therefore not mutually exclusive).

Future digital skills and routes to access

6.11 Looking more broadly at the skill areas that are likely to grow as a result of digitisation over the longer term, the former UK Commission for Employment and Skills published a series of sector-focused skills assessments. These included assessments for the digital industries, media and ICT. These are now several years old and precede significant technological advances, but they do outline some of the skills that are required and the conventional entry routes into the labour market. In particular, they highlight:

- The importance of **internal recruitment and upskilling** within the existing workforce, even to fill roles in highly specialised areas of expertise. The transformational nature of digitisation mean that most employees will need to upskill to some extent; in areas of rapid growth and high specialisation (such as cyber security), demand is likely to outstrip the supply of new entrants to the labour market. Further national and international research has also highlighted the extent to which firms engage in 'workarounds' to compensate for difficulties in hiring skilled staff through conventional routes. This includes, for example, opening 'satellite' offices in locations where there is a pool of talent, outsourcing digital functions and potentially acquiring existing firms with digital capabilities[79].

- The importance of **non-technical skills, especially in more senior roles**. The brief review of skills demands in key technology areas highlights two aspects of this. First, *analytical* and *risk management* skills which go beyond technical knowledge. Second, *stakeholder management* and *business relationship* skills, which are vital in managing the interface between technical development, product design and customer service.

Table 6-3: Selected sub-sector skills and entry routes

Sub-sector	Key skill demands	Sub-sector entry routes
Cyber security	Technical knowledge, understanding of security issues, analytical skills, risk analysis, risk management	Internal recruitment and recruitment from general IT roles; apprenticeships as a pathway to higher skilled roles
Mobile technologies	Agile techniques, account management, ability to interact between technical specialists, design teams and customers.	Upskilling existing staff; recruitment based on experience
Cloud computing	Technical skills, security, networking, visualisation and big data analytics. At higher level, risk management and business stakeholder management (bridging the gap between IT and wider operations)	Competition for high level IT skills often means reliance on contractors and consultants while staff are upskilled
Games and visual effects	Highly specialised technical and artistic skills	Internationalised labour market – worldwide recruitment

Source: UKCES (2012), ICT sector skills assessment; UKCES (2012), Creative media and entertainment skills assessment; UKCES (2013), Technology and skills in the digital industries

[79] Economist Intelligence Unit (2016), *The Quest for Digital Skills: A multi-industry executive survey*, p. 4

Demand for digital occupations and skills in 'non-digital' industries

6.12 Increasingly, more sophisticated applications of digital technology become embedded within jobs that have not historically been regarded as specialist IT occupations. Table 6-4 sets out likely areas of increased demand for digital skills:

Table 6-4: Changing digital skills demands in selected 'non-digital' sectors

Sector	Changing digital skills requirement
Manufacturing	• Internationally, manufacturers' greatest skills gap is in big data, largely as a response to Industry 4.0 and the convergence of physical and digital manufacturing • Because there is often an imbalance between established manufacturing *production* locations and concentrations of digital workers, there is a tendency for manufacturers to establish satellite offices in 'digital hotspots' to attract talent and to outsource work to specialist design companies. • Future skills demand include proficiency in design packages and specialist software among production engineers (with skills gaps partly addressed through apprenticeships) and software development
Logistics	• In the short term, job roles and the knowledge and skills required in the sector "are anticipated to evolve, rather than undergo a radical switch as a consequence of technology" (UKCES), with a general need for greater IT skills at lower skill levels as operations switch to the use of mobile technologies • More specialised skill demands are likely in intelligent transport systems, such as vehicle tracking and tracing; and in the analysis of automated data collection and real-time performance reporting
Financial and professional services	• The financial services sector is likely to experience job losses due to automation, both in lower-skilled jobs (data entry and processing) and medium-skilled occupations (e.g. credit and risk analysis) • However, recent years have seen rapid growth in new areas of digital competence: some 90% of financial services firms surveyed in a recent poll cited 'moderate' or 'severe' digital skills shortages, with particular demand in: ➢ cyber security ➢ analytics and big data (closely linked with security, as data volumes and regulatory requirements relating to data management and processing increase) ➢ web and mobile development.
Health and social care	• The sector overall is growing rapidly, but is subject to significant cost pressures. • At operational level, there is likely to be a need to upskill staff to deal with and advise clients on the operation of new digitally-enabled medical devices and measures to increase self-management • As in the financial and professional services sector, the greatly increased volume of (often sensitive) data will lead to increased data analytics and security capacity
Retail	• The sector is experiencing disruption through the growth of online retailing, and recognises a significant digital skills gap. However, the industry is often perceived as unattractive for those looking to develop technology-focused careers • Upskilling of existing staff, especially older workers, will be important in responding to the increasing sophistication of technology • Nationally, requirements have been identified for additional Level 4 provision in relation to multi-channel retailing, data analytics and management

Sources: Economist Intelligence Unit (2016), The Quest for Digital Skills: A multi-industry executive survey; UKCES (2015), Sector insights: Skills and performance in the retail sector; UKCES (2015), Sector insights: Skills and performance in the advanced manufacturing sector; UKCES (2014), Understanding skills and performance challenges in the logistics sector; UKCES (2015), Sector insights: Skills and performance in the health and social care sector

Further and higher education supply

Higher education

6.13 Securing additional higher education capacity in Swindon is a priority for local partners: currently, there is no university presence in the town: a significant absence, given Swindon's size. However, Swindon and Wiltshire is in close proximity to several universities with strong capabilities in relation to advanced digital technologies. These include the **University of Bath**, which is leading the national **Institute of Coding** consortium, which has been established with Government funding to offer an 'industry-led' curriculum delivering undergraduate, masters and short courses in areas (such as cybersecurity) seen as skills priorities for the UK)[80]. **Bath Spa University, University of the West of England**, **University of Bristol**, **Oxford University, Oxford Brookes University** and the **University of Gloucestershire** are also relatively close by, offering a concentration of (often world class) research-intensive and applied higher education. In consultation, businesses reported that the universities along the wider M4 corridor provided a pool of talent from which they recruit.

6.14 Despite the lack of 'general' higher education provision in Swindon and Wiltshire, there are two specialist (and unique) HE facilities in the area:

- first, the **Dyson Institute of Science and Technology** at Malmesbury (referred to in para. 5.42) is an example of a large business investing directly in its own skills development, offering degrees in partnership with the University of Warwick as part of an integrated employment/ education offer). Given the widely-reported shortfalls in advanced digital and engineering skills, and the increasing costs to learners of university education, this may be a model that is replicated elsewhere, providing greater certainty to employers and learners alike
- second, Shrivenham near Swindon hosts the **UK Defence Academy**, a secure military site run in partnership with Cranfield University. Cranfield is a leading research institution in digital technologies, alongside management and leadership, and the Defence Academy forms part of Swindon and Wiltshire's wider base of advanced military technology assets (including MoD Corsham and Porton Down).

Further education

6.15 Further education in Swindon and Wiltshire is offered by three main providers, all of which have a computing and digital technology offer:

- **Swindon College,** which offers courses in business, computing and finance; media and production; automotive; and engineering and electrical, all of which have digital technology components. Swindon College also has around 500 higher education

[80] University of Bath (http://www.bath.ac.uk/research/news/2018/01/25/institute-of-coding-established/)

students via courses validated by a variety of partners, including Oxford Brookes University

- **New College Swindon** offers computing and media as part of its course offer. Linked with its 14-19 offer, it has become a participant in the **'Digital Schoolhouse'** initiative, linking with primary schools to deliver a more innovative digital curriculum offer. At the other end of the skills spectrum, the College has also announced a new Foundation Degree in Cybersecurity (delivered in partnership with the University of Gloucestershire), with the first cohort starting in September 2018[81].

- **Wiltshire College** operates from seven sites across the county (with the main locations at Trowbridge, Salisbury, Chippenham and Lackham). The course offer includes a range of subjects with 'advanced digital' elements, including motorsport engineering, life sciences and agritech, as well as media and creative, computing and information technology. The current expansion of the Salisbury and Lackham campuses (funded through the Local Growth Fund) will provide additional capacity in life sciences and agritech respectively[82]. The College also recently announced a new partnership through which higher education courses (including in computing and motorsport engineering) will be validated by Oxford Brookes.

6.16 Bringing together further and higher education, a current priority is the development of a new **Institute of Technology**, specifically focused on bridging the gap in STEM skills:

A new opportunity for advanced technical education: Swindon Institute of Technology

Following the Government's announcement in 2016 that new funding will be made available to establish new Institutes of Technology, Swindon College, with Swindon and Wiltshire LEP, Oxford Brookes University and the University of Gloucestershire, has progressed a proposal for an IoT designed to offer new higher and further level provision in STEM skills. The bid has been supported by a number of digital employers, including Excalibur and Nationwide, as well as by Swindon's advanced manufacturing base.

In May 2018, the Government announced that the Swindon IoT proposal is one of 16 nationally (and one of three in the South West) to progress to the next stage of consideration.

Source: TES, May 2018 (https://www.tes.com/news/shortlisted-institute-technology-proposals-unveiled); Business West (https://www.businesswest.co.uk/blog/institute-technology-cards-swindon)

Digital skills supply and demand issues in Swindon and Wiltshire: Insights from stakeholder consultation

6.17 At national level, the digital skills landscape can be summarised as follows:

- employment in the digital sector is associated with high level skills.

- growth in employment in the digital sector is forecast to outstrip growth in any other sector over the next few years

[81] New College Swindon (http://www.newcollege.ac.uk/learn-with-us/degree-level-and-access/new-foundation-degrees-for-sept-2018)
[82] Wiltshire College (https://www.wiltshire.ac.uk/aboutus/campuses/salisbury)

- high level digital skills are needed to drive digital innovation – but there is a partial disconnect between the skills that graduates have those that employers want
- FE provision is being closer aligned to the needs of employers and employment through structural interventions but still has a long time to effect reform
- to build a pipeline of talent, embedding digital learning in the school curriculum is a priority, as is…
- … better careers education, information advice and guidance for young people
- technological change is rapid and those already in the workforce will need to adapt existing skills and learn new ones
- every industrial sector will be affected by new digital technologies.

6.18 The consultation process across Swindon and Wiltshire recognised these trends and changes. Throughout discussions with consultees (including businesses and skills providers), three key factors shaped the discussion of skills issues:

- the *geography* of Swindon and Wiltshire
- the *ease of recruitment* by digital businesses and to digital roles
- *connections* between employers and education providers.

The geography of Swindon and Wiltshire

6.19 Consultees emphasised Swindon and Wiltshire's relationship to its neighbours and its proximity to London and the South East, as well as the labour market distinctions between Swindon and Wiltshire.

6.20 Table 6-5: below provides a summary of this difference from a skills perspective drawn from the Area Review[83].

Table 6-5: Key Demographic Data

	Swindon	Wiltshire	Great Britain
Total population (2015)	217,200	48,6100	6,3258,400
Population aged 16-64	64.5	60.6	63.3
% of 16 – 64 with HE qualifications	28.8%	37.4%	37.1%
% formally qualified to Level 2	68.9%	78.1%	73.6%
Gross weekly pay of residents (£)	551.6	522.3	541.0
% of main benefit claimants	7.1%	5.5%	8.6%

Source: DfE Local Area Review

6.21 Swindon was described as a "city in all but name", with a large population concentrated in an urban area with a heritage of large industrial manufacturing. Its workforce skills base is relatively low, and this has been frequently cited in strategy. While it has good further

[83] Department for Education (August 2017) Gloucestershire, Swindon and Wiltshire Area Review. Final Report.

education provision, and its schools are improving, they are still underperforming and GCSE results are comparatively low[84]. Swindon also has a stock of large employers, some of them either technology companies or companies with significant demand for digital skills.

6.22 Wiltshire, on the other hand, was described as very rural with a large number of micro and small businesses, including a range of technology companies, employing highly skilled individuals. The population in Wiltshire was characterised as being older, more affluent and more highly skilled compared with the younger, relatively less qualified population in Swindon.

6.23 The geography of the area also affects the ability of young people, to travel and access different learning opportunities beyond GCSE. This is a factor affecting colleges' ability to specialise because they need to know that they will attract sufficient numbers to specialist courses: some are considering the viability of establishing their own bus services to address this.

Ease of recruitment

6.24 The second theme that emerged from consultation relates to employers' ability to recruit to digital roles. On the whole, **there were no clear reports of systemic skills recruitment shortages or endemic recruitment difficulties**, despite the widely-reported evidence of a 'crisis' in digital skills at national level. College graduates were reported as securing jobs, and employers were either not recruiting or were finding the skills they need. In some cases, employers reported a need to recruit nationally, although this appears to have met with mixed success: several digital employers reported that they had had greater success in recruiting locally (especially for staff at the early stages of their careers) and investing in staff development.

[84] http://www.bbc.co.uk/news/uk-england-wiltshire-42342967

Higher Futures

To support businesses in tackling skills shortages, Swindon and Wiltshire LEP sponsors Higher Futures, a skills service which assists local businesses in identifying their skills gaps, understanding the local skills offer and how it can be accessed and making links with local schools and colleges. Through its advisory service, Higher Futures assisted Zircon, an engineering software company based in Trowbridge, in recruiting its first Degree Apprenticeships, enabling recent graduates to add to their computing knowledge gained at university with practical project development experience within a digital business.

Source: Higher Futures

6.25 There was a clear acknowledgement of the rapid pace of technological change, and a need to ensure that young people are equipped with the right skills *and* that businesses have the ability to take advantage of new opportunities. This was associated with business leadership and management skills.

Links between employers and providers

6.26 The third theme to arise from the discussions was the extent of **links between employers and education providers** and strong interest from both the 'demand' and 'supply' sides in making the skills and education system work for the area's businesses and young people.

6.27 Examples of recent engagement include the Corsham Institute's Thought Leadership Programme[85], the recent workshops and seminars held as part of the preparation of the area's bid for an Institute of Technology[86]; discussions about HE partnerships and the potential for a greater HE presence in Swindon and Wiltshire, and the more regular interaction between employers and training providers as part of their engagement in work placements, internships, career guidance and apprenticeships. It was noted that there are key strengths in the area to link employers with providers:

- some colleges have long established links with employers to offer work placements or work-based learning experiences including major companies and the military
- there is an **Enterprise Adviser Network** hosted through the local authorities and supported by the LEP that is working with almost all schools and colleges in Swindon and Wiltshire to support effective encounters between schools and employers
- there are examples of very **effective apprenticeship provision** in the area although the last year has seen a drop in the number of apprenticeships being offered by employers in the IT and digital sectors
- specialist training providers are providing **training into companies on aspects of up-skilling and re-skilling**. This includes training in digitally related skills entirely delivered commercially by the private sector, reflecting quite high levels of demand for re-training and up-skilling from workers already in the labour market, as well as from employers.

[85] Grand-Clement, Sarah (2017) Digital Learning: Education and skills in the digital age. Corsham Institute, Rand Europe and St George's House.
[86] Swindon College's bid has recently (June 2018) been shortlisted as one of sixteen by the Government. https://www.gov.uk/government/publications/institutes-of-technology-competition

6.28 However, consultees also noted some drawbacks:

- **SMEs find it difficult to find time** to engage with skills providers
- **engagement models are not always appropriate** (for example many IT companies are micro-businesses working out of domestic settings and are therefore inappropriate hosts for work placement students)
- businesses reported that while they had been successful in recruiting the 'right' staff locally – often direct from colleges and/ or as the result of positive work experience placements – **access to providers was often uncoordinated and difficult to navigate**. In some cases, businesses could be valuable 'ambassadors' for both industry opportunities and for the skills system, if better engagement mechanisms could be developed
- **technology moves faster than the curriculum content of accredited qualifications**. This means that people with recently acquired qualifications may still need additional learning or top-up courses to enhance their employability and effectiveness in the workforce.

6.29 Finally, while the wider region has a strong university presence (including the University of Bath, which is leading on a major multi-provider national Institute of Coding), there is no university located in the LEP area. Securing a higher education presence is a high priority for the LEP and its partners, although there is however some university provision in the area including for example Applied Computing at Wiltshire College and the HND in Computing at Swindon College.

Implications for the Digital Capabilities Strategy

6.30 Analysis of the digital skills landscape in Swindon and Wiltshire suggests several implications for the Digital Capabilities Strategy:

- **advanced digital skills will be increasingly important across the board**. While the digital sector may be in the vanguard of demand, the need for higher technical skills will be important for the whole economy
- **the need for new skills will not be entirely satisfied within the current skills system.** While employers are generally able to recruit, there is a widespread recognition that the pace of technological change means that 'learning by doing' in the workplace is important. Increasingly, existing employees will need to upskill as well. At the same time, given that the digital sector is largely made up of small and micro businesses, and remains relatively young, additional management skills are likely to be important as firms scale up
- **better connectivity between providers and business could yield some 'quick wins'.** Both providers and employers expressed a strong willingness to work more closely together, as well as an understanding of why this doesn't always happen in reality (due to time pressures, funding priorities, and so on). There are likely to be some strong ambassadors for (for example) better coordinated work experience, and

this is something that could be developed, perhaps building on the success of Higher Futures

- **additional higher education capacity is a priority, but in the shorter term, there are opportunities to work closely with institutions in the wider region.** University provision in the hinterland is good, and very relevant (via, for instance, University of Bath, UWE and Oxford Brookes) to the digital industries. As it progresses to the next round in its bid for Government support, the proposed Institute of Technology could be a key focus for this.

7. Digital infrastructure provision

Introduction

7.1 Swindon and Wiltshire's ability to take advantage of the opportunities presented by digital technology will depend on the quality of its digital infrastructure. This section maps broadband and mobile coverage across the area, drawing comparisons with other locations in the South of England. A full series of charts is attached as Annex C.

7.2 Overall, digital infrastructure in Swindon and Wiltshire is good compared with similar locations in the UK, and it is improving. However, this should be seen is in a global context in which while the UK has relatively high levels of broadband penetration, the infrastructure approaches taken by different countries vary substantially, and the extent of fibre provision direct to the premises is greater in most other European countries[87].

Fixed broadband infrastructure

7.3 Nationally, broadband coverage has continued to improve. According to Ofcom, 'superfast' broadband (30 Mbps and above) is available to 91% of premises. Figure 7-1 gives an indication of the practical applications of different speeds:

Table 7-1: What you can do with different broadband speeds

	Download speed		
	Ultrafast (300 Mbps)	**Superfast (30 Mbps)**	**10 Mbps**
Streaming music	Yes	Yes	Yes
Downloading an album	< 10 secs	30-60 secs	1-2 min
Streaming an HD film	Yes	Yes	Yes
Downloading an HD film	< 5 min	30 min	60-90 min
Streaming an ultra HD film	Yes	Yes	No
Downloading an ultra HD film	< 15 min	90 min – 2 hrs	5 hrs

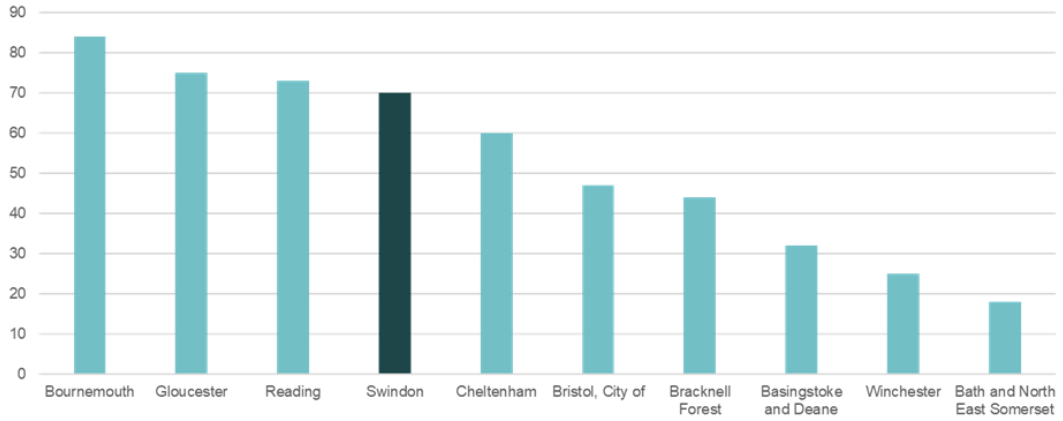
Source: Ofcom (2017),Connected Nations, p.1

Ultrafast

7.4 Around 70% of premises in Swindon benefit from access to ultrafast broadband of 300 Mbps or greater, partly driven by the rollout of the Gfast network. While behind the almost-universal rollout of ultrafast in Bournemouth, availability in Swindon is favourable compared with near neighbours such as Bristol and Cheltenham:

[87] OECD, Broadband Portal (http://www.oecd.org/sti/broadband/broadband-statistics/)

Figure 7-1: % of premises with access to ultrafast (over 300 Mbps): Swindon and comparators



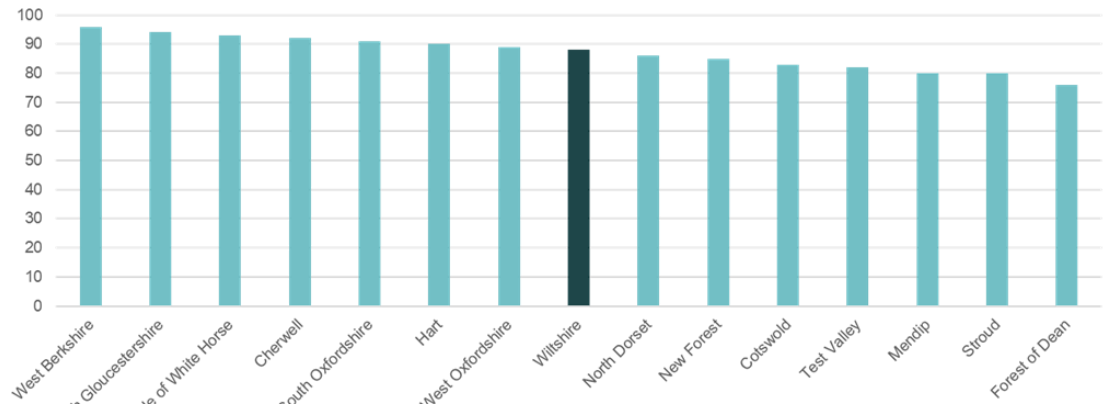
Source: Ofcom (2017)

7.5 In Wiltshire, ultrafast penetration is much lower. In contrast to neighbouring areas like West Berkshire and Vale of White Horse, there has been no major rollout.

Superfast

7.6 Almost 90% of premises in Swindon and Wiltshire have access to superfast broadband of 30 Mbps and above, following the rollout of the BDUK-funded Superfast Swindon and Wiltshire Online programmes. While businesses reported local connectivity challenges (including in some urban locations), superfast broadband availability is good, particularly given the area's dispersed settlement structure:

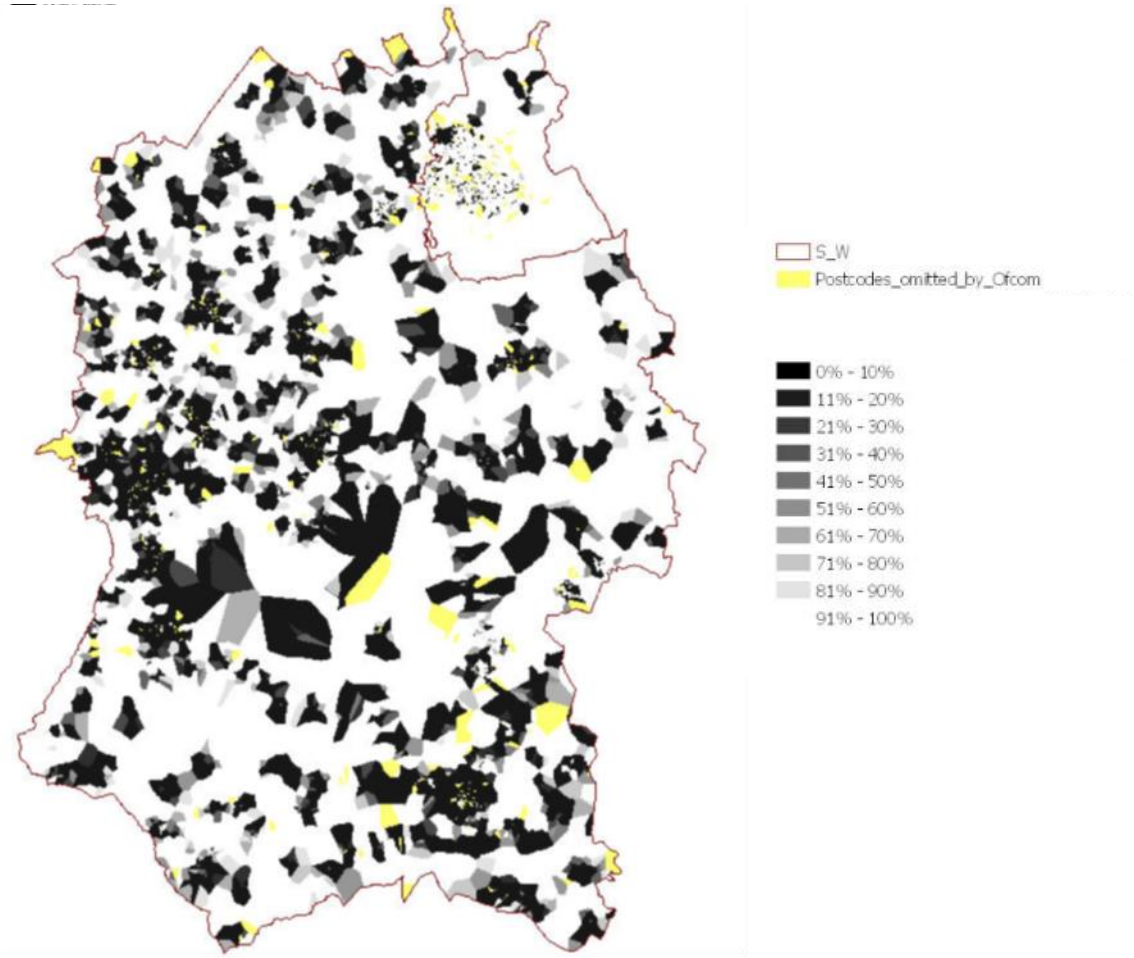
Figure 7-2: % of premises with access to superfast (over 30 Mbps): Wiltshire and comparators



Source: Ofcom (2017)

7.7 However, in consultation, businesses highlighted rising demand for bandwidth, noting that while there may be capacity to accommodate current levels of usage, this is likely to be insufficient as new applications are developed. Average data usage in Swindon is high relative to that of the comparator areas shown above, potentially fuelling demand for future ultrafast (and faster) services.

Figure 7-3: Coverage of superfast broadband (30 Mbps and above)



Source: Ofcom (2017) Produced by SQW 2018. Licence 100030994, Contains OS data © Crown copyright [and database right] [2017]

Mobile coverage

7.8 Expectations of mobile services are changing, with the widespread use of smartphones and tablets and the increasing reliance on high quality data services.

7.9 Almost all of the land area of Swindon and Wiltshire is covered by at least one mobile operator, on both 4G and 2G signals. 90% of Swindon and 67% of Wiltshire is covered by all four operators[88]. Coverage overall is broadly comparable with the rest of the South, although Ofcom's *Connected Nations* report notes that as motorists rely on connectivity for a variety of services, there is a need to improve coverage (and signal strength) on roads.

Implications for the Digital Capabilities Strategy

7.10 Swindon and Wiltshire's generally good digital infrastructure should be an important asset in marketing the area to investors: Swindon's infrastructure is particularly good. However, there is a need to improve mobile connectivity across the area, and while broadband provision is currently good, demand continues to rise rapidly.

[88] Ofcom (2017)

8. Opportunities associated with the 'smart cities' agenda

Introduction

8.1 In recent years, the concept of the 'smart city' has gained increasing traction, as places have sought to use new technology to address public service challenges in areas such as transport, health and social care, while also stimulating the market for new digital solutions.

8.2 This section explores what the smart city concept means, and what it *could* mean for Swindon and Wiltshire. It considers a number of examples of smart city programmes from elsewhere in the UK, noting the range of approaches that different places have taken.

What do we mean by 'smart cities'?

8.3 The 'smart cities' agenda forms part of the Information Economy theme of the Government's Industrial Strategy. The smart cities agenda is built around the use of technology to develop a more personalised relationship between citizens and service providers. In a background paper published by the (then) Department for Business, Innovation and Skills, the concept of a smart city is defined as using the Web to *"enable and encourage the citizen to become a more active and participative member of the community, for example, providing feedback on the quality of services or the state of roads and the built environment, [or] adopting a more sustainable and healthy lifestyle"*.[89] A smart city *"brings together hard infrastructure, social capital including local skills and community institutions, and (digital) technologies to fuel sustainable economic development and provide an attractive environment for all"*.[90]

8.4 As well as the availability of technology to support new solutions, the concept is also driven by a need to meet a number of long-term challenges, such as pressure to reduce emissions, better management of resource consumption and growing economic, financial, and environmental pressures. [91]

8.5 At the same time, the 'smart city' is supposed to bring economic benefits, for example by providing a 'testbed' for new technologies which can be exploited commercially and – more indirectly – by attracting talent to the city and encouraging regeneration.[92]

Recent developments in the UK

8.6 The smart cities agenda is gaining momentum in the UK, and a recent report highlights 20 cities in the UK that are leading the way as smart cities. These cities have programmes in areas as diverse as digital innovation, social care, urban mobility, energy, education, and

[89] Department for Business, Innovation and Skills, 'Smart Cities: Background paper, October 2013: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/246019/bis-13-1209-smart-cities-background-paper-digital.pdf pg.7. [Accessed 25.6.18].
[90] Ibid, pg.7. [Accessed 25.6.18].
[91] Huawei & Navigant, 'UK Smart Cities Index 2017', October 2017: http://e.huawei.com/uk/marketing-material/onLineView?MaterialID={A81CFA81-C7A8-4E8F-A088-963C7E73F3CC} pg.16. [Accessed 25.6.18].
[92] Ibid, pg.13. [Accessed 25.6.18].

sustainability.[93] In Huawei's UK Smart Cities Index 2017, Bristol and London are considered to be 'leaders' in their smart city execution and strategy, with Manchester, Leeds, Birmingham and Milton Keynes the best performing 'contenders'.[94]

8.7 As the name suggests, the smart city concept has been urban-focused to date. However, there are examples of the agenda being exploited across a wider rural/ urban footprint: an example of this is a recent collaboration between Essex County Council and Hertfordshire County Council, announced in March 2018, who are, in partnership with the technology firm Telensa, piloting new smart city services, including gully monitoring, highway wind monitoring, traffic monitoring and analytics, waste bin monitoring and air quality monitoring.[95]

8.8 A number of initiatives are also underway at national level to support the agenda. In June 2018, the Government announced that Innovate UK has offered £8 million to 13 businesses developing innovative solutions for the UK's urban infrastructure, energy and transport challenges. The loan will be used to help the innovative companies scale up and commercialise new technologies.[96] In addition to this, the Future Cities Catapult brings together businesses, universities and city leaders to encourage them to collaborate and find solutions to the problems that cities face. Their mission is "to advance urban innovation, to grow UK companies [and] to make cities better" and this involves providing opportunities for collaboration, testing new ideas and developing new products, services and business models.[97]

Case Studies

A.1 Several places have developed smart city programmes. The following paragraphs look at some of those that are most relevant to Swindon and Wiltshire, considering Milton Keynes, Bristol, Exeter, Bournemouth and Reading.

Milton Keynes

8.9 Milton Keynes is seen as a 'leader' in the smart city concept, according to Huawei's recent report. At the core of this is the **MK:Smart** project, which has received some £16m over three years (an £8m grant from the Higher Education Funding Council for England's (HEFCE) Catalyst Fund, match-funded by the Open University, Milton Keynes Council, BT and a number of technology partners).

8.10 Central to the project is the creation of a state-of-the-art **'MK Data Hub'** which supports the acquisition and management of vast amounts of data relevant to city systems from a variety of data sources. These include local and national open data, data streams from key infrastructure networks (energy, transport, water) and other relevant sensor networks (e.g. weather and pollution data), data acquired through satellite technology, social and economic

[93] Huawei & Navigant, 'UK Smart Cities Index 2017', October 2017: http://e.huawei.com/uk/marketing-material/onLineView?MaterialID={A81CFA81-C7A8-4E8F-A088-963C7E73F3CC} pg.4. [Accessed 25.6.18].
[94] Ibid, pg.4. [Accessed 25.6.18].
[95] Telensa, 'Essex and Hertfordshire County Coucils work together to pilot UK innovation in smart city service', March 6th 2018: https://www.telensa.com/news/essex-hertfordshire-county-councils-work-together-pilot-uk-innovation-smart-city-services [Accessed 28.6.18].
[96] Gov,uk, 'First innovation loans offered to businesses improving smart cities and transport', June 25th 2018: https://www.gov.uk/government/news/first-innovation-loans-offered-to-businesses-improving-smart-cities-and-transport [Accessed 26.6.18].
[97] Future Cities Catapult, About: https://futurecities.catapult.org.uk/about/ [Accessed 28.6.18].

datasets, and crowdsourced data from social media or specialised apps. Having been restricted for some time while in development, the MK Data Hub was launched to the public in June 2016.[98]

8.11 The MK Data Hub has enabled the development of **MK Insight**, a portal that provides quick access to information about Milton Keynes, and which aims to be a one-stop-shop for sharing documents, information and data.[99] MK:Smart also states that a number of SMEs are also pioneering application development on the Data Hub, creating solutions in various domains, including education, healthcare and even a community radio.[100]

8.12 Another key focus for MK:Smart is transport and urban mobility. The Milton Keynes Futures 2050 Commission Report outlines the need for the development of a citywide travel integration system. Within this context, MK:Smart is promoting the concept of Cloud-Enabled Mobility through the development of the MotionMap app. The new app provides city wide information and travel integration systems which is intended to reduce congestion and influence travel decisions.[101]

8.13 In addition to these technical solutions, MK:Smart also comprises ambitious education, business and community engagement activities, including:

- The **Innovation and Incubation Centre (IIC) at University Campus Milton Keynes (UCMK)** provides training in data-driven business innovation and the digital economy, as well as hands-on support for business development, demonstration facilities, and an incubation space.
- MK Smart teamed up with several Milton Keynes schools to deliver the **Urban Data School** - an initiative to bring data literacy education to primary and secondary schools. The **Urban Startup Lab** also provides training programmes that cover digital technologies and business innovation, in partnership with the corporate information advisory service Fronesys.[102]
- The **Our MK** project MK:Smart to engage with citizens and find out their suggestions for addressing sustainability issues in their local community. Our MK has supported and funded 13 projects, run by citizens. Successes to date include the MK Food Passport scheme.[103]
- The Data Hub has also been used to support the **Ground Resistance** arts installation. Created by artists Wesley Goatley and Georgina Voss, the Ground Resistance arts installation was presented at the Milton Keynes International festival in July 2016. This installation used visual and audio representations to focus on the concept of the 'smart city' and what Milton Keynes looks like when seen through the data that it is generating

[98] http://www.mksmart.org/about/ [assessed 26.06.2018]
[99] http://mkinsight.org/about-us/ [accessed 03.07.2018]
[100] MK: Smart Brochure, http://www.mksmart.org/wp-content/uploads/2017/07/MKSmart-brochureFINAL.pdf [accessed 03.07.2018]
[101] Milton Keynes Futures 2050 Commission, Summary, p.12
[102] http://www.mksmart.org/education/ [accessed 03.07.2018]
[103] https://www.spacehive.com/movement/ourmk/about#top-tips-for-a-successful-crowdfunding-campaign [accessed 03.07.2018]

8.14 An evaluation of MK: Smart is underway. A team of researchers from the Open University will study the impact and engagement of the Smart Cities agenda in Milton Keynes. The OU's two-year project, which started in January 2017, has been given funding by the Economic & Social Research Council (ESRC). It will examine what kinds of users, citizens and consumers are likely to be embraced by the smart policies, technologies and vision.[104]

Bristol

8.15 Bristol has "overtaken London as the UK's leading smart city" according to the second UK Smart Cities Index. Central to Bristol's activity is **Bristol Is Open,** a joint venture between the University of Bristol and Bristol City Council. It is funded by the local, national and European governments, with academic research funding, and by the private sector. The project launched in April 2015 and aims to create the world's first "open programmable city" that will support the creation of new smart services.[105]

8.16 At the core of the project is an open network that provides a platform for multiple city applications. The project integrates three networks through software controls: fibre in the ground, a wireless network along the Brunel Mile area of Bristol with Wi-Fi, 3G, 4G, LTE, and 5G experiments, and a radio frequency mesh network deployed on 2,000 of the city's lampposts. This platform is intended to enable companies to test new technologies in a real-world environment, with the networks are expected to be extended out to the wider West of England city region over the next three years.[106]

8.17 Applications of the network include:

- the **Bristol Data Dome**, which is used for complex data visualisation and housed inside At-Bristol Science Centre's Planetarium. The 98-seat Bristol Data Dome is the UK's only stereo 3D hemispherical screen with 4K resolution. It is connected to the rest of the city by a 30Gb/s fibre link and high-performance computer hosted in the University of Bristol's Faculty of Engineering.[107]

- the **IoT Mesh network,** a project aimed at extending connectivity through access points mounted on 1,500 street lampposts. It is designed for low bandwidth applications and offers the opportunity for network operators, application developers and device manufacturers to develop, test and showcase their apps and services in a real-time environment on a real-world, city-wide network.[108]

- the implementation of the **City Operations Centre**, opened in October 2017, which provides integrated monitoring and management of city services. It brings together the council's Emergency Control Centre, Traffic Control Centre and Community Safety (CCTV) Control Rooms. The centre provides services including emergency response to telecare and assistive technology users, alarm and security monitoring, lone worker support, CCTV management, traffic signal monitoring, set up and review of traffic signals and many others. The centre monitors over 200 junctions, almost 40

[104] https://www3.open.ac.uk/media/fullstory.aspx?id=30190 [accessed 03.07.2018]
[105] https://www.bristolisopen.com/ [accessed 26.06.2018]
[106] https://www.bristolisopen.com/ [accessed 26.06.2018]
[107] https://www.smartcitiesworld.net/connectivity/connectivity/iot-mesh-nears-completion-in-bristol [accessed 26.06.2018]
[108] City Experimentation-as-a-Service – Beta Live from: https://www.bristolisopen.com/platform/#product3 [accessed 26.06.2018]

traffic and information signs, and a CCTV network of 700 cameras as well as handling some 46,500 welfare and telecare calls every month.[109]

Exeter

8.18 **Exeter City Futures** is a community interest company (CIC) established by Oxygen House Investments in partnership with Exeter City Council. This smart city venture was founded in 2015 and focuses largely on environmental and transport-related challenges, with the aim of "making Exeter congestion free and energy independent" by 2025.[110]

8.19 As part of the City Futures programme, the City Council has partnered with Devon County Council and a consortium of partners to launch a smart transportation project called **Engaged Smart Transport**. The project uses real-time sensor data regarding traffic and weather conditions and public services performance with insights into behavioural decision-making, travel mode shift and engagement in smart technologies.[111] The project uses intelligent transport systems from Imtech Traffic & Infra and environmental sensors from Vaisala, which will provide information on road conditions and weather. A team from the University of Exeter will provide behavioural research into real-time travel decision making, while Black Swan will deliver trend analysis and prediction, as well as social media engagement.[112]

8.20 Linked with this, Exeter City Futures has set up the **Urban Impact Accelerator** to address these challenges. The aim of the Accelerator is for Exeter City Futures to connect with entrepreneurs and help them to build businesses and social enterprises that contribute to the programme's goals.[113]

Bournemouth

8.21 In 2016, Bournemouth became a **test bed for the national rollout of 5G**. National mapping agency, Ordnance Survey (OS), was chosen by the Department of Culture, Media & Sport (DCMS) to lead a consortium that included the 5G Innovation Centre (University of Surrey) and the Met Office. The consortium was to develop a planning and mapping tool which could be used to determine the prime locations to place the radio antennae (access points) necessary to enable a 5G network.

8.22 Together, the consortium has developed a demonstrator tool that lets network providers and local authorities visualise the best locations for placing radio antennae which will, ultimately, help deliver faster network speeds and better coverage for mobile and connected devices. The Bournemouth trial has the potential to be scaled up to cover the rest of the UK and demonstrate to network planners and the UK government how a UK-wide 5G rollout could work.[114]

[109] http://news.bristol.gov.uk/state_of_the_art_operations_centre_opens_in_bristol [accessed 26.06.2018]
[110] UK Smart Cities Index, Huawei from Navigant Consulting, Inc., 2017, p.63
[111] http://www.commute-exeter.com/ [accessed 26.06.2018]
[112] https://www.computerweekly.com/news/4500260390/Exeter-and-Devon-councils-launch-smart-transport-project [accessed 26.06.2018]
[113] http://www.t4cuk.com/latest-funds/exeter-city-futures-urban-impact-accelerator/ [accessed 28.06.2018]
[114] https://www.ordnancesurvey.co.uk/about/news/2016/uk-leading-way-5g-future.html [accessed 28.06.2018]

Reading

8.23 The **Reading 2050 Vision** was launched in 2017. This outlines a plan to make Reading a "smart and sustainable city" by 2050. This is a private sector-led initiative by Reading UK, with lead partners Barton Wilmore and the University of Reading, with support from Reading Borough Council. [115]

8.24 As part of this, the Thames Valley Berkshire LEP was awarded £1.73m of Local Growth Fund for a **'Smart City Cluster'** project across Reading, Bracknell, Wokingham and West Berkshire to help realise the Smart City vision. The project will deliver a communications platform that will provide a low powered wide area network, as a platform for Internet of Things applications and opportunities for the low-cost deployment of smart devices for business, developers and local authorities to use. The project started in January 2018 and will be delivered by Reading Borough Council.[116]

8.25 The Reading 2050 Vision states that Reading will *"strengthen and develop our world-class public bus service"* and *"deliver a fully integrated transport network citywide, which maximises our connectivity, while also prioritising green and smart methods of travel"*. Using digital technology, Reading has made significant progress. For example, in January 2017, Reading Buses launched its contactless pay system and mobile ticketing and bus information app. This made Reading Buses the first independent operator to go 100% contactless and Reading the UK's first town-wide contactless bus network outside of London.[117]

8.26 In order to achieve "a fully integrated transport network citywide", Reading Council has opened up transport data to support real-time traffic and bus information using the **Real-Time Open Data Information System**. The system has been designed to provide developers with access to data from across the region's transport network. The hope is that, by making data available from across the region's transport network, this will inspire the development of high quality applications that create better informed travellers and stimulate smarter choices.[118]

Opportunities in Health

8.27 Alongside the locally-based smart cities programmes, there is a substantial programme in the NHS to use digital technologies to drive new healthcare solutions. NHS England launched the Test Beds Programme in 2016, designed to test interconnected devices and medical technologies which could help patients to remain independent, stay out of hospital and monitor their own conditions. This identified a series of regionally-based 'test beds' focused on particular technologies or types of intervention, with a view to demonstrating the viability of technologies and devices so that they can be rolled out elsewhere in the country.[119] Five of

[115] UK Smart Cities Index, Huawei from Navigant Consulting, Inc., 2017, p.57
[116] http://www.thamesvalleyberkshire.co.uk/2018-impact-report/infrastructure [accessed 28.06.2018]
[117] https://www.intelligenttransport.com/transport-news/22399/contactless-payment-reading-buses/ [accessed 28.06.2018]
[118] http://opendata.reading-travelinfo.co.uk/ [accessed 28.06.2018]
[119] Kent Design and Learning Centre, Developing a potential project for ERDF funding: Issues and options, October 2017, SQW

the seven NHS Test Beds are funded directly by NHS England, while two are IoT (or Internet of Things) test beds, funded by the Department of Health through Innovate UK.[120]

8.28 Test bed projects include Diabetes Digital Coach, developed by consortium of 10 technology and evaluation partners. It is led by the West of England Academic Health Science Network (AHSN) and funded by the Department of Health through Innovate UK. The Diabetes Digital Coach aims to provide people with Type I and Type II diabetes with digital tools to better self-manage their condition.[121] The project will run until the end of July 2018, after which the evaluation report will be published.

Conclusions

8.29 It is evident from the case studies that places are pursuing the smart cities agenda from a variety of angles. For example, Milton Keynes has largely focused on collating data and opening up these data to the public, Bristol have adopted a technology/ infrastructure led approach, and Exeter has adopted an 'outcome'-led approach focused mainly on transport. However, within all the areas considered we have yet to see evidence of hard outcomes. This may in part be a result of the length needed to run these projects and initiatives over a substantial length of time.

8.30 The five areas considered have all been cities, and some case (such as those focused on public transport networks), it is easier to pursue the agenda over a city area. However, it may be possible to develop data driven approaches (such as Milton Keynes' Smart:MK programme) over in wider/more rural areas.

8.31 Linked with the Wiltshire *Digital Strategy* and related strategy approaches, there could be an opportunity for Swindon and Wiltshire to 'lead the way' in developing a LEP-wide smart city approach. Recognising the work underway in other locations, there could also be an opportunity for Swindon and Wiltshire to scale up and build on initiatives that other areas are pursuing, building links with existing programmes.

[120] https://www.weahsn.net/what-we-do/bringing-innovation-into-practice/diabetes-digital-coach/ [accessed 03.07.2018]
[121] https://www.diabetesdigitalcoach.org/ [accessed 03.07.2018]

9. Conclusions

Strengths, weaknesses, opportunities and threats

9.1 Bringing together the analysis in the evidence base, the following paragraphs provide a summary SWOT assessment of Swindon and Wiltshire's digital sector and the wider 'digital economy':

Strengths

9.2 Swindon and Wiltshire's central location and generally well-performing economy gives it some clear strengths in relation to its digital capabilities:

- **Digital infrastructure provision is good and it is improving.** Around 91% of premises have access to superfast broadband, and in Swindon, around 70% of premises can access ultrafast (putting it substantially ahead of Bristol). 4G mobile coverage is also good (other than in a limited number of rural locations in the south of Wiltshire), and compares positively to provision elsewhere in the South of England
- **Connectivity is good and improving, providing ready access to markets and labour supply.** Swindon and Wiltshire enjoy excellent access to Bristol and Bath and to London; journey times will improve with the electrification of the Great Western mainline; and it is well located for access to the Oxford – Milton Keynes – Cambridge and M3 corridors. Businesses cited the area's central location as a key strength.
- Linked with this, **there is proximity to other major centres of digital innovation**, notably in Bristol and Bath, Thames Valley Berkshire, Oxford and (in respect of cybersecurity) Gloucestershire.
- **There is a reasonably strong concentration of employment and business stock in the digital sector.** The sector is slightly larger in relative terms than it is across England as a whole, offering a degree of 'critical mass' in terms of employment and business opportunities.
- **There are a number of larger businesses which are exerting a 'demand pull' on advanced digital technology.** These include firms such as Nationwide and the major manufacturers around Swindon and the A350 Corridor, as well as the stock of company headquarters (including large digital businesses such as Intel)
- **Relative to its neighbours, Swindon and Wiltshire enjoys cost advantages.** These may not be permanent, and they do not apply everywhere – but given its connectivity and location, the area is a cost-effective place to recruit and base a business
- **'Quality of life'** is seen as an asset by entrepreneurs and investors

Weaknesses

9.3 Set against these, there are some weaknesses that strategy will need to address:

- **There is no real 'sector identity'.** The digital sector is diverse, dispersed and has few 'anchor' businesses or institutions. Businesses do not regard themselves as belonging to a 'cluster'
- **Sector networks are minimal.** Linked with the lack of 'sector identity', there is no industry-led body that can articulate a voice for the sector, or support investment campaigns.
- **There is limited awareness of the area as a digital business location.** It is not a widely-recognised 'tech' location (unlike, say, Bristol or the Thames Valley), and historically, Swindon in particular has tended to be in the 'shadow' of neighbouring large centres such as Reading and Bristol

Opportunities

9.4 Looking to the future, there are significant opportunities ahead:

- **Technological change will drive new products and business models.** The digital sector is inherently dynamic: as technology advances, there are increasing opportunities for 'convergence' and for the development of products and services for which there is not (yet) demand. For firms that are innovative and flexible, there is potential for rapid growth
- **There are areas of strength with potential for growth.** For example, the stock of local businesses engaged in the commercial application of cybersecurity remains small, but there may be opportunities to build on Swindon and Wiltshire's major defence-related presence
- **There is business enthusiasm for greater collaboration.** There was strong business engagement with the development of the Digital Capabilities Strategy and a willingness to work together, as well as evidence of successful collaboration in (for example) the preparation of the Institute of Technology bid)
- **Businesses are investing in skills.** Dyson Institute is a very high profile example of this, but there are further (smaller scale) examples of digital businesses 'growing their own' staff over the long term and investing in skills development through the private sector
- **Access to local talent could increase**, as changes in the university market and the cost associated with it encourages more people to stay locally. This could be reinforced by the development of a higher education offer in Swindon
- **There are opportunities arising from investment in new facilities focused on the digital sector.** In particular, these include investment in the Mansion House at Corsham, as well as in the development of the Carriage Works at Swindon

- **Public investment could help to drive demand**, in (for example) the development of digital health and the 'smart cities' agenda

Threats

9.5 However, the Strategy will need to be alert to threats ahead, both specifically to Swindon and Wiltshire and across the wider environment:

- **Swindon and Wiltshire's *relative* productivity has declined in recent years**, compared with the UK overall and with its neighbours. While the economy remains buoyant, a loss of more productive sectors and occupations over the long term could threaten prosperity and attractiveness to investors
- **There is a risk of an outflow of talent**. Bristol and Bath are already important employment locations; as connectivity to London improves, it is possible that opportunities outside Swindon and Wiltshire become more attractive to tech talent
- **Businesses that fail to adapt to new technology will become uncompetitive**. While new digital technology creates opportunities, there will be businesses in Swindon and Wiltshire that will fail if they do not increase their digital capabilities
- **An ageing workforce presents challenges to adoption**. Linked with the previous point, much industry adaption will need to take place within the existing workforce: digital capabilities will rely as much on this as on new entrants
- **Public scepticism is increasing**. Particularly following the recent data ethics controversies, there is the risk of a public 'backlash' towards tech solutions, which may impact on entry to the sector, as well as the willingness of public bodies to drive adoption. This could be reinforced if the employment impacts of technological disruption are significant or poorly managed.

Where next?

9.6 The SWOT analysis set out above indicates that Swindon and Wiltshire is well positioned to strengthen its digital capabilities. In the context of a generally well performing economy, it has good digital infrastructure provision, a stock of businesses that are engaged in digital innovation and a labour market that appears to work effectively. This provides a strong basis on which to improve collaboration within the sector (and beyond) and develop greater 'critical mass'.

Annex A: The Tech Nation 'digital tech' definition

A.1 Various attempts have been made to formally define the digital sector, although – reflecting the dynamic and rapidly evolving nature of the sector – no single perfect definition exists.

A.2 However, to enable comparisons to be drawn with other LEP areas and to analyse employment and business stock, the definition adopted by Tech City UK in the *Tech Nation* report is helpful. This defines a 'digital tech' sector according to a series of Standard Industrial Classification (SIC) codes:

Table A-1: Tech Nation 'digital tech definition

SIC	Description
26.20	Manufacture of computers and peripheral equipment
58.21	Publishing of computer games
58.29	Other software publishing
61.10	Wired telecommunications activities
61.20	Wireless telecommunications activities
61.30	Satellite telecommunications activities
61.90	Other telecommunications activities
62.01	Computer programming activities
62.02	Computer consultancy activities
62.03	Computer facilities management activities
62.09	Other IT and computer service activities
63.11	Data processing, hosting and related activities
63.12	Web portals
95.11	Repair of computers and peripheral equipment

A.3 While this definition is widely used, other definitions are available, also built up from SIC codes. The most commonly used alternative is the **Department for Digital, Culture, Media and Sport (DCMS)** definition, which is widely used in Government reports, including reports prepared by the former UK Commission for Employment and Skills.

A.4 The Tech Nation definition is somewhat narrower than that used by DCMS: for example, the latter contains several distribution and manufacturing activities that are not included in the Tech Nation definition.

A.5 Currently, the Tech Nation definition arguably has greater currency, given the widespread use of the Tech Nation report series, so we propose using it in our analysis. However, it only offers a very rough approximation, and should be treated on that basis.

Annex B: The Swindon and Wiltshire economy

Introduction

B.1 This annex provides an overview of Swindon and Wiltshire's economy, supporting the analysis of the digital sector contained in Section2, and summarising the area's economic output, productivity and sectoral composition.

Overview

B.2 In headline terms, the Swindon and Wiltshire LEP area was home to 488,400 people[122] and 394,000 jobs[123] in 2016. Some 60.1% of the total population was of working age[124], that is, they were aged between 16 and 64. Swindon and Wiltshire has a relatively high employment rate. In the year from October 2016 to September 2017, the economic activity rate was 84.5% and the employment rate was 80.7%[125]. These figures were higher than the national averages for the same year (76.3% and 74.7 respectively)[126].

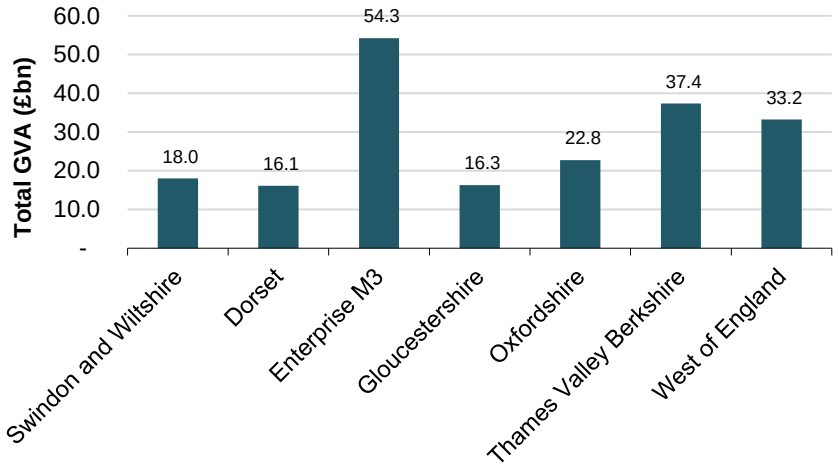
GVA

B.3 In 2016, total GVA, measured in current basic prices, in Swindon and Wiltshire was £18bn. This figure was relatively low when compared to other LEP areas. The Enterprise M3 LEP had the highest total GVA in 2016 (£54.3bn). This is in part explained by the area having 987,000 jobs (a figure that was much higher than in all other comparator areas). In the context, Enterprise M3 LEP had 2.5 times more jobs than Swindon and Wiltshire LEP.

B.4 Total GVA increased by some 55% between 2002 and 2016; this was equivalent to a compound annual growth rate (CAGR) of 3.2% per annum. Comparatively, Swindon and Wiltshire experienced relatively slow growth in total GVA since 2002 (see Figure B-1).

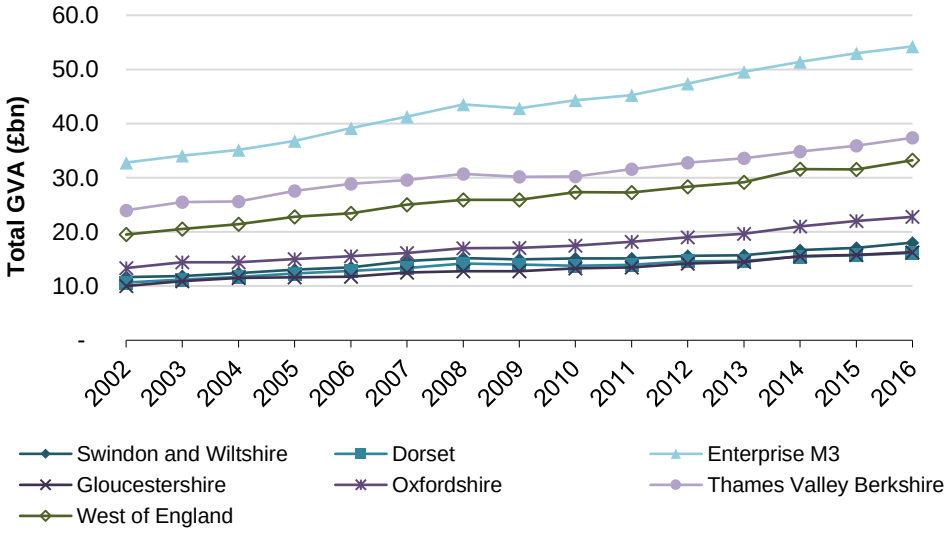
[122] ONS Population estimates - local authority based by five year age band, ONS Crown Copyright Reserved [from Nomis on 6 March 2018]
[123] ONS jobs density, ONS Crown Copyright Reserved [from Nomis on 6 March 2018]
[124] ONS Population estimates - local authority based by five year age band, ONS Crown Copyright Reserved [from Nomis on 6 March 2018]
[125] ONS annual population survey, ONS Crown Copyright Reserved [from Nomis on 6 March 2018]
[126] ONS annual population survey, ONS Crown Copyright Reserved [from Nomis on 6 March 2018]

Figure B-1: Gross Value Added (current prices) by Local Enterprise Partnership 2016 (£bn)



Source: ONS Regional gross value added (balanced) by local enterprise partnership in England

Figure B-2: Gross Value Added (current prices) by Local Enterprise Partnership 2002 to 2016 (£bn)



Source: ONS Regional gross value added (balanced) by local enterprise partnership in England

Table B-1: Change in Gross Value Added (current prices) by Local Enterprise Partnership (2002 to 2016)

	Total GVA change 2002 to 2016	
	%	CAGR
Swindon and Wiltshire	55%	3.2
Dorset	51%	3.0
Enterprise M3	65%	3.7
Gloucestershire	62%	3.5
Oxfordshire	71%	3.9
Thames Valley Berkshire	56%	3.2
West of England	**70%**	**3.9**

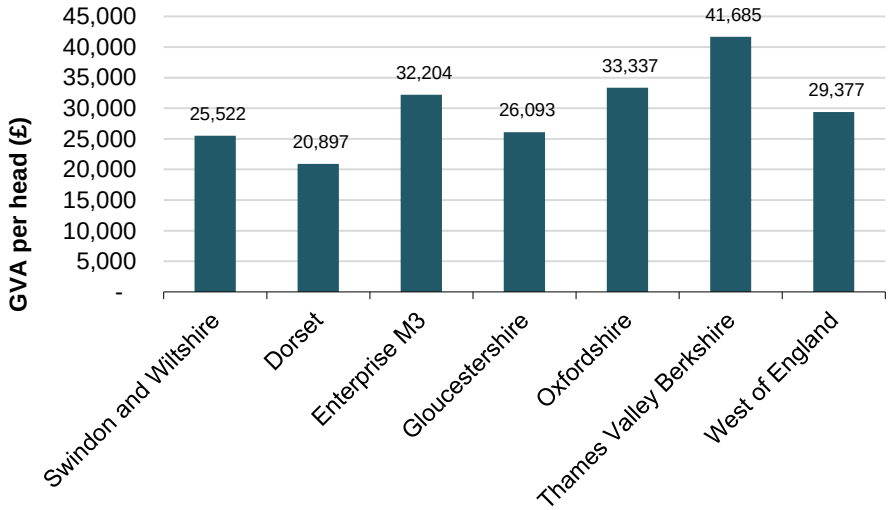
Source: SQW analysis of ONS Regional gross value added (balanced) by local enterprise partnership in England

GVA per head

B.5 Swindon and Wiltshire's GVA per head (current prices) was £25,522 in 2016. This was the second lowest across the comparator areas considered and it was 61% that of the best performing area, Thames Valley Berkshire.

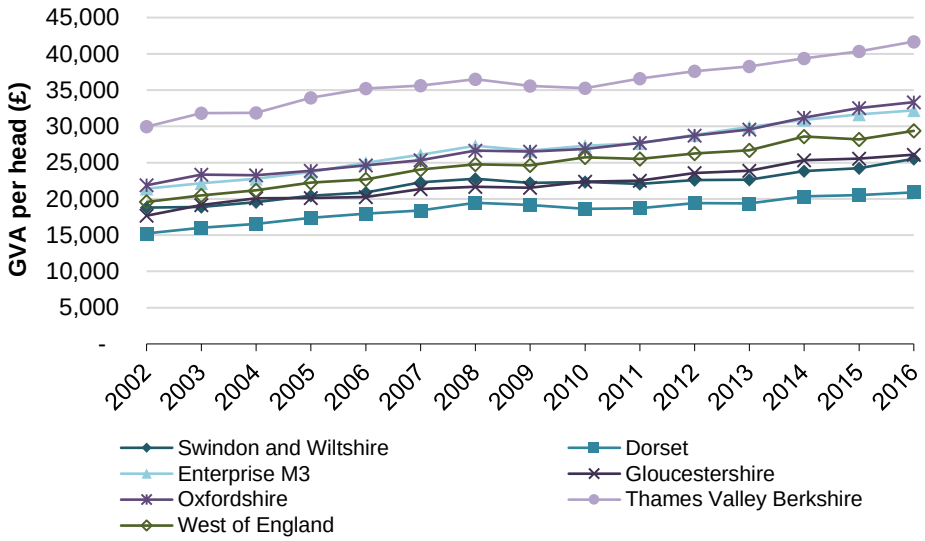
B.6 Between 2002 and 2016, GVA per head increased slowly in Swindon and Wiltshire – at a rate of 2.2% per annum. Amongst all comparator areas, Swindon and Wiltshire experienced the slowest growth in GVA per head between 2002 and 2016.

Figure B-3: Gross Value Added per head (current prices) by Local Enterprise Partnership 2016 (£)



Source: ONS Regional gross value added (balanced) by local enterprise partnership in England

Figure B-4: Gross Value Added per head (current prices) by Local Enterprise Partnership, 2002 to 2016 (£)



Source: ONS Regional gross value added (balanced) by local enterprise partnership in England

Table B-2: Change in Gross Value Added per head (current prices) by Local Enterprise Partnership (2002 to 2016)

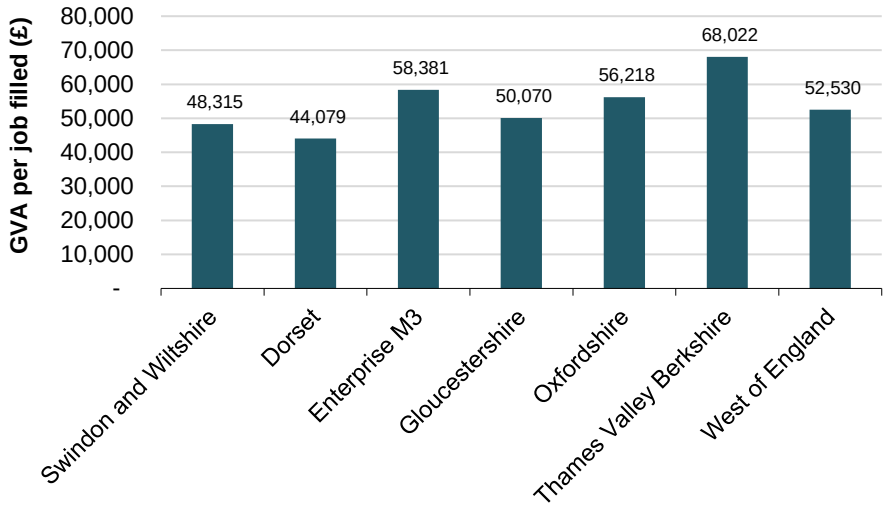
	GVA per head change 2002 to 2016	
	%	CAGR
Swindon and Wiltshire	36%	2.2
Dorset	37%	2.3
Enterprise M3	50%	3.0
Gloucestershire	48%	2.8
Oxfordshire	52%	3.1
Thames Valley Berkshire	39%	2.4
West of England	50%	2.9

Source: SQW analysis

GVA per Job

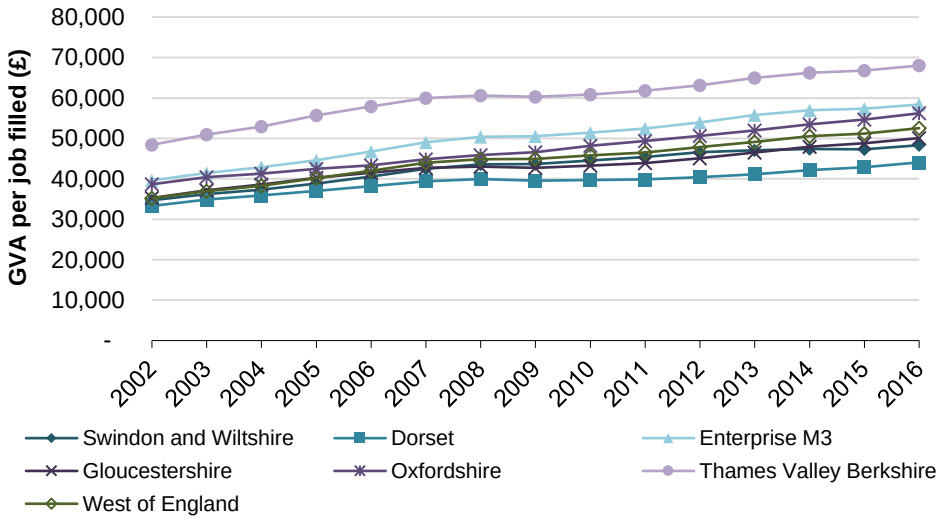
B.7 GVA per job describes the productivity of labour. GVA per job filled in Swindon and Wiltshire was £48,315 in 2016; this figure was the second lowest amongst comparator LEP areas. This implies that productivity in Swindon and Wiltshire is relatively low. Swindon and Wiltshire experienced relatively slow growth in GVA per job filled between 2002 and 2016, although GVA per job filled in Swindon and Wiltshire has increased by 39% since 2002; this is equivalent to a CAGR of 2.4% per annum.

Figure B-5: GVA per filled job by Local Enterprise Partnership 2016 (£)[127]



Source: ONS Subregional Productivity: Labour Productivity (GVA per hour worked and GVA per filled job) indices by Local Enterprise Partnership

Figure B-6: GVA per filled job by Local Enterprise Partnership, 2002 to 2016 (£)[128]



Source: ONS Subregional Productivity: Labour Productivity (GVA per hour worked and GVA per filled job) indices by Local Enterprise Partnership

[127] Data are nominal; ie, data are not adjusted for inflation. Data are smoothed using a weighted 5-year moving average
[128] Data are nominal; ie, data are not adjusted for inflation. Data are smoothed using a weighted 5-year moving average

Table B-3: Change in Gross Value Added per job filled by Local Enterprise Partnership (2002 to 2016) [129]

GVA per filled job change 2002 to 2016		
	%	CAGR
Swindon and Wiltshire	39%	2.4
Dorset	32%	2.0
Enterprise M3	47%	2.8
Gloucestershire	42%	2.5
Oxfordshire	45%	2.7
Thames Valley Berkshire	40%	2.5
West of England	49%	2.9

Source: SQW analysis of ONS Subregional Productivity: Labour Productivity (GVA per hour worked and GVA per filled job) indices by Local Enterprise Partnership

Sectoral composition

Priority sectors in the SEP

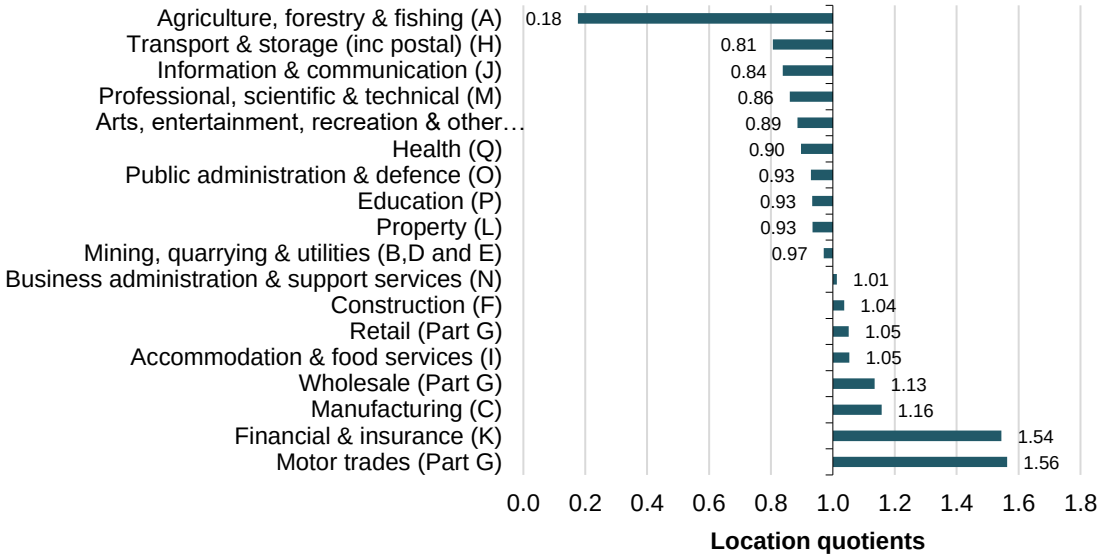
B.8 The LEP's Strategic Economic Plan (SEP) identified the following key sectors, in recognition of their growth potential: advanced engineering and high value manufacturing, health and life sciences, financial and professional services, digital and information and communications technology, and land-based industries.

Overall pattern of employment concentration

B.9 Location quotients show those sectors where there is a concentration of jobs in Swindon and Wiltshire with higher employment than would be expected from the national average. The sector with highest employment compared to the national average is motor trades (LQ 1.56). Swindon and Wiltshire is home to a number of large employers which are involved in the manufacture of motor vehicles, including Honda, Cooper Tyre and BMW. This may in part explain the large location quotient for motor trades. There was also a high concentration of employment in the financial and insurance sector compared to the national average (LQ 1.54).

[129] Data are nominal; ie, data are not adjusted for inflation. Data are smoothed using a weighted 5-year moving average

Figure B-7: Employee concentration by sector 2016



Source: SQW analysis of Business Register and Employment Survey: open access, ONS Crown Copyright Reserved [from Nomis on 5 March 2018]

Table B-4: Employee concentration by sector 2016

Industry	Swindon & Wiltshire	
	Count	LQ
Agriculture, forestry & fishing (A)	350	0.18
Mining, quarrying & utilities (B,D and E)	3,500	0.97
Manufacturing (C)	30,000	1.16
Construction (F)	15,000	1.04
Motor trades (Part G)	9,000	1.56
Wholesale (Part G)	15,000	1.13
Retail (Part G)	32,000	1.05
Transport & storage (inc postal) (H)	13,000	0.81
Accommodation & food services (I)	25,000	1.05
Information & communication (J)	12,000	0.84
Financial & insurance (K)	18,000	1.54
Property (L)	5,000	0.93
Professional, scientific & technical (M)	25,000	0.86
Business administration & support services (N)	30,000	1.01
Public administration & defence (O)	12,000	0.93
Education (P)	27,000	0.93
Health (Q)	37,000	0.90
Arts, entertainment, recreation & other services (R,S,T and U)	13,000	0.89
Column Total	323,000	

Source: SQW analysis of Business Register and Employment Survey : open access, ONS Crown Copyright Reserved [from Nomis on 5 March 2018]

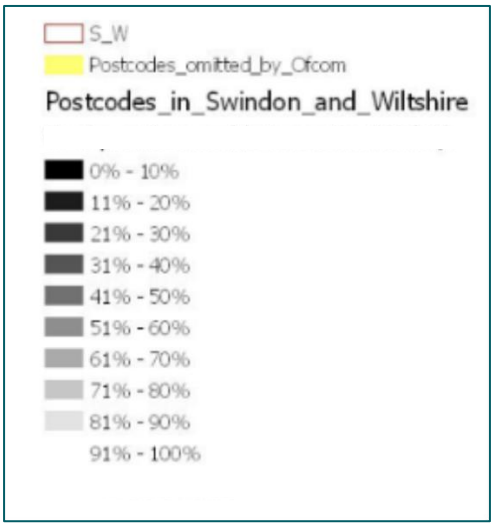
Annex C: Digital infrastructure: Additional data charts

C.1 Supplementing the analysis in Section 7, this annex sets out a series of slides and supporting commentary containing further data insights into Swindon and Wiltshire's digital infrastructure. The data presented below is from Ofcom unless otherwise stated and has been mapped by SQW[130]; there are no restrictions on its use.

Fixed broadband

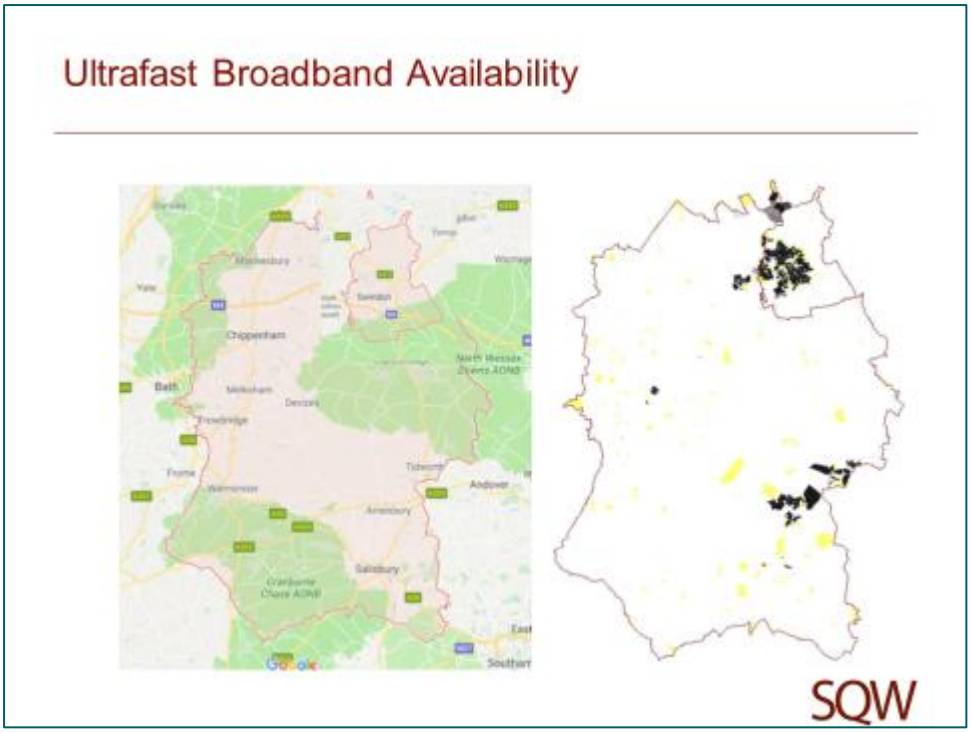
Ultrafast

C.2 The following map shows the postcodes in black where Ultrafast broadband is available (fixed broadband with speeds in excess of 300Mbit/s). Ofcom uses the EU definition of Ultrafast – the industry prefers a definition of 100mbit/s and above. Postcodes coloured in grey have partial availability of ultrafast (we used a scale of black = 100% availability, white = 0% availability and the scale varies from darker to lighter grey in graduations of 10% in between), using the scale below:



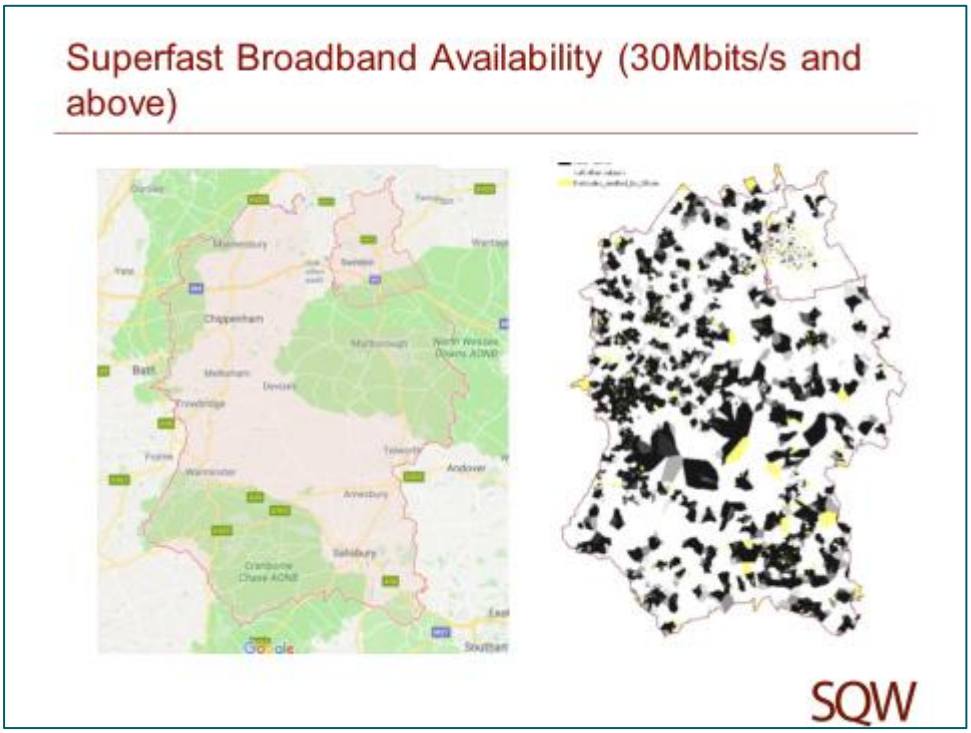
C.3 The yellow areas of the map are postcodes which were missing from the Ofcom dataset. Ofcom state that: *"It is likely that the missing postcodes are commercial locations. Whilst not explicitly excluded, the Connected Nations report is focussed primarily on residential broadband services. Therefore locations that are entirely serviced by non-residential services, such as commercial leased lines, will not be included in the analysis."* This has been tested by looking at a sample of postcodes missing: they are indeed places like business parks and high streets, although there are also some rather large rural postcodes included.

[130] Maps produced by SQW 2018. Licence 100030994, Contains OS data © Crown copyright [and database right] [2017]



Superfast

C.4 The following slides show the coverage of superfast broadband (30Mbit/s and above) and broadband at 10Mbit/s, 5Mbit/s and 2Mbit/s, using the same scale as the previous slide on Ultrafast.



10 Mbit/s and above

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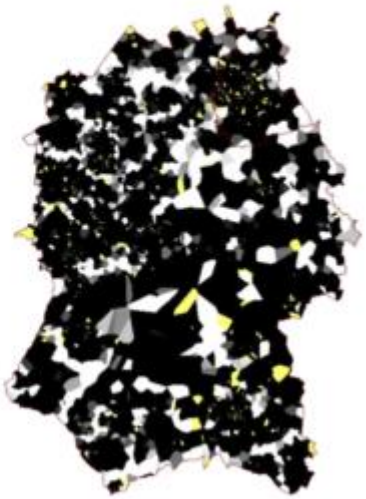
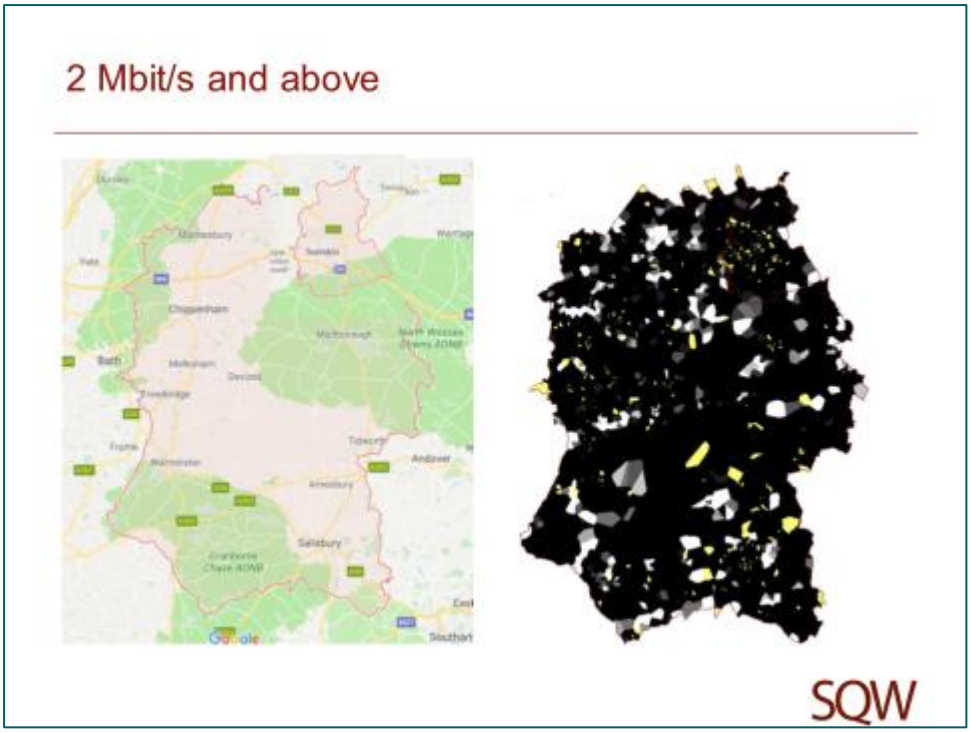
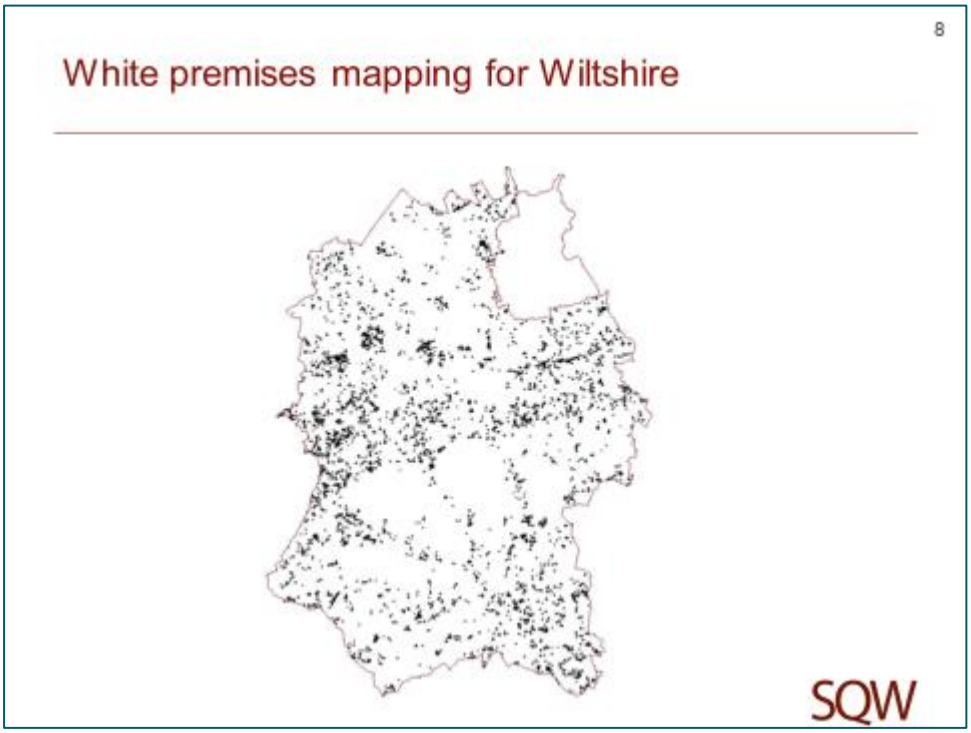
5 Mbit/s and above



SQW

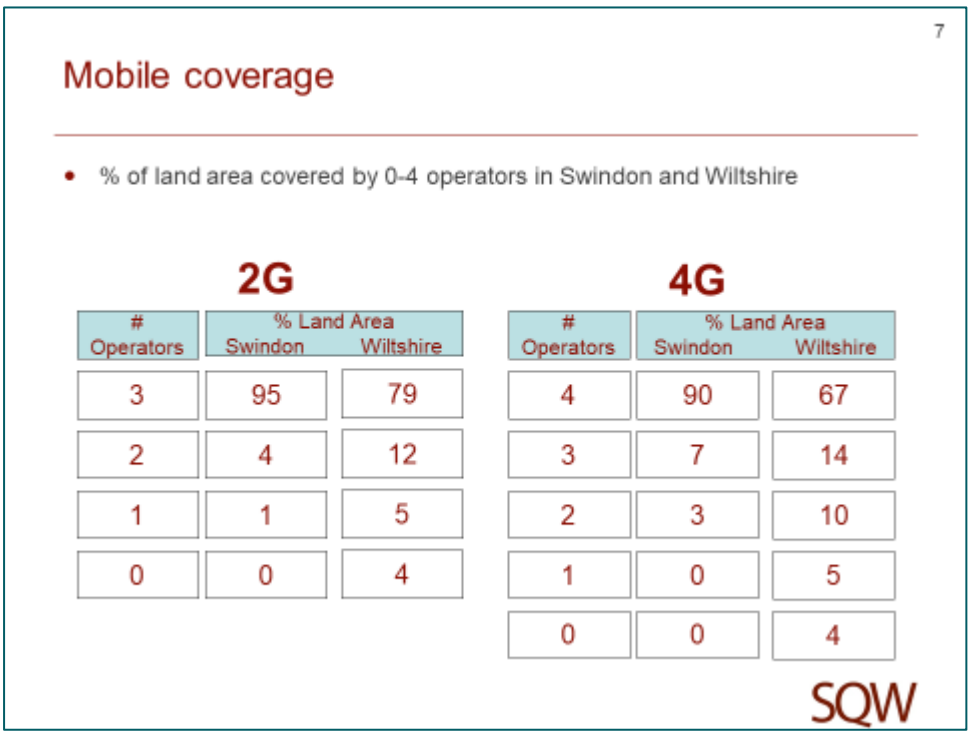


C.5 The following slide shows all the White Premises in Wiltshire (White Premises are premises that no operator serves at 30Mbit/s or above and no operator has any current plans to do so *(source: Wiltshire Online)*:



Mobile coverage

C.6 The following slide shows mobile coverage across Swindon and Wiltshire[131]:



7

Mobile coverage

- % of land area covered by 0-4 operators in Swindon and Wiltshire

2G

# Operators	% Land Area Swindon	Wiltshire
3	95	79
2	4	12
1	1	5
0	0	4

4G

# Operators	% Land Area Swindon	Wiltshire
4	90	67
3	7	14
2	3	10
1	0	5
0	0	4

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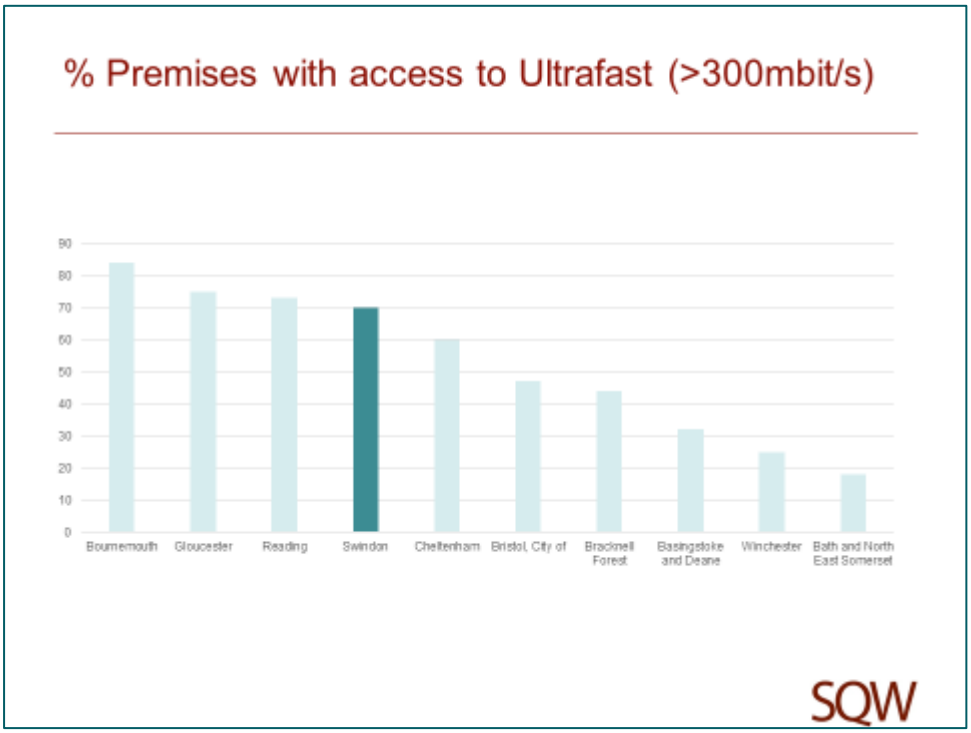
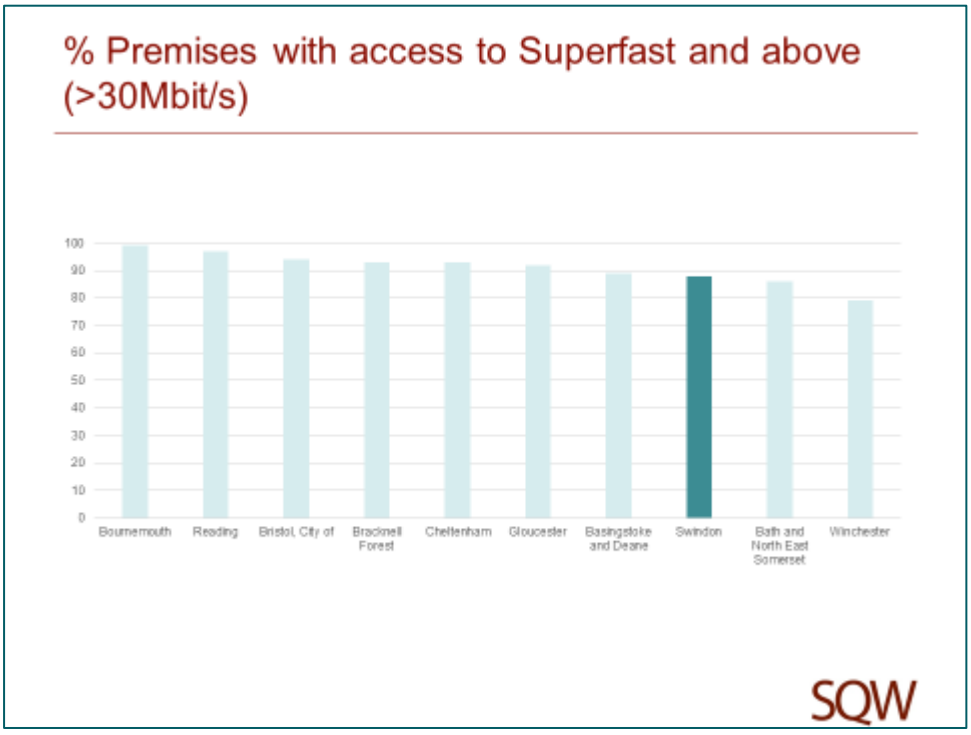
Comparisons of coverage between Swindon and other local authority areas

C.7 The following slides compare coverage in Swindon with that in a selection of other mainly urban authorities in the South of England, looking at both fixed and mobile communications and data usage.

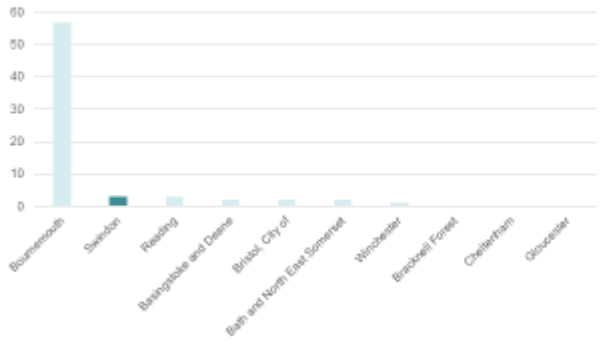
[131] It is possible to map mobile coverage to local (postcode) level across Swindon and Wiltshire using Ofcom data. However, this data is restricted, and maps derived from it cannot be published. The data presented in the tables on the slide summarise the information.

Swindon fixed communications





% of premises with access to FTTP



Top 20 FTTP LAs

Bournemouth	57
Kingston upon Hull, City of	45
East Riding of Yorkshire	34
Cornwall	29
Tower Hamlets	28
Spelthorne	25
West Berkshire	21
Waltham Forest	20
Cotswold	17
York	13
Milton Keynes	13
Newham	13
Lewisham	12
Powys	11
Westminster	11
Herefordshire, County of	10
City of London	10
Southwark	10
Greenwich	10
Gwynedd	10

Swindon is 71st for 391 LAs

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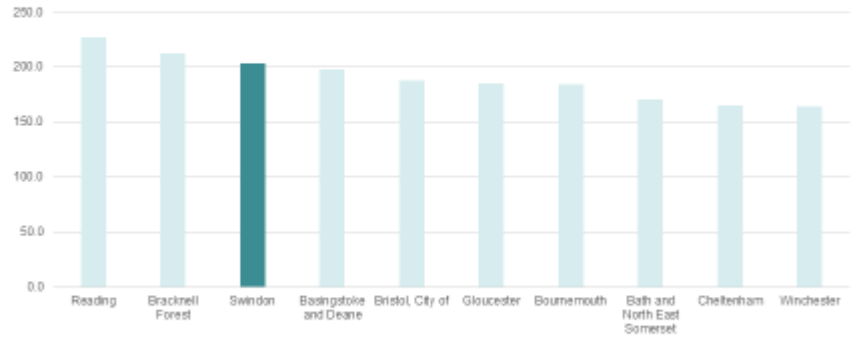
Average data usage (GB) in May 2017



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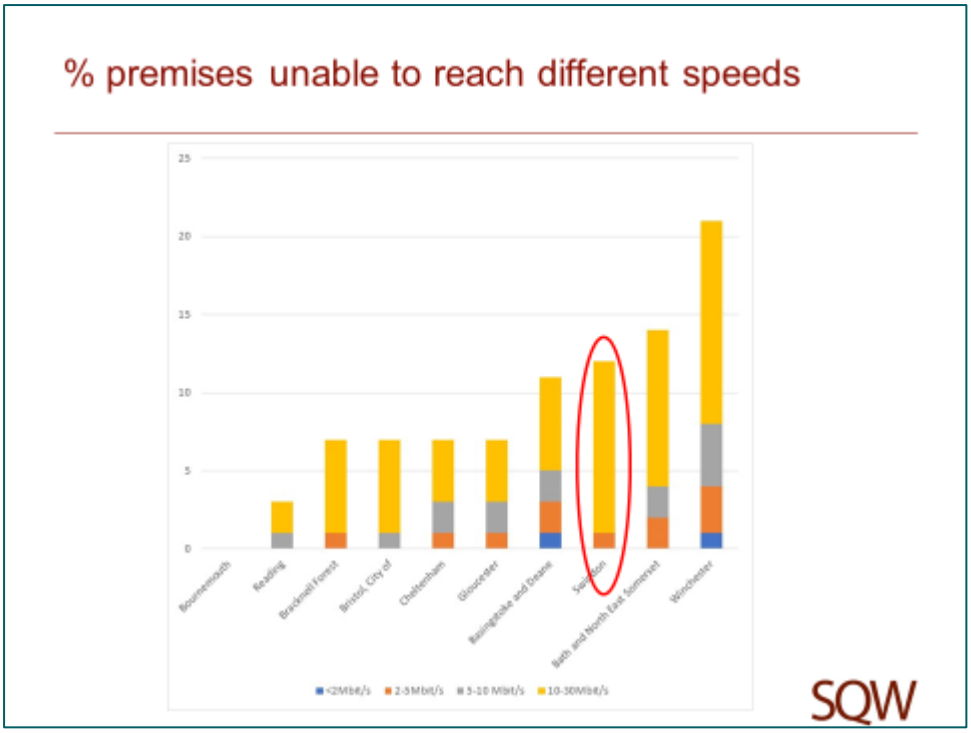
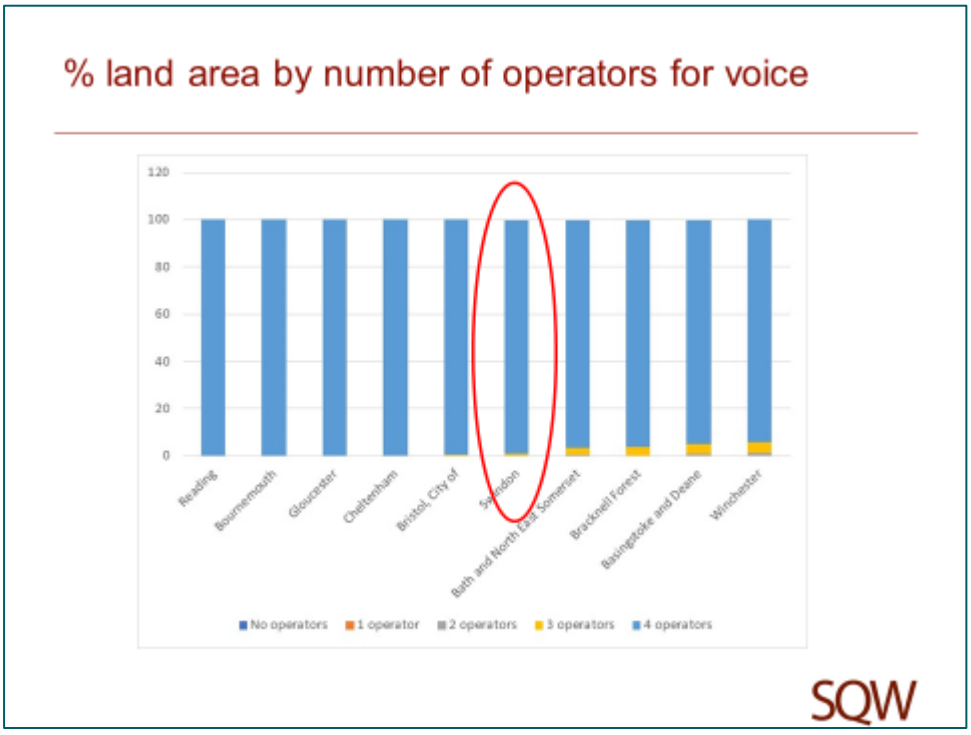
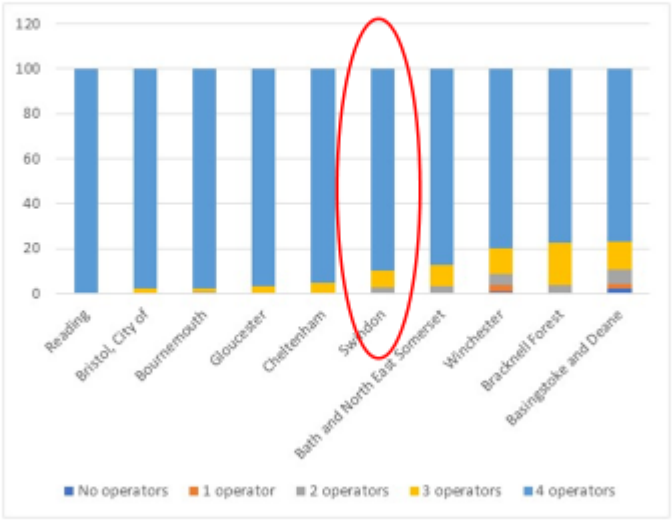


Swindon mobile communications



% road length by number of operators for voice



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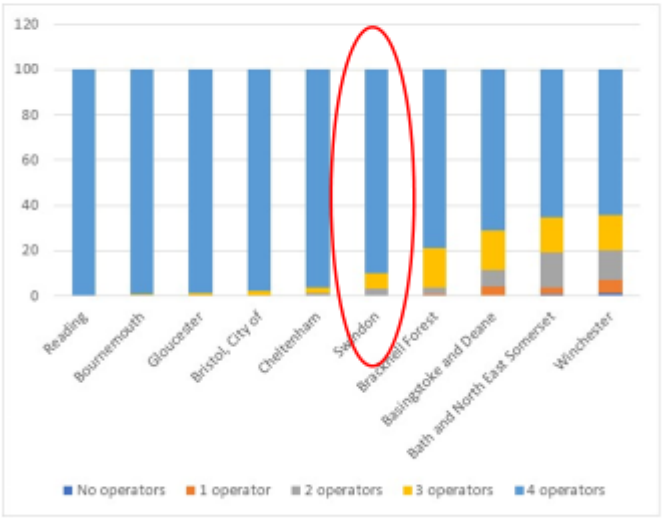
% land area with 4G by number of operators



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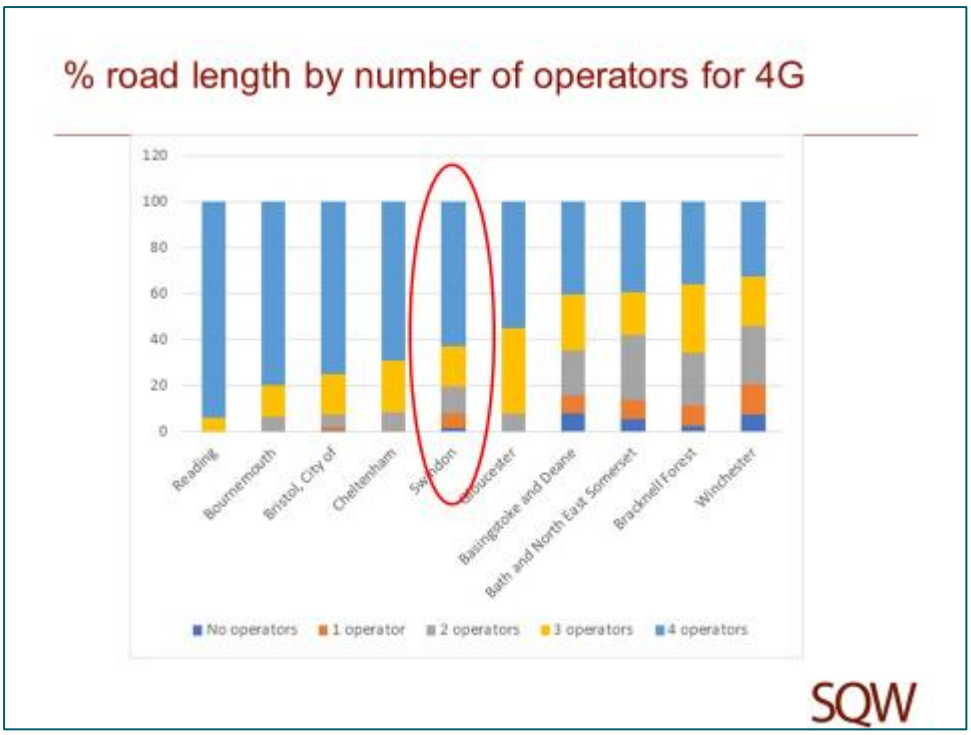
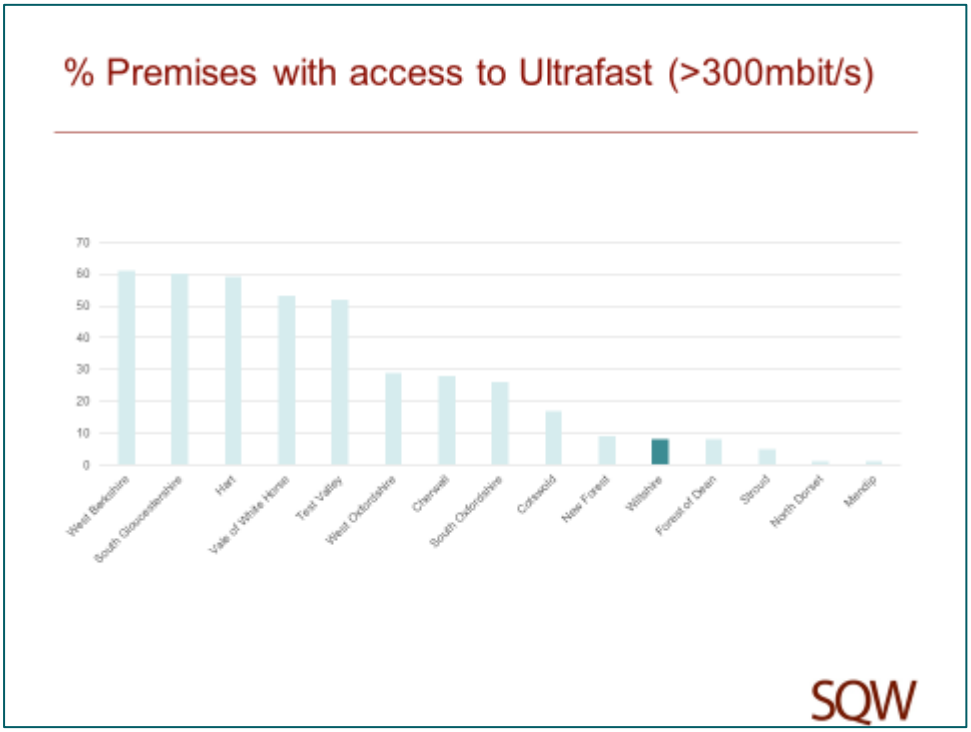


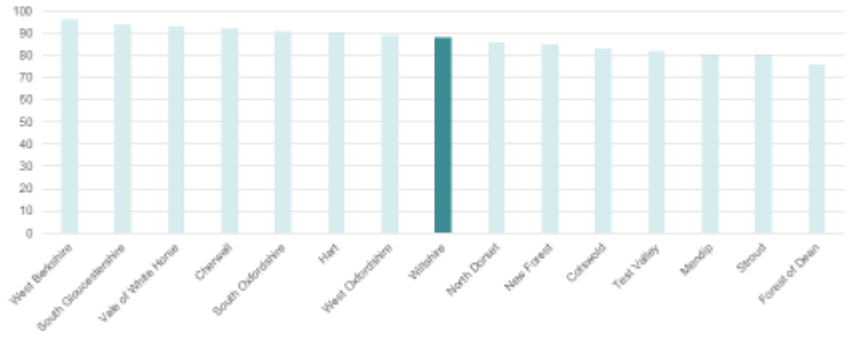
Comparisons of coverage between Wiltshire and other local authority areas

C.8 The following slides compare coverage in Wiltshire with that in a selection of mainly rural district and unitary authority areas in the South of England, looking at both fixed and mobile communications and data usage.

Wiltshire fixed communications

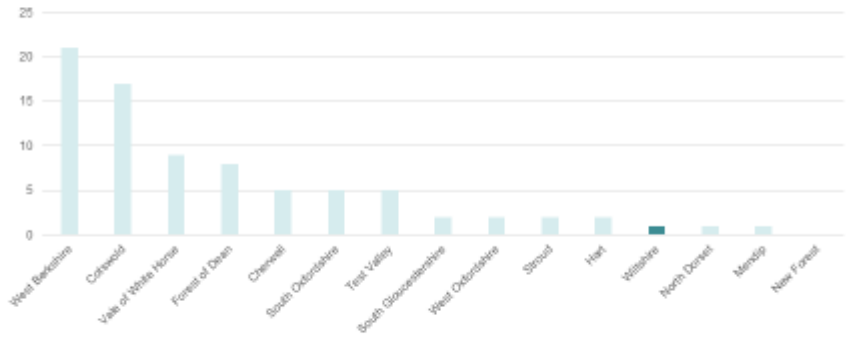


% Premises with access to Superfast and above (>30Mbit/s)



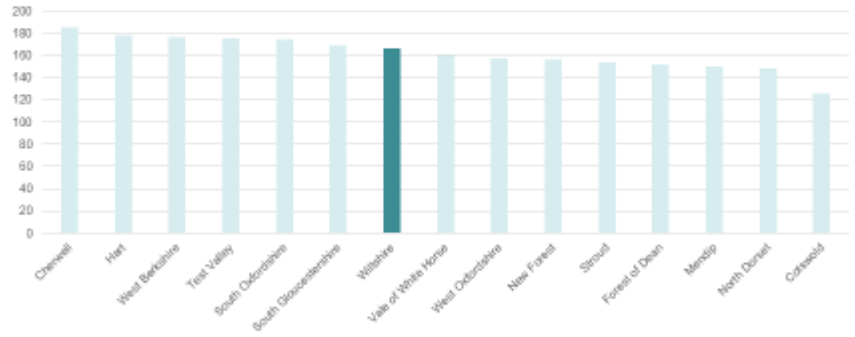
SQW

% of premises with access to FTTP



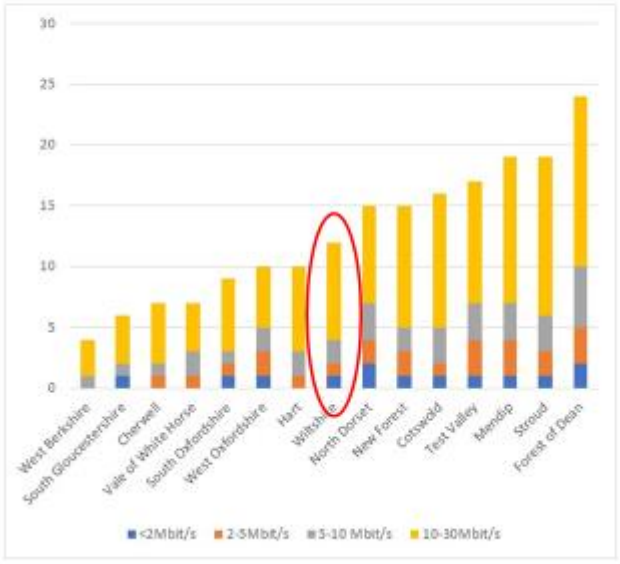
SQW

Average data usage (GB) in May 2017



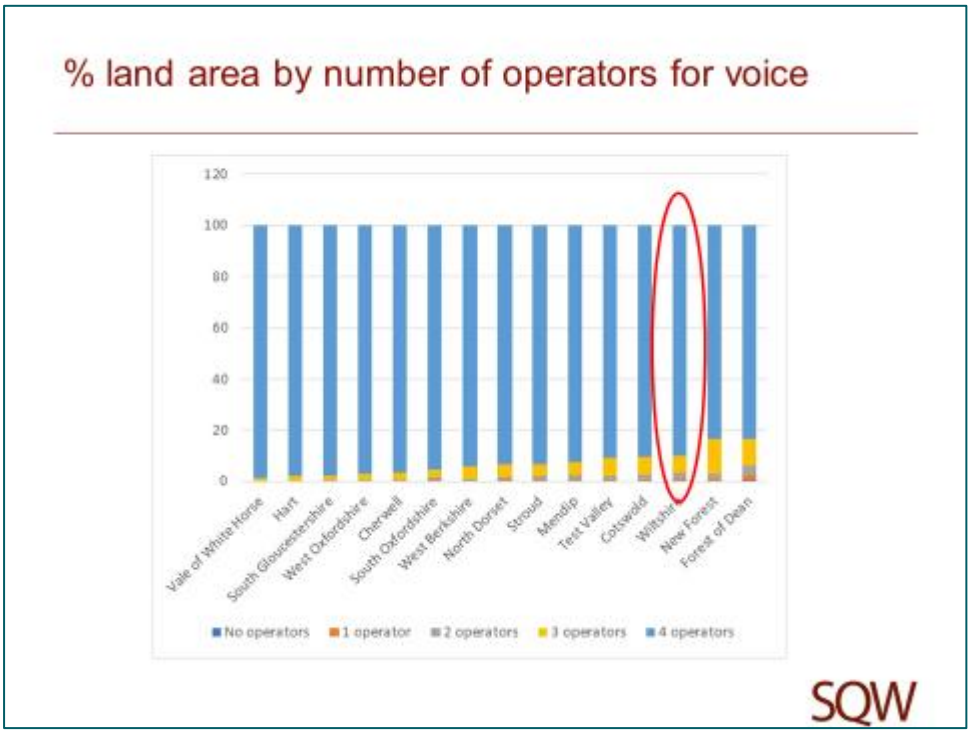
SQW

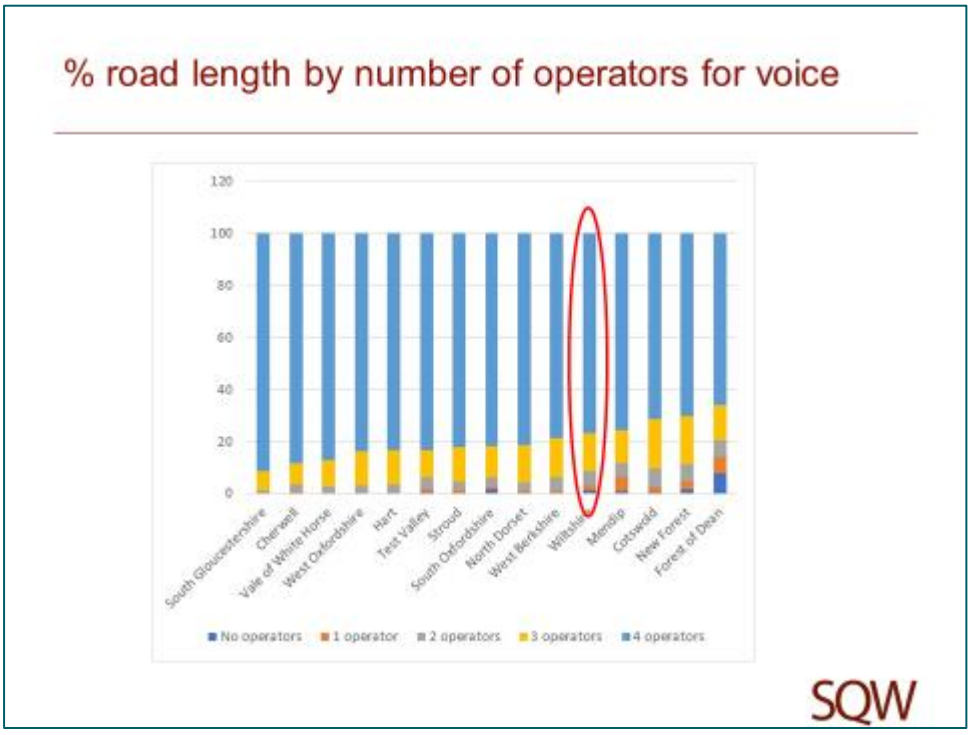
% premises unable to reach different speeds



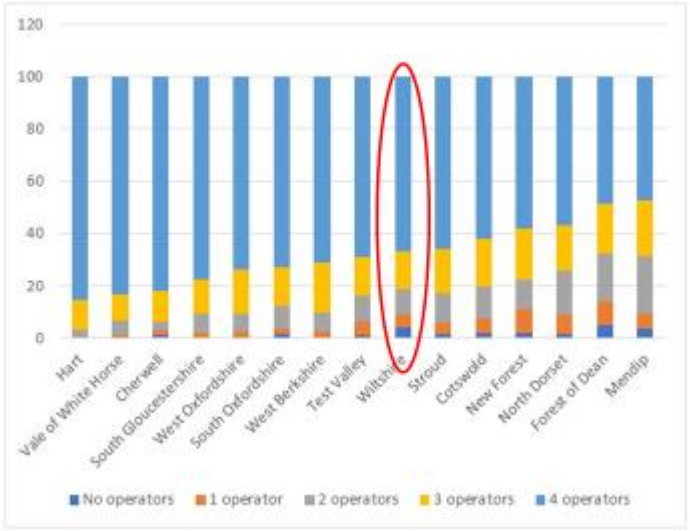
SQW

Wiltshire mobile communications





% land area with 4G by number of operators



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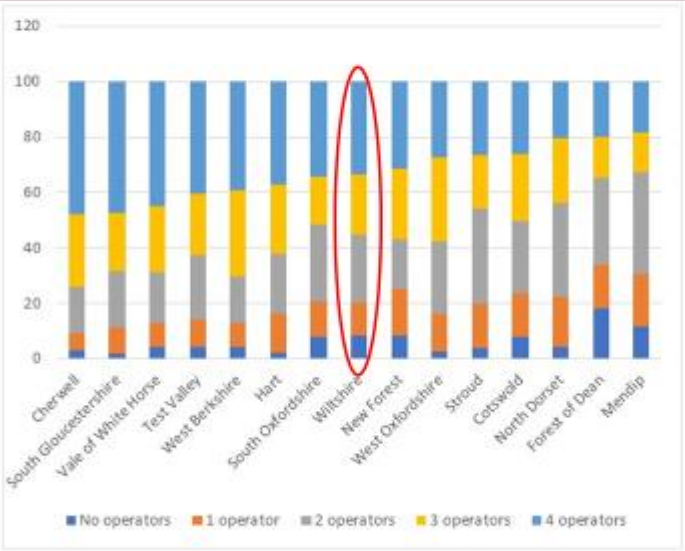
% road length by number of operators for 4G



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Annex D: List of consultees

D.1 In addition to two stakeholder workshops held in March and April 2018 (both of which were attended by around 30 business and other stakeholders), bilateral consultations were held with the following:

Table D-1: Digital Capabilities Strategy: Consultees

Consultee	Organisation
Alex Cole	TIN Smart
Alison Clare	Corsham Institute
Darren Griffiths	DTR VMS Ltd
Dave Barton	NautoGuide
David Dewart	Swindon Borough Council
Graham Taylor	Swindon New College
Joe Frost	Gigaclear
Julia Falaki	Gloucestershire & Wiltshire Partnership
Julia Stuckley	Swindon Borough Council
Mandy Timbrell	Higher Futures
Martin Roberts	Swindon Borough Council
Matt Reynolds	Cirencester College
Mark Bates	Nationwide Building Society
Mike Oram	Maydens
Nadine Miles	Render Media
Patrick Wilson	PW Architects
Paul Coles	BT
Peter Boucher	Excalibur Communications
Sally Ford	Wiltshire College
Sarah Cosentino	Wiltshire Council
Syed Shah	Swindon Council
Will Titcombe	Vysiion

D.2 In addition, the Strategy was supported by a Steering Group, comprising Paddy Bradley (SWLEP), Debby Skellern (SWLEP), Julian Head (SWLEP), Glyn Peach (Swindon Borough Council), Ian Baker (Wiltshire Council) and George Gill (GG Media Resources and SWLEP Board member).