Final Evaluation of the Next Generation Broadband Wales Programme

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SQW

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Glossary

ERDF	European Regional Development Fund
FTTC	Fibre to the Cabinet
FTTP	Fibre to the Premises
Mbps	Megabits per second
OAIP	Open Access Infrastructure Point
SMEs	Small and Medium Enterprises
SMART objectives	Objectives that are: Specific, Measurable, Achievable, Relevant and Time-bound
TPP	Total Premises Passed
WEFO	Welsh European Funding Office

Summary

Background

1. The rollout of publicly funded superfast broadband forms a key part of the Welsh Government's Digital Wales Strategy, and is a priority for the European Commission through the Digital Agenda for Europe. The Welsh Government made the commitment in its 2011 Programme for Government for all residential premises and all businesses in Wales to have access to next generation broadband by 2015 (now extended to 2016).

2. Following an Open Market Review in 2011 that identified over half of premises in Wales would not be covered by the commercial roll-out of superfast broadband services, the Welsh Government established the 'Next Generation Broadband Wales' programme, known as Superfast Cymru, to extend superfast coverage to those areas not covered by commercial roll-out.

3. Superfast Cymru provides gap funding to stimulate private sector investment into upgrading the infrastructure in those areas that are not covered by commercial superfast broadband rollout plans, (the 'intervention area').

4. The programme secured £205 million of public funding to bring superfast (24Mbps+) broadband access to 691,000 premises (95 per cent of the 727,000 premises in the intervention area), with speeds of at least 30Mbps available to 655,000 of these premises (90 per cent of the intervention area premises). Combined with the commercial roll-out, Superfast Cymru aimed to ensure that 96 per cent of all premises in Wales would have access to fibre-based services. The programme also included an apprenticeship scheme, and a marketing and awareness raising programme to stimulate demand from households and businesses across Wales.

5. The programme was funded from the 2007-13 ERDF programmes in the Convergence and Competitive regions of Wales (£90 million), the Welsh Government (£59 million), and Broadband Delivery UK (£57 million). A further £52 million of private investment was committed by BT, the selected commercial delivery partner.

6. SQW, working with BMG Research, was commissioned by the Welsh Government to undertake an independent impact and process evaluation of Superfast Cymru. The evaluation included surveys of enterprises and households (covering those that had and had not adopted superfast broadband); consultations with partners and stakeholders involved in the programme; and the development of an impact model to estimate the net economic, social and

environmental impacts of the programme. Primary research was also undertaken with apprentices.

Evaluation findings

7. As at September 2015, Superfast Cymru had delivered substantial achievements:

- **About 520,000 premises have been passed** by the intervention's superfast services, with 97 per cent of these premises able to access 30Mbps+, and the roll-out is currently on course to meet its target of 691,000 premises passed by summer 2016. Given a six-month delay at the start of the programme owing to State Aid-approval (outside of the control of the Welsh Government), and the challenges associated with Wales' topography, this represents a major engineering and operational achievement.

- **Take-up has been reasonably strong**, with take-up levels standing at 23 per cent in the intervention area by September 2015. Clawback mechanisms (see below) will ensure that coverage can be extended further, alongside the additional coverage enabled by the further funding under the next phase of the programme announced in September 2015. The Welsh Government has recently introduced a take-up target of 50 per cent by 2024, but this may be too low: our surveys suggest that take-up levels in the order of 60 per cent would be realistically achievable in the next two years (i.e. by 2017) for both households and businesses.

- **Business benefits are being realised for those businesses taking up superfast broadband** in the intervention area. Of those 'adopter' businesses surveyed expecting some material benefit from superfast broadband: 74 per cent agreed that their business will save time; 59 per cent agreed that their business will be able to address new market opportunities; 47 per cent agreed that their business will be able to scale-up more easily; and 41 per cent agreed that their business's profitability will improve. When asked how likely it is that superfast broadband will have a positive effect on their business's performance over the next three years, the average score was 6.2 out of 10, with 16 per cent saying that this was absolutely certain (10 out of 10).

- **Significant benefits are being experienced by households taking up superfast broadband** in the intervention area. Of the 70 households interviewed which had taken up superfast broadband: 77 per cent agreed that it would help their household save time (of which 53 per cent agreed strongly); 65 per cent agreed that it would help their household get better access to educational opportunities; 59 per cent agreed that it would help their

household enjoy leisure time more; and 57 per cent agreed that it would help their household feel better connected with friends and family.

- Discounting at 3.5 per cent p.a. over the modelling period to 2024, the Present Value of the total public funding for the programme is approximately £202 million (in 2015 prices), whereas the Present Value of the net GVA impacts over the period is £1,348 million. This gives **a positive Net Present Value of approximately £1.1 billion, and a Benefit Cost Ratio of 6.7**: that is, every £1 of public money invested in Superfast Cymru is expected to generate £6.70 in net economic benefits for Wales over that period.

- **ERDF outputs have largely been met**. With some months left for the delivery of the programme, the formal ERDF targets established for the programme on the creation of 'Open Access Infrastructure Points', and jobs created have been delivered. Further, the perceptions of the apprentices taken on by BT, in support of this programme, have been positive.

8. The evaluation evidence indicates that **overall the programme has been well managed by the Welsh Government**. Key factors included an effective Programme Board, a well-resourced and technically-sound project team, and full engagement with BT in the programme's governance and management: BT's participation on relevant Boards helped to facilitate a 'partnership' approach' to delivery.

9. Other positive elements of the programme's delivery include:

- a dedicated process of cabinet verification and speed checking that may be regarded as 'best practice' and should be considered by other similar programmes across the UK

- a contract with appropriate 'clawback' provisions meaning that once take-up of services using the subsidised infrastructure reaches a certain level, additional funding will be made available from BT for re-investment in extending coverage further

- integrating effectively the skills and workforce development activities into the infrastructure programme, leveraging BTs existing processes.

10. However, the evaluation identified some areas where things could have been done differently in order to improve the programme's effectiveness. Four key issues were identified in the evaluation:

- **Information sharing between BT and the Welsh Government**. The availability of detailed historical and forward-looking information from BT has been a challenge in delivery, and the Welsh Government has been frustrated at times over BT's reluctance to share information. Bearing in mind the extent

of public funding being used for the infrastructure build, greater openness to sharing such information would have been helpful for all concerned – for example, in helping to manage public expectations regarding service availability. This would have been in keeping with the programme's broader spirit of partnership working.

- **The marketing and communications of the programme**. Significant resource has been put into marketing and communications, by BT and the Welsh Government. However, consistent with other reviews of the programme by the Welsh Audit Office and National Assembly, the evaluation indicates that this has been an area of challenge, with issues identified including inconsistency in messaging regarding the timing of roll-out to local areas, and in some cases issues in the communication between BT and Local Authorities and other stakeholders. Arguably a more coherent and strategic approach to marketing and communications may have helped accelerate the socio-economic impacts of superfast broadband, and an appropriately challenging target for take-up would have helped to focus this activity.

- **Lack of visibility on business take-up**. While overall levels of take-up have been reported, the monitoring data is not able to identify the levels of take-up by businesses, which is the primary driver of the intervention's economic impact. The evaluation's survey provides some baseline information on business take-up – estimated at around 28 per cent of businesses for those areas where superfast broadband has been available for at least six months – and this could be built on going forward.

Going forward

11. In light of the findings of the evaluation, we make the following recommendations:

- **Recommendation 1**. The Welsh Government should continue to stimulate demand for superfast broadband, in conjunction with the market. This will help to maximise the social and economic impacts of the intervention, but will also help to pull through further clawback funding.

- **Recommendation 2**. The Welsh Government should re-visit its (recent) target for superfast take-up, and consider setting this at a more ambitious level. A recent Analysys Mason report for BT suggests that superfast take-up could approach 80 per cent of all premises in the UK by 2020.

- **Recommendation 3**. The Welsh Government should consider conducting further surveys – potentially every two years – in order to assess how business take-up is progressing, and what outcomes businesses are

experiencing from using superfast services. This survey work could be considered as part of the Superfast Exploitation Project.

- **Recommendation 4**. The Welsh Government should consider requiring new build developments over a certain scale to have access to affordable superfast broadband services (i.e. without the need for public subsidy).

1. Introduction and methodology

Background

1.1   The rollout of publicly funded superfast broadband forms a key part of the Welsh Government's Digital Wales Strategy, and is a priority for the European Commission through the Digital Agenda for Europe. The Welsh Government made the commitment in its 2011 Programme for Government for all residential premises and all businesses in Wales to have access to next generation broadband by 2015 (now extended to 2016).

1.2   Following an Open Market Review in 2011 that identified over half of premises in Wales would not be covered by the commercial roll-out of superfast broadband services, the Welsh Government established the 'Next Generation Broadband Wales' programme (publicly named Superfast Cymru) to extend superfast coverage to those areas not covered by commercial roll-out.

1.3   Superfast Cymru provides gap funding which is used to stimulate private sector investment into upgrading the infrastructure in those areas that are currently not covered by commercial superfast broadband rollout plans, (the 'intervention area'). The programme secured £205m of public funding, from the 2007-13 ERDF programmes in the Convergence and Competitive regions of Wales, the Welsh Government, and Broadband Delivery UK (part of the UK Department for Culture, Media and Sport and the delivery vehicle for the government's broadband related policies). A further £52m of private investment was committed by BT, the selected commercial delivery partner.

1.4   The Convergence and Competitiveness funding from ERDF involved two separate contracts and Business Plans. However, in reality the programme has been delivered by the Welsh Government and BT in an integrated fashion across the two regions.

1.5   Superfast Cymru aimed to bring superfast broadband at speeds of at least 30 Mbps to 90 per cent of premises across the intervention area, with an additional 5 per cent of premises being capable of accessing speeds of at least 24Mbps. When combined with the commercial roll-out, Superfast Cymru would mean that 96 per cent of all premises in Wales would have access to fibre-based services. The remaining premises would be enabled through targeted schemes such as Access Broadband Cymru (though the scope of Superfast Cymru has recently been expanded to include some of these remaining premises in further phases).

1.6   As part of the programme, BT also committed to recruiting and training 100 apprenticeship placements, and the Superfast Cymru contract allowed BT to

spend up to £1.7 million to raise awareness and stimulate demand from households and businesses, based on a marketing plan agreed with the Welsh Government.

The evaluation

1.7 In May 2015, SQW, working with BMG Research, was commissioned by the Welsh Government to undertake an independent evaluation of Superfast Cymru, focused on the first phase of activity covered by the £205m of public funding (i.e. not the expansion announced in September 2015). This public funding included approved ERDF expenditure of approximately £90m across the Convergence (£80m) and Competitiveness (£10m) respectively.

1.8 The aims of the evaluation established by the Welsh Government were to:

- conduct a comprehensive evaluation of project activity and outcomes against the key performance indicators

- assess the effects of project delivery and processes in achieving project aims and objectives, including an exploration of any best practice, challenges encountered and how they were addressed

- assess the 'added value' of the project for its beneficiaries and stakeholders with regard to the packages of support offered, and to determine the nature of unintended outcomes not covered by the WEFO key performance indicators, including where possible assessing economic impact

- assess the project's delivery and achievement against the cross cutting themes (CCT) aims, objectives and CCT-related indicators outlined in the ERDF Business Plan.

Methodology

1.9 Five complementary strands of research activity have been used to inform this report:

- **A desk-based review of background documentation and data**. Information captured from key documents such as the ERDF Business Plans, and Business Case, was used to populate a project logic model (providing the foundations for the evaluation process), and monitoring data has been reviewed to assess progress and delivery performance.

- **Partner and stakeholder consultations**. Consultations were completed with both representatives of the organisations involved in delivering/funding Superfast Cymru (the Welsh Government, BDUK, and BT) and representatives of external organisations that have been involved with the

programme or have an interest in the roll-out of superfast broadband across Wales (including local authorities, business representative organisations). The consultations have been used to provide qualitative perspectives to the evaluation, including feedback on project management and delivery. Consultees are listed in Annex C.

- **Surveys of enterprises and households**. Telephone surveys were completed with samples of enterprises in the Convergence and Competitiveness regions, and households in the Convergence region, to provide evidence on the level of potential and actual take-up of superfast broadband and the reasons for this, and the effects of superfast broadband. Further details of the surveys are provided below.

- **The development of an impact model**. An Excel-based model has been developed for the period to 2024, to estimate the net economic, social and environmental impacts for Wales.

- **Primary research with BT apprentices**. This involved an online survey of apprentices to provide evidence on their experience of the scheme, and case studies with three apprentices to provide further qualitative insight into apprentices' experience.

Details of the surveys

Enterprise survey

1.10 Telephone interviews were completed with 280 SMEs[1] across Wales. All interviewing took place in September and October 2015, with an average survey length of around 10 minutes.

1.11 The survey frame was drawn from a business database, with the following approaches and sampling factors applied:

- the survey focused on those locations (identified by postcode) in the Convergence and Competitiveness regions where superfast broadband infrastructure had been rolled out by the end of February 2015, providing a minimum of a six-month period for take-up

- a quota was applied to secure an even split in the survey between 'adopters' of superfast broadband and 'non-adopters', with an initial screening question used to identify take-up; note that this means the survey sample is *not* likely to be representative of the business base as a whole

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[1] Private sector firms with up to 249 employees

(with actual take-up by business estimated at around 20-25 per cent in advance of the survey)

- targets were set to ensure that the survey sample was, as far as practical given the quota on adopters/non-adopters, matched to the spatial distribution of firms between the Convergence and Competitiveness areas, with data also recorded on the sector and size of respondents.

1.12 Details of the survey sample are provided in Table 1.1.

Table 1.1: Enterprise survey sample (n=281)

Category	Completions
Adopter status	
Adopters	140
Non-adopters	141
Location	
Convergence area	169
Competitiveness area	112
Employment	
1-4	146
5-9	54
10-49	70
50-249	10
Sector	
ABCDEF: Agriculture, forestry and fishing; Mining and quarrying; Manufacturing; Electricity, gas, steam and air conditioning supply; Water supply, sewerage, waste management and remediation activities; Construction	62
GHI: Wholesale and retail trade, repair of motor vehicles and motorcycles; Transportation and storage; Accommodation and food service activities	110
JKLMN: Information and communication; Financial and insurance activities; Real estate activities; Professional, scientific and technical activities; Administrative and support service activities	79
PQRS: Education; Human health and social work activities; Arts, entertainment and recreation; Other service activities	30

Source: BMG Research

Household survey

1.13 Telephone interviews were completed with 140 households. As required in the specification for the evaluation, the household survey was focused on the Convergence area only (which was the focus of the largest share of public investment by the programme).

1.14 Based on random dialling using area codes (and including both landline and mobile numbers), the survey was again focused on those postcodes where superfast broadband infrastructure had been rolled out by the end of February 2015, and a quota was set to secure even responses from adopters and non-adopters.

1.15 No formal targets were set by geography or the gender or age of respondents. However, households in all 15 local authority areas were included in the survey sample, and the male/female split was even (with 70 completions each). The age breakdown of respondents is set out in Table 1.2.

Table 1.2: Age-group of household survey respondents (n=140)

Age group of respondent	Completions
16-24 years	21
25-44 years	42
45+ years	77

Source: BMG Research

Report structure

1.16 The remainder of this report is structured as follows:

- section 2 provides an assessment of the programme rationale and objectives

- section 3 summarises our assessment of programme inputs and activities

- section 4 assesses progress against intended outputs and take-up

- section 5 assesses progress towards intended outcomes

- section 6 presents our estimates for future net impacts, and for key value for money metrics

- section 7 summarises our conclusions, lessons learned, and recommendations.

1.17 There are four annexes provided in this document: Annex A summarises findings from three case studies with BT apprentices; Annex B contains further findings from the surveys; Annex C lists the study consultees, and Annex D provides an overview of assumptions used in the impact model developed for this evaluation.

1.18 A separate supporting document contains the research tools used in the study (enterprise survey, household survey, apprentice survey, and consultation guides).

2. Assessment of project rationale and objectives

Context and rationale for intervention

Market context

2.1   The UK was one of the most successful countries in rapidly extending broadband availability to a near-ubiquitous coverage level – achieving c.99 per cent coverage of first generation broadband (of at least 0.5Mbps) by the end of 2005. However, after a period in which broadband had been perceived to be 'problem solved' by some, it has now re-gained a high profile as a policy area with the emergence of a new digital divide – again, primarily between urban and rural areas.

2.2   Virgin Media has been at the forefront of market developments, offering a new generation of 'superfast' broadband to households and businesses, using DOCSIS 3.0 technology – rolling out a 50Mbps service from December 2008, and more recently launching a 120Mbps service which is now available across their cable footprint (about half of the UK). Under its competitive strategy, the company has repeatedly upgraded the bandwidths of existing customers, and most of Virgin's broadband customers are now using bandwidths of 30Mbps or more. The company has also announced plans for a major expansion of its cable footprint – albeit this will primarily be in urban areas. Virgin Media has recently increased its top tier residential service to 200Mbps, and will be launching a 300Mbps service for businesses in early 2016.

2.3   BT responded with the introduction of Fibre-to-the Cabinet services (the maximum downstream bandwidths for which are now up to 80Mbps), and Fibre-to-the-Premises services (now offering speeds up to 330Mbps). The company invested about £2.5 billion in order to extend such superfast services to two-thirds of the UK through its commercial roll-out. In terms of future improvements, BT recently announced that it expects to roll-out G.FAST services over the next decade to 'most homes' in the UK, which should provide speeds of up to 500Mbps.

2.4   However, with a high overlap between BT and Virgin Media coverage areas, this left about a third of the UK with little prospect of fixed-line superfast broadband through normal market forces, and facing an ever-worsening digital divide. The unit costs of rolling out infrastructure in areas of lower population density are much higher than those for urban areas, and there was little competitive pressure to do so.

2.5 The problem was particularly pronounced in Wales: Ofcom's Infrastructure Report for 2013 found that only 48 per cent of Welsh premises had access to next generation access services at that point, versus the UK average of 73 per cent.

Policy context, and the programme

2.6 Policy makers at European, UK and Wales levels have recognised that this new digital divide is unacceptable, and would constrain socio-economic development.

2.7 It is increasingly apparent that the ongoing improvements to the quality of broadband infrastructure and services are having important economic impacts. For example, in the UK Broadband Impact Study for DCMS, SQW estimated that faster broadband speeds will add about £17 billion to the UK's annual Gross Value Added (GVA) by 2024. The bulk of this economic impact comes from improvements in the productivity of broadband-using firms, but there are also significant benefits from safeguarding employment in areas which would otherwise be at an unfair disadvantage, from productivity-enhancing time-savings for teleworkers, and from increased participation in the labour force of carers and disabled people.

2.8 There are important environmental impacts too. Allowing for rebound effects (in particular, teleworkers needing to heat their homes in the winter), we estimated that faster broadband will account for about 1.6 million tonnes of carbon dioxide equivalent (CO_2e) savings per annum, by 2024, across the UK.

2.9 In recognition of such important impacts, policy makers have set demanding targets for ensuring that the benefits of better broadband are not restricted to the most densely populated areas.

2.10 At a European level, the Digital Agenda for Europe sets out the goals of extending 30Mbps connectivity throughout Europe by 2020, with 50 per cent take-up of services of 100Mbps or more.

2.11 The UK Government's objectives for broadband have evolved over the last few years: initially setting a target for 90 per cent coverage of superfast (24Mbps+) services, which has since been increased to 95 per cent. This has been taken further in the March 2015 budget, in which the Chancellor of the Exchequer set out an aspiration to extend ultrafast (100Mbps+) services to 'nearly all' premises in the UK.

2.12 Policy-makers in Wales have long recognised the importance of high quality broadband for the nation's socio-economic development, as part of the

'Delivering a Digital Wales' strategic framework, with one of the main pillars of this strategy being the establishment of a 'first class, globally competitive digital infrastructure.

Figure 2.1: The key thematic areas of Delivering a Digital Wales
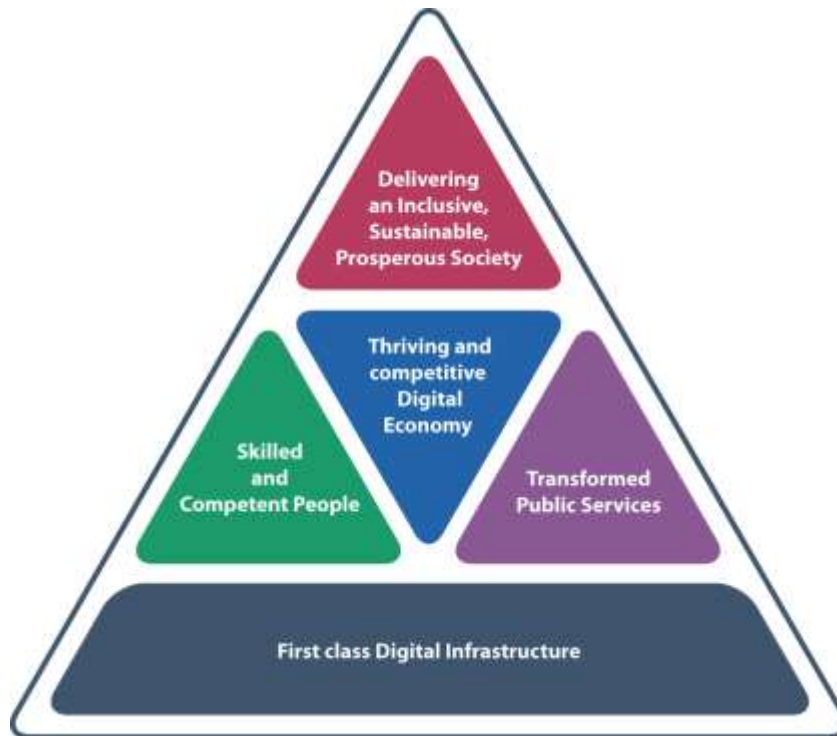
Source: Welsh Government (taken from Competitiveness Business Plan)

Rationale for intervention

2.13   Our assessment is that the rationale for Superfast Cymru (focused specifically on the infrastructure) as publicly-funded intervention in the broadband market, is strong in that it:

- improves the socio-economic efficiency of the broadband market by addressing 'externality' market failures (spillover economic and environmental benefits are not factored into telecommunications companies' roll-out decisions, which are predominantly driven by household demand)

- mitigates an unacceptable digital divide inequity for SMEs and communities in less densely populated areas of Wales.

2.14   The marketing and demand stimulation element of Superfast Cymru also addresses information-related market failures, amongst businesses and households, which may not have sufficient resources to research and understand the benefits of adopting superfast broadband, and of how best to

realise these benefits in their business operations or personal lives, or simply may not have been aware that it was available.

2.15 The evidence from our surveys indicates that a lack of awareness remains a major barrier to take-up of superfast broadband: of the 'non-adopters' surveyed 31 per cent of enterprises, and 44 per cent of households, were unaware that superfast broadband was available to them (despite being located in areas where superfast broadband had been enabled for at least six months at the time of the survey). These data support the 'information failure' argument for the marketing and demand stimulation element of the programme. Further detail of the marketing and communications of Superfast Cymru is provided in Section 3.

Objectives

Core objectives

2.16 The core objectives of Superfast Cymru, as set out in the Business Plans for the Convergence and Competitiveness ERDF contracts, were as follows:

- Seek to ensure that all businesses in Wales have access to next generation broadband[2] by 2015.

- Seek to ensure that all residential premises in Wales have access to next generation broadband by 2015.

- Seek to ensure the ambition for 50 per cent of all residential and business premises in Wales to have access to at least 100Mbps by 2015.

- Ensure a minimum of 300 additional open-access infrastructure points are created in the Convergence region of Wales.

- Ensure a minimum of 50 additional open-access infrastructure points are created in the Competitiveness region of Wales.

2.17 These were supported by a further set of, explicitly 'non-SMART', objectives:

- Ensure there is no retail price difference between urban areas of the UK and rural parts of Wales.

- Ensure retail Internet services are available to end users.

- Stimulate demand and take-up of NGB services.

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[2] Next generation broadband was defined by the Welsh Government as a service providing at least 30Mbps download speeds

- Ensure the bandwidth targets specified above are not simply nominal ('up to') targets achievable only in ideal circumstances (as in first-generation broadband), but that end users will have a high quality of experience.

- Implement activities to support the Welsh Government's Sustainability Agenda, including generating opportunities for job creation, training, apprenticeship, supply-chain benefits for Welsh businesses and suppliers, in addition to energy and environmental aspects that are at the forefront of the project requirements.

- Deliver options as to how the market could improve mobile coverage across Wales, particularly in rural areas for current generation mobile coverage (2G and 3G) and future generation mobile coverage (4G/LTE).

- Deliver options as to how NGBW could be used by the public sector.

2.18   The objectives appear to be broadly appropriate. However, we highlight the following points:

- First, the focus on seeking to ensure that 'all' businesses and residential premises in Wales have access to next generation broadband is consistent with the overall strategic objectives of the Welsh Government, but this was not wholly achievable through the initial phase of the Superfast Cymru programme (i.e. with the £205m public funding). The current contract with BT requires the following levels of premises coverage within the intervention area: 95 per cent at 24Mbps+, 90 per cent at 30Mbps+ and 40 per cent at 100Mbps+. It may have been helpful for these specific targets for the current programme phase to have been more explicit in the public-facing communications on the programme. As with broadband interventions elsewhere in the UK, there has been a degree of ambiguity over 'fibre-based' services versus 'superfast' services in the public announcements re coverage targets (and in Wales there is the added ambiguity as to whether 'superfast' means 24Mbps+ or 30Mbps+).

- Second, the objectives around OAIP (albeit consistent with the indicators defined in the Operational Programme), do not seem to be particularly meaningful or useful, as the numbers of premises addressed by these access points was not specified. We suggest that it would have been better to set ERDF targets for the numbers of premises passed by subsidised infrastructure, rather than the number of OAIPs created.

- Third, it is not evident how a number of the wider objectives would be delivered by, or monitored, by the programme. For example, the programme has no direct ability to influence the retail prices offered by ISPs on the infrastructure developed via the programme, and the objective related to the use of superfast broadband by the public sector is rather ambiguous.

- Finally, although there was an objective to 'stimulate demand and take-up of NGB services' no formal quantified target was initially set for take-up (although the Welsh Government has recently announced – July 2015 – a target of 50 per cent take-up by 2024). As the programme's socio-economic benefits are dependent on Welsh households and businesses actually using the services made available, it may have been helpful to have an explicit quantified target for take-up from the outset. Furthermore, the recently stated target of 50 per cent take-up by 2024 looks rather modest to us: our surveys suggest that take-up levels in the order of 60 per cent would be achievable within the next couple of years, and a recent Analysys Mason report for BT suggests that superfast take-up could approach 80 per cent of all premises in the UK by 2020.

2.19   The contractual requirements under the ERDF contracts were for employment and OAIPs only, specifically:

- Convergence Programme: 150 jobs created, and 300 OAIPs created

- Competitiveness Programme: 50 OAIPs created

Wider skills objectives

2.20   BT committed to deliver the ERDF employment outputs alongside the infrastructure-related obligations, and a set of wider outputs to contribute to developing job skills and opportunities in Wales (with the data recorded under the Convergence ERDF contracts). These objectives were as follows:

- Jobs created (ERDF output): 150, including new entrants (50), and full time equivalent jobs e provided for apprentices (100)

- Full time equivalent jobs safeguarded (non-ERDF output): 320

- Person-weeks of employment to be made available as work experience (non-ERDF output): 900[3].

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[3] One week of work experience was classified as 30 hours of work, generated through 'Adult Work Placement', a BT Group employment volunteering initiative centred on providing local

Logic model

2.21   In evaluating a publicly-funded intervention, it is good practice to develop a 'logic model' which explicitly articulates the context and rationale for the initiative, and describes the relationship between the inputs, activities, outputs, outcomes, and impacts.

- inputs are the resources used by the intervention.

- activities are those tasks undertaken by the intervention.

- outputs are the readily measurable results of those activities.

- outcomes are the benefits attributable to the intervention for its direct beneficiaries.

- impacts are the wider benefits to the economy/society attributable to the intervention.

2.22   A logic model for Superfast Cymru is presented in Figure 2.2. In developing this, the evaluation team has taken a holistic view of the project, within which the aspects of particular relevance (and/or attributable) to the ERDF investment can be separately highlighted (for example, the jobs created and jobs safeguarded through the BT apprenticeship scheme).

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jobseekers with an operational placement in which they can develop both the technical and soft skills essential for sustainable employment. Placements are with Openreach or BT Facilities Services.

Figure 2.2: Logic model for the Next Generation Broadband Wales Programme

Context
- Improvements in UK and international urban bandwidths, through commercial roll-outs of superfast broadband (SFBB) services
- Growing evidence of the importance of broadband in supporting economic growth, necessary to maintain and enhance Wales' competitive economic advantage
- Growing popularity of bandwidth-hungry consumer applications
- Lack of infrastructure-level competition and high unit costs in areas not targeted by commercial providers – more than 50% of premises in Wales were expected to be left unserved by commercial roll-outs.
- Without intervention, this would lead to undesirable outcomes: a growing digital divide, sub-optimal exploitation of connectivity for driving local economic growth and for reducing carbon emissions
- UK Government policy imperative of building world-class connectivity across the UK and EU commitments (via ERDF) to support SME growth and competitiveness
- Welsh Government strategy ('Delivering a Digital Wales') to establish a first class, globally competitive digital infrastructure to support economic development and deliver public services

Intended net impacts
- Reduced digital divide across Wales
- Net GVA from productivity uplift, employment safeguarding, teleworking, and increase labour market participation
- Reduced carbon emissions

Intended outcomes
- 95% of premises with access to superfast broadband infrastructure
- Enhanced productivity for SMEs using subsidised services
- Safeguarding of employment in subsidised areas
- Enhanced productivity of teleworkers, enabled through subsidised superfast broadband services
- Increased labour force participation (e.g. carers, disabled)
- Reduced commuting and business travel
- Increased adoption of energy-efficient cloud-based services
- Increased availability of retail internet services to end users
- Improved attractiveness as a location for inward investment
- Contribution to improving the efficiency of public services (e.g. tele-health)

Rationale for intervention
- Mitigate an unacceptable digital divide inequity for SMEs and communities (including related to access to public services) in areas across Wales not covered by commercial roll-out plans
- Improve the socio-economic efficiency of the broadband market by addressing 'externality' market failures (spillover economic and environmental benefits are not factored into telcos' roll-out decisions, which are predominantly driven by household demand density)

Inputs
- Public capital - £57m BDUK, £90m ERDF, £58m Welsh Government
- Private capital (BT) - £52m
- Total funding - £257m

Activities
- Planning and surveying
- Operational works to implement:
  - Connectivity to core infrastructure and service provider networks
  - Access optical fibre network (Middle Mile)
  - Nodes (OAIPs) for distribution of the NGB network (e.g. Street cabinets)
  - Last mile fibre/copper connectivity to provide access to NGB to the premises
- Programme management, governance and marketing
- BT apprenticeship programme

Intended outputs
- 350 additional open-access infrastructure points (300 in the Convergence region, 50 in the Competitiveness region)
- 655,000 premises passed in the Convergence and Competitiveness regions
- 100 gross apprenticeship jobs created
- 50 gross jobs/associated jobs created

Source: SQW, based on Welsh Government documents

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3. Assessment of project inputs and activities

Inputs

Planned expenditure

3.1   The approved budget for the Superfast Cymru programme covered by the evaluation is £257m, of which £205m is from the public sector. The overall funding profile is broken down by source in Table 3.1.

Table 3.1: Breakdown of programme budget by funding source

	Planned expenditure (£m)	Proportion of expenditure
ERDF	89.5	35%
Welsh Government	58.6	22%
BDUK	56.9	22%
BT	52.0	21%
Total	**257.00**	**100%**

Source: Welsh Government

3.2   Planned activity in the Convergence area accounted for the majority of the public funding, including £80m of the £89.5m of ERDF support, and all of the Welsh Government support. Note that no spatial breakdown of private sector (i.e. BT) expenditure was available.

Table 3.2: Public funding broken down by Convergence and Competiveness area

	Convergence area (£m)	Competitiveness area (£m)	Total (£m)
ERDF	80	9.5	89.5
Welsh Government	58.6	-	58.6
BDUK	41.88	15.02	56.9
Total	**180.48**	**24.52**	**205**

Source: Welsh Government

3.3   The original planned expenditure profile over time for the programme as a whole is set out in Table 3.3; the majority of expenditure was planned for 2013-14 and 2014-15, with the expectation that 91 per cent of expenditure would have been incurred by March 2016. Note that this original profile included expenditure in 2012-13; however, the programme was delayed by six months owing to State Aid issues meaning delivery commenced in the 2013-14 financial year.

Table 3.3: Expenditure profile (public funding)

	2012-13	2013-14	2014-15	2015-16	2016-17
Annual expenditure £m	3.8	63.9	73.4	45.4	18.5
Cumulative expenditure £m	3.8	67.7	141.1	186.5	205.0
Annual % vs total	2%	31%	36%	22%	9%
Cumulative vs total	2%	33%	69%	91%	100%

Source: Welsh Government

Actual expenditure

3.4 Actual publicly funded expenditure had reached £148.3m by September 2015, equating to 72 per cent of the total planned programme publicly funded expenditure. The expenditure by source and over time is set out in Table 3.4. ERDF Competitiveness funding was fully spent by September 2015, reflecting the completion of the infrastructure roll-out in this area by June 2015.

Table 3.4: Actual public sector expenditure by September 2015

	2013 -14	2014-15	2015-16	Total
ERDF - Convergence	12.9	29.1	19.0	61.0
ERDF - Competitiveness	0.9	5.6	3.0	9.5
Welsh Government & BDUK	21.8	34.7	21.4	77.8
Total	**35.6**	**69.4**	**43.4**	**148.4**

Source: Welsh Government

3.5 With only annual data available, an exact assessment of the programme's performance against expenditure plans is not possible. However, assuming that half of the 2015-16 expenditure should have been delivered by September 2015, the indicative planned expenditure by September 2015 is £163.8.

3.6 Actual expenditure of £148.4m is 91 per cent of the indicative planned expenditure; given the delays in the start of the programme and the effects of this on the delivery, 91 per cent of expenditure achieved against the indicative target at this stage appears to be reasonable.

Activities

Procurement

3.7 Consultations undertaken with partners and stakeholders for this evaluation identified some concern over the procurement process. It is beyond the scope

of this evaluation to provide a detailed assessment of the procurement process undertaken for Superfast Cymru, as this has been considered in some detail by the Welsh Audit Office (WAO) in a recent report[4].

The WAO found that the procurement process had been appropriately conducted:

> *'We are satisfied that the Welsh Government maintained a competitive procurement environment throughout the process. Welsh Government officials and external experts examined BT's final bid in May 2012 and although the bid met the minimum requirement and was technically compliant, officials considered that it lacked information in some areas … The Welsh Government asked BT to clarify certain aspects of its bid by providing further information. On the basis of the information supplied by BT, the Welsh Government accepted the bid subject to receiving a detailed project plan from BT.'*

Network roll-out

3.8   Superfast Cymru's agreement with BT was for superfast (24Mbps+) broadband access to be made available to 691,000 premises (95 per cent of the 727,000 premises in the intervention area), with speeds of at least 30Mbps available to 655,000 of these premises (90 per cent of the intervention area premises).

3.9   Whilst some specific 'local' issues were highlighted in our consultations, stakeholders' perceptions of the overall progress on infrastructure roll-out were generally positive – especially given the challenging topography of Wales. We highlight four further points regarding the network roll-out:

- The start of activity was put back by six months owing to delays in obtaining state aid approval from the European Commission; this issue was not related specifically to the Welsh programme, nor the fault of the Welsh Government, and meant that the planned start of the programme in August/September 2012 had to be delayed to February 2013; in turn the Welsh Government and BT amended the agreement and put the date of completion back to 30 June 2016.

- The original intention for the programme was that Fibre to the Premises (FTTP) technology would be used; however, during the procurement phase it became apparent that providing FTTP to all premises was

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[4] Welsh Government investment in next generation broadband infrastructure, Wales Audit Office, May 2015

unaffordable, and the network roll-out of the phase of delivery covered by this evaluation is almost entirely Fibre to the Cabinet (FTTC).

- The Welsh Government has recently announced that, following negotiations with BT, "Fibre on Demand" would be made available across the majority of Wales. This is very welcome, given the role that this service could play in putting rural SMEs on a more sustainable level playing field with their urban counterparts in terms of future broadband speeds. Wales is ahead of the rest of the UK in securing this – although we understand that, as of mid-October 2015, BT Wholesale had not yet lifted its 'stop sell' on Fibre on Demand (i.e. no new orders can be taken) - even though BT Openreach had made the service technically available across the FTTC footprint in Wales.

- As part of the roll-out, the Welsh Government included an independent verification of the cabinets enabled by BT (carried out by a Secure Test and Verification team), with a 20 per cent sample of cabinets tested to ensure that the claimed speeds are delivered and that the cabinets are in the correct location; this verification is a specific innovation to the programme in Wales and regarded by project partners as an example of good practice, providing improved certainty on speeds claimed by BT and helping to maximise value for money, with payment made only on successful verification of the cabinets.

Marketing and communications

3.10   BT was responsible for undertaking marketing and communications of Superfast Cymru based on a marketing plan agreed with the Welsh Government. BT employed three staff to deliver the marketing plan, although consultations suggested this may not have been sufficient given the scale of the programme. The core medium for marketing and communications was the Superfast Cymru website – http://www.superfast-cymru.com – which includes news and updates on the programme, and a searchable map that sets out roll-out plans.

3.11   The marketing and communications elements of the programme were consistently identified by consultees as an area where there was scope for improvement, although the messages were mixed, both positive and negative. Four themes emerged:

- **Inconsistency in messaging regarding the timing of roll-out to areas across Wales** on the Superfast Cymru website meaning that households and businesses were 'disappointed' when the planned roll-out did not occur as planned. The website was updated during the

programme (in mid-2014) to provide more detailed information, but the issue of 'managing expectations' (particularly for households) has remained an issue throughout the delivery phase. It should be noted, however, that this has also been an issue experienced elsewhere in the UK: amendments to roll-out plans are inevitable in a programme of this type, as they are subject to the findings of detailed surveys of local infrastructure, and to specific implementation issues (e.g. wayleaves and road closures). Given the importance of this issue for public perceptions of the programme, it warrants periodic reviews to ensure that the communications on future service availability are being handled as well as possible, from the customer perspective.

- Overall, **there remains some way to go in raising levels of awareness about superfast availability in enabled areas**: this was a qualitative message that emerged from the consultations, and was confirmed in our surveys in superfast-enabled areas. Amongst the non-adopters, 69 per cent of businesses and 56 per cent of households were aware that superfast broadband was available to them, but this leaves 31 per cent of non-adopting businesses and 44 per cent of non-adopting households that were not. As such, there clearly remains a job to be done to ensure that everyone who could potentially benefit is actually aware that superfast services are now available.

- **An initial lack of awareness-raising that the roll-out of the infrastructure did not mean that superfast broadband would be automatically enabled for customers** i.e. that they had to upgrade. Whilst this is a misunderstanding on the part of households and businesses, the feedback from Local Authorities and business representative groups was that more could have been done to make this clearer in the programme's messaging. However, we note two points to contextualise this finding: first, this issue was *not* evidenced in our evaluation surveys, where only one household (and no businesses) reported they had not taken-up superfast broadband because they were expecting the upgrade to happen automatically; second, the issue was recognised in the course of the programme, and the communications were amended to emphasise the point that customers need to place an order for an upgrade in order to receive superfast services.

- **Mixed feedback on the communication between BT and Local Authorities and other stakeholders regarding the programme**. Various activities were put in place in order to provide effective communication with local stakeholders, including a dedicated contact in

BT's marketing team for each Local Authority, and a series of events and workshops across Wales. However, the consultations with local partners identified mixed messages on how effective this was; some consultees felt that the communications were effective, and that local partners were well-informed about the programme, whereas others considered that communications could have been better to ensure that local areas and business groups were able to understand planned activity in their area in order to help stimulate take-up from households and businesses.

3.12 The issue of marketing and communication was also identified in the WAO report from earlier this year, with the report stating that: '*Some local authorities, businesses and residents have not been satisfied with the communication about the Superfast Cymru rollout*'. The recent National Assembly for Wales Public Accounts Committee review of Superfast Cymru also highlighted concerns regarding the marketing of the programme:

> *The Committee believes the communications strategy to support the rollout of Superfast Cymru developed by BT and funded through the Welsh Government contract could have been improved and has, at times been misleading and unhelpfully raised community and business expectations. The Committee noted that some households and businesses have experienced difficulties obtaining information, particularly in relation to whether and when next generation broadband will be available at specific premises.* [5]

3.13 The evaluation evidence suggests that issues with marketing and communication have been recognised by both BT and the Welsh Government, with more resource allocated to marketing as the programme has developed. Given that programmes of this type are inevitably subject to change in their detailed roll-out plans, the communications around the locations and timing of future service availability are absolutely critical. This is an area that warrants continual review, to ensure that the information provided is as accurate, timely and helpful as possible from the customer perspective.

Apprenticeship programme

3.14 The BT Apprenticeship Scheme trains apprentices across different areas of BT's business, enabling individuals to specialise in a range of business and technical roles. Typically, apprenticeships are between two and four years in

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[5] National Assembly for Wales Public Accounts Committee, Welsh Government Investment in Next Generation Broadband Infrastructure, November 2015

duration, and include eight milestones as set out in the diagram below**Error! Reference source not found.**.

Figure 3.1: Apprentice activity overview

Application stage	• Online application form • Includes aptitude tests in numeracy and literacy
Assessment Centre	• Known as the "Hub Day" • Includes a group task, a five minute informal chat and a formal interview
Induction	• Structured three week programme • Week 1: general introduction, health & safety training • Week 2 & 3: on-the-job training across different parts of the business
Work shadowing	• Two month period • Trainee apprentices "buddied" with established engineers/business specialists across the business
Field work	• Trainees expected to gain experience of working independently in the field
Further training	• Further technical training in specialist areas, e.g. fibre and copper technologies
Begin apprentice-ship	• Apprentices provided with a mentor to assist in career development • Also provided with a line manager and an apprenticeship coach • Duration of apprenticeship varies
Assimilation	• At the end of the scheme, apprentices are "assimilated", i.e. formally integrated into the business with a fixed role in a specific area of the business.

Source: SQW, based on consultations and BT

3.15 BT collected data on the characteristics and background of apprentices, with data available on 100 apprentices[6]. This information indicates that the apprentices were overwhelmingly male (98 of the 100), and from a 'white British' background (99 of the 100). As may be expected, the apprentices

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[6] Once the target of 100 apprenticeships provided was met, profile data on apprentices were no longer collected.

were generally young, with 91 aged up to 24, and a small number (8 of the 100) over 25.[7]

3.16   Apprentices most commonly held either NQF Level 2 (equivalent to GCSEs) or NQF Level 3 (equivalent to A-levels) qualifications prior to the apprentice scheme. [8] as set out in Figure 3.2.

Figure 3.2: Highest level of qualification held prior to the scheme
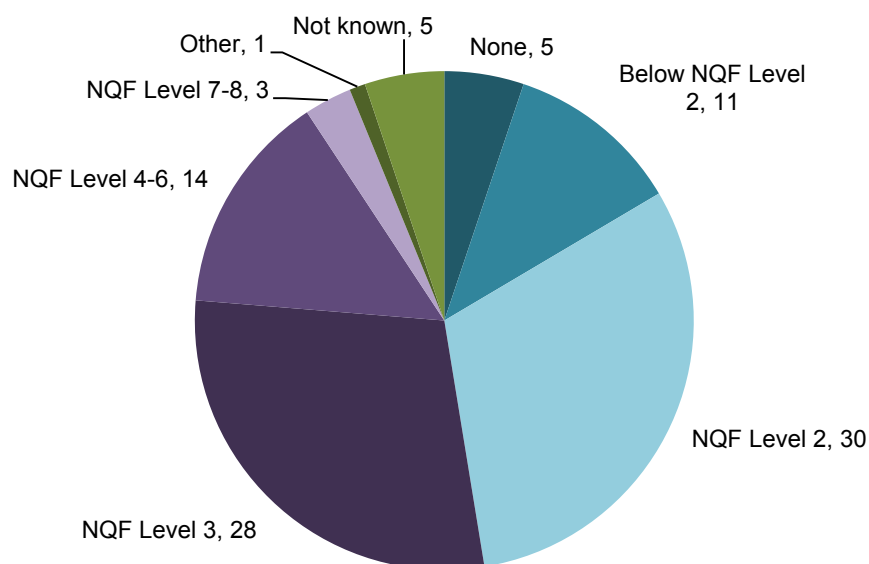
Source: WEFO beneficiary data

3.17   Around one-fifth of the apprentices possessed some Welsh language capability (understanding, speaking, reading or writing Welsh).

3.18   Before starting the apprenticeship, nearly half of the apprentices had been in full-time or part-time employment (40 and 5 respectively) with just one-in-ten unemployed and claiming Job Seekers Allowance. Around a quarter of apprentices were in full-time education prior to entering the scheme.

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[7] Data was not available on age for one apprentice
[8] The data provided to the evaluation team referred to NQFs, although that framework has now been superseded by the Qualifications and Credit Framework (QCF). For further details see http://www.accreditedqualifications.org.uk/qualifications-and-credit-framework-qcf.html

Figure 3.3: Employment status prior to apprenticeship (n=100)
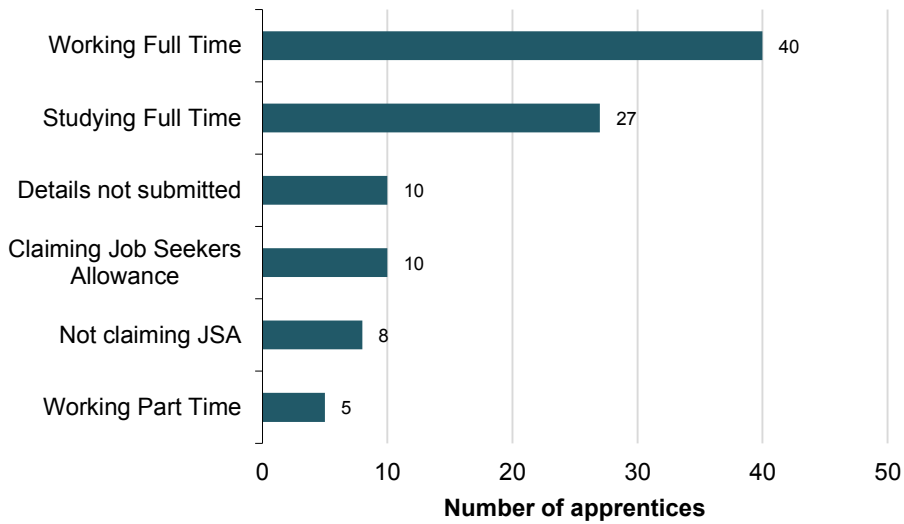
Source: WEFO beneficiary data

3.19   In our online survey of the apprentices (which received 24 responses), the most common reason for getting involved in the scheme was the opportunity to "earn whilst you learn" (and this reason was mentioned by all three apprentices featured in the case studies, outlined in Annex A), but greater job security, a belief this would lead to an increase in pay, and gaining a qualification were also common reasons for involvement.

3.20   The opportunity for a career with BT was also an important factor for over half of those apprentices surveyed, and more commonly cited than wanting a career in the sector more broadly.

Figure 3.4: Reasons for getting involved in the BT apprenticeship scheme
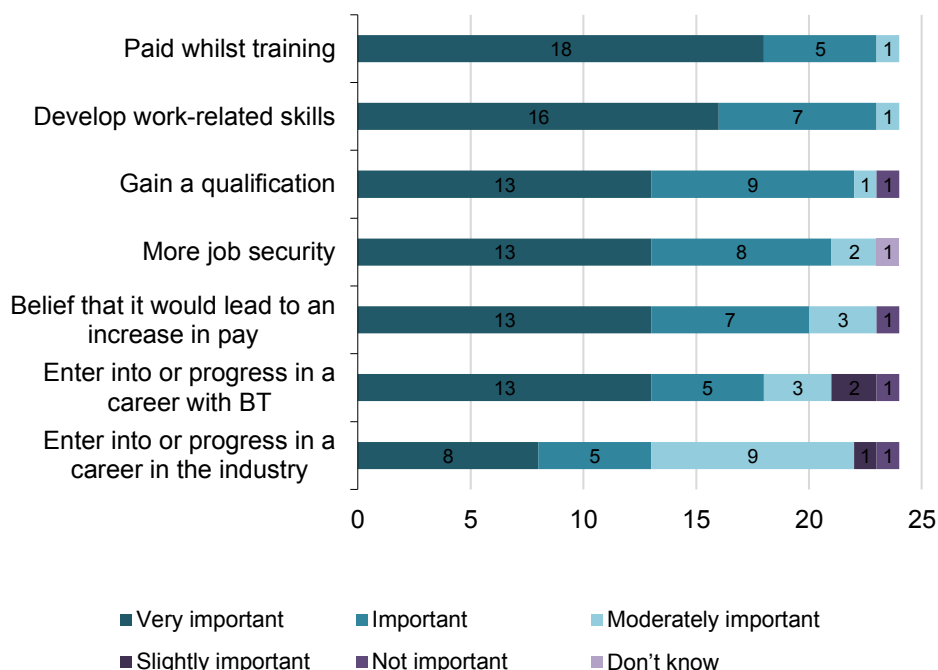
Source: SQW Apprentice Survey

3.21 The perceptions of BT apprentices taken on in support of this programme were broadly very positive, as discussed in section 5 and as illustrated in the case studies in Annex A.

Project governance and management

3.22 The governance of the programme is provided through a Programme Board, meeting on a quarterly basis, and comprising senior representatives from the Welsh Government and (from November 2012) BT. The Programme Board provides the overall strategic direction for the programme.

3.23 There is also an Operational Board which meets monthly, again involving Welsh Government and BT. This provides more 'day-to-day' oversight for the programme, and includes updates on the roll-out, take-up, and marketing/communications.

3.24 The functions of the Programme Board and Operational Board are set out in Table 3.5 and Table 3.6 respectively.

Table 3.5: Function of the Programme Board

- Receive the outcome of senior organisational decisions on the programme and ensure alignment to the organisational strategy
- Manage the overall programme budget received from the organisation
- Resolve programme, commercial or contractual issues which are escalated to the Board and where appropriate, and act as a route for escalation of exception reports to wider organisational governance boards
- Review key decisions on the programme and assess the overall delivery status based on best practice high level information provided by the PMO, give direction to the Programme Manager and provide a further level of quality assurance for defined workstreams
- Track and review costs and delivery of programme benefits
- Receive and monitor lessons learnt
- Oversee the coherence of the programme to deliver the overall objectives
- Manage (inter) dependencies between the constituent workstreams and with other activities/programmes across the organisation, and'
- Manage programme level risks and issues.

Source: Welsh Government, *Terms of Reference for the Next Generation Broadband for Wales Implementation Programme Board*

Table 3.6: Function of the Operational Board

- Oversee the management of the NGBW Programme at an operational level
- Take action and decisions on operational matters
- Referring decisions to Programme Board for approval as deemed appropriate by the Programme Director
- Track and review costs and delivery of project benefits
- Oversee the coherence of the project to deliver the overall objectives
- Manage (inter) dependencies between the constituent workstreams and with other activities/projects across the programme, and;
- Manage programme level risks and issues at an operational level and refer any risks to the Programme Board where appropriate.

Source: Welsh Government, *Terms of Reference for the Next Generation Broadband for Wales Implementation Operational Board*

3.25   Management of the programme at the Welsh Government includes a dedicated team, led by a Programme Director, supported by financial, technical, commercial, project management, monitoring, and communications/marketing staff. Importantly the 'delivery' team at the Welsh Government was put in place following the completion of the procurement process, providing a clear differentiation between those involved in agreeing the contract and delivering the programme. The programme team structure is set out in Figure 3.5.

Figure 3.5: Programme Team Structure
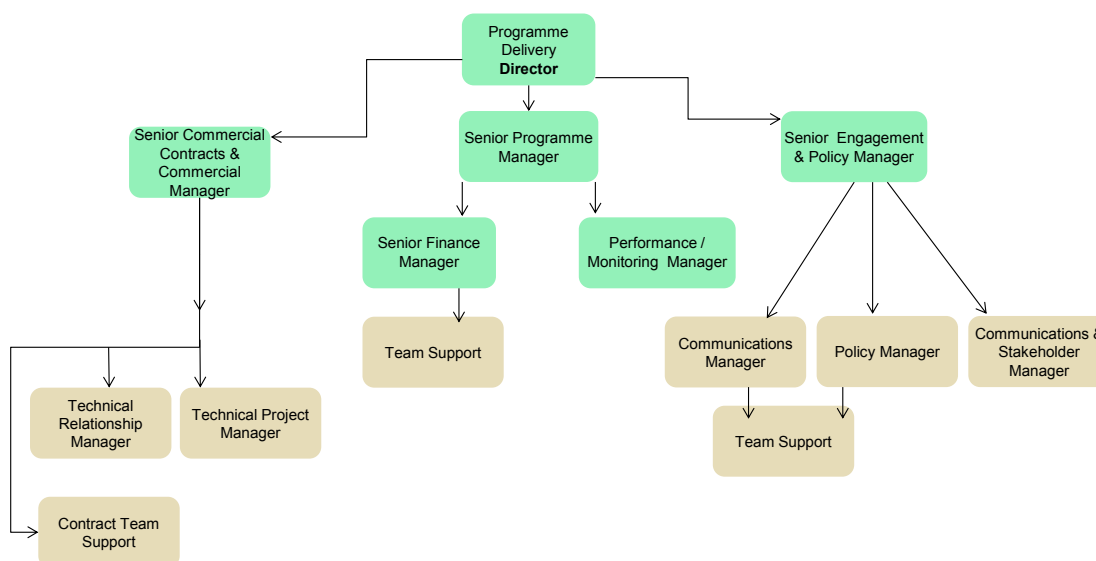
Source: Welsh Government

3.26   Consultations undertaken for this evaluation suggest that the governance and management of the programme has generally worked well, and that it has improved over time as relationships between BT and the Welsh Government have developed. This is consistent with the WAO report from earlier this year.

3.27   The key enablers of the effective governance and management have been:

- shared accommodation between the Welsh Government and BT, helping to generate an atmosphere of collaborative working and engagement

- weekly meetings at Programme Director level from the Welsh Government and BT respectively

- the regularity of other meeting including the Quarterly Strategic Programme Board, and monthly Operational Board.

3.28   However, the evaluation also identified some areas where processes have been less effective. These are primarily around the sharing of information between the Welsh Government and BT. This covers information both on the planned roll-out – including where and when activity will take place – and on the work that has been carried out.

3.29   For example, there has been an on-going debate between the two organisations regarding the sharing of a 'Premises Data Extract' file as required under the Superfast Cymru contract. This file provides detailed information on roll-out plans and levels of take-up, and has been requested by the Welsh Government to provide both important management information,

and to help inform marketing and exploitation activities through spatially detailed information (i.e. data at the level of premises, not postcode). To date BT has not provided this file to the Welsh Government despite it forming part of the contract. We understand that this issue had still not been resolved as at December 2015.

3.30 Sub-optimal sharing of information between BT and the 'client' (in this case the Welsh Government) is not an issue unique to the Superfast Cymru programme. However, this may be more problematic in Wales than elsewhere, as the required information may differ from the standardised sets provided under the BDUK Framework contracts. Given our previous comments regarding perceived weaknesses in managing expectations through communications on the roll-out, and in demand stimulation, we suggest that it is in the interests of both parties to resolve this quickly, in order for the remaining months of the current phase to be as effective as possible.

Cross Cutting Themes

Equality and Diversity

3.31 The Cross Cutting Theme (CCT) of Equality and Diversity in the Convergence and Competitiveness requires projects supported by ERDF to ensure gender equality, equal opportunities and protection from discrimination are embedded throughout the project delivery. In Wales, this commitment includes a provision to support the Welsh language.

3.32 As an infrastructure programme there is limited direct engagement with end beneficiaries where equality and diversity issues are evident. However, examples of the programme's contribution to the Equality and Diversity CCT include the following:

- In 2011 an Equality Impact Assessment of the planned programme was conducted that informed the procurement and delivery, and this was subsequently updated in April 2012; this work informed the Equality and Diversity Delivery Plan for the project.

- Regarding the apprentices, data was collected on information such as gender, age, ability/disability/any health condition, and ethnicity.

- The programme's communications were undertaken in both English and Welsh, and the Superfast Cymru website is available in Welsh. Some examples of Welsh language marketing material are provided below.

Figure 3.6: Examples of use of Welsh language in programme communication

Engineers flyer	Christmas advert
Cabinet Sticker	**Web banner**

Source: Welsh Government

Environmental Sustainability

3.33   This CCT requires environmental sustainability to be built into all aspects of the project. To deliver against this CCT, obligations have been set by the Welsh Government in the grant agreement with BT. The Welsh Government has requested that BT must:

- use reasonable endeavours not to do anything that would have an adverse effect on any Natura 2000 site

- ensure details are provided about measures adopted to minimise energy usage in relation to the Network, and that BT conforms with the requirements of the EC Code of Conduct on Energy Consumption of Broadband equipment

- ensure reasonable endeavours are taken to minimise the impact of waste, and that a Waste Management Plan is generated.

3.34 Further analysis of the effects of the programme on environmental sustainability are provided in section 6, based on the findings of the impact model regarding the *environmental* impacts of faster broadband, and from publicly funded intervention, through teleworking, reduced business travel, and the use of cloud computing.

4. Assessment of achievement against intended project outputs, and take-up

Premises passed

4.1　Total Premises Passed (TPP) in Wales had reached 521,442 (with 24Mbps+ service) by September 2015. This represents 75 per cent of the total target of 691,000 premises passed with 24Mbps+ superfast services. The data suggest that the programme is on track to achieve the targets (of 655,000 with 30Mbps+ and 691,000 with 24Mbps+) by the contractual deadline of June 2016.

**Figure 4.1: Total Premises Passed in Wales, June 2013-September 2015**
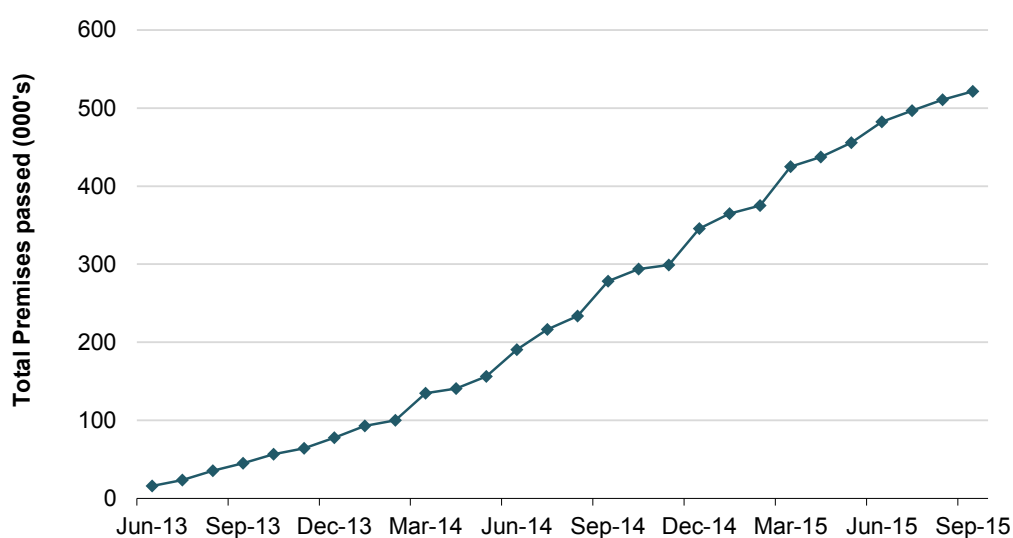
Source: Welsh Government

4.2　Of the 521,442 premises passed by September 2015, 97 per cent (approximately 506,000 premises) are able to access speeds of at least 30Mbps.

4.3　Around 80 per cent of the 521,442 premises were in the Convergence region and the remaining 20 per cent were in the Competitiveness region (see Figure 4.2).

Figure 4.2: Total Premises Passed in the competitiveness and convergence regions, Q1 13/14 to Q2 15/16
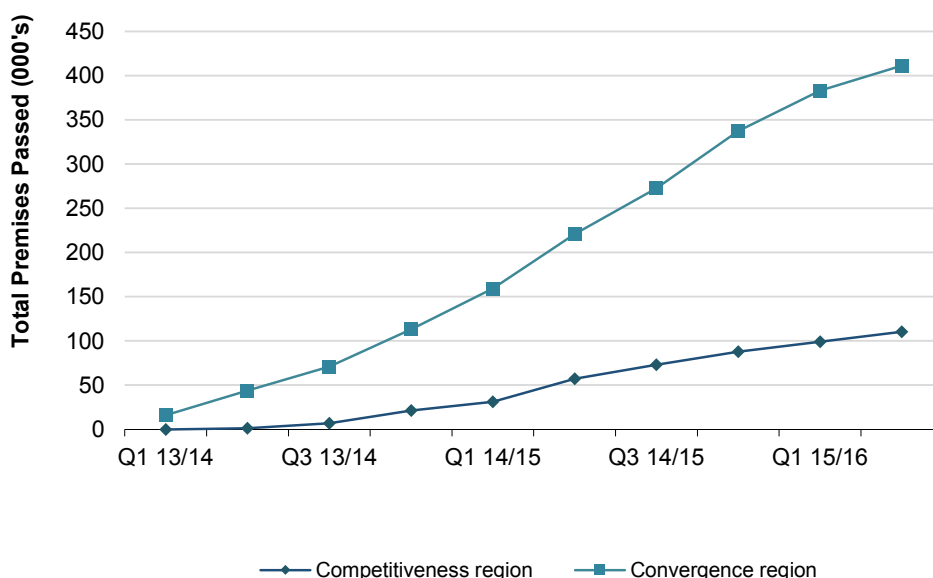
Source: Welsh Government

Open Access Infrastructure Points

4.4   The ERDF Business Plans for the Competitiveness and Convergence regions established targets of 50 and 300 Open Access Infrastructure Points (OAIPs) respectively; OAIPs are infrastructure installations and equipment which are open to all operators and service providers.

4.5   The number of OAIPs delivered by September 2015 is set out in Table 4.1; the target has been over-delivered by some margin in the Competitiveness region, and the programme is expected to achieve the target in the Convergence region, with 81 per cent achieved by September 2015. However, as noted in section 2, in our view the number of OAIPs created was not a particularly meaningful indicator of the performance of the programme.

Table 4.1: OAIPs delivered by September 2015

	Target	Actual	% target achieved
Convergence	300	244	81%
Competitiveness	50	125	250%
Total	**350**	**369**	**105%**

Source: Welsh Government

4.6 The breakdown of OAIPs delivered by local authority area is set out in Table 5.2, with delivery in all local authorities across Wales, but particularly in the most rural parts of the country such as Powys (Competitiveness) and Gywnedd (Convergence).

Figure 4.3: OAIPs delivered by September 2015 by Local Authority District

Convergence region

Local Authority	Number of OAIPs
Gwynedd	43
Carmarthenshire	26
Ceredigion	24
Denbighshire	22
Pembrokeshire	20
Isle of Anglesey	20
Conwy	15
Rhondda Cynon Taff	15
Swansea	14
Neath Port Talbot	13
Caerphilly	12
Bridgend	8
Blaenau Gwent	6
Torfaen	4
Merthyr Tydfil	3

Competitiveness region

Local Authority	Number of OAIPs
Powys	52
Flintshire	18
Monmouthshire	16
Wrexham	14
Vale of Glamorgan	11
Newport	11
Cardiff	3

Source: Welsh Government

Other outputs

4.7 As set out in section 2, the programme has various employment-related targets for jobs created and safeguarded, jobs for apprentices, and person-weeks of employment. These outputs are principally associated with employment at BT. However, the jobs safeguarded indicator includes both jobs safeguarded at BT through the programme, and wider jobs safeguarded in businesses benefiting from the infrastructure.

4.8 The outputs delivered by September 2015 are set out in Table 4.2; all outputs except jobs safeguarded have been delivered in full. Information from the Welsh Government indicates that a survey will be undertaken with external businesses at a later date in order to obtain further information on jobs safeguarded.

**Table 4.2: Progress against employment-related outputs as at September 2015**

	Target	Actual	% target achieved
Full time equivalent jobs created	50	105	210%
Full time equivalent jobs safeguarded	320	124	39%
Full time equivalent jobs to be provided for apprentices	100	123	123%
Person-weeks of employment to be made available as work experience	900	992	110%

Source: Welsh Government

Take-up

4.9   As noted in Section 2, no formal targets were set by the Welsh Government for take-up of superfast broadband. However, it is the extent to which households and businesses across Wales actually use the subsidised infrastructure that is the most important determinant of the socio-economic outcomes of the programme. The take-up data are therefore very important.

4.10   The contract with BT also included a 'clawback' schedule through which Welsh Government receives funding back from BT, if actual capital expenditure turns out to be lower than expected, or if take-up exceeds a specified threshold. This will provide a future funding stream for re-investment in broadband technologies helping the Welsh Government to continue to extend and improve the reach of fibre broadband or to invest in other technologies.

Figure 4.4: Percentage take-up of superfast broadband in the intervention area (as per cent of premises passed), December 2014 to September 2015
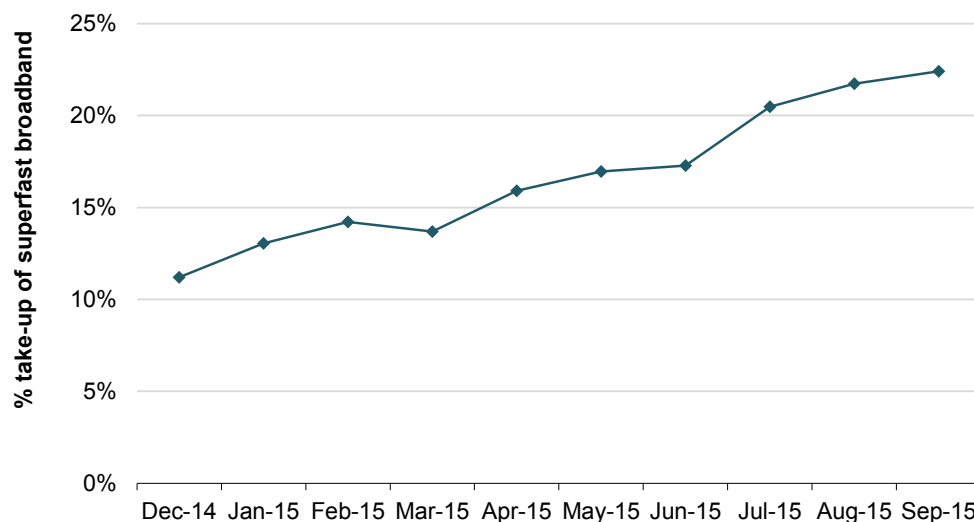
Source: Welsh Government

4.11 Take-up across the intervention area by Local Authority District is set out in Table 4.3. This highlights the significant variations in take-up, ranging from around 15 per cent in Conwy, Carmarthenshire and Monmouthshire, up to nearly 50 per cent in Cardiff, with high levels of take-up also in other urban areas such as Swansea and Newport.

4.12 For context, Table 4.3 also shows data from Ofcom for the level of take-up of superfast broadband in each local authority in 2013 i.e. before the majority of the infrastructure was completed.

4.13 These two metrics cannot be compared directly – the Ofcom data cover Local Authority Districts as a whole, not just the intervention area. However, they highlight how quickly the programme has captured the pent-up demand for faster broadband in those areas which were previously unserved, such as Powys, Merthyr Tydfil, Ceredigion, and Pembrokeshire. For example, by September 2015 intervention area take-up in Merthyr Tydfil was around one-third of premises passed: a major achievement given that Ofcom reported zero superfast availability and take-up here in 2013.

Table 4.3: Take-up of superfast broadband by local authority area, September 2015

Location	% take-up in intervention area (of premises passed)	% take-up across Local Authority District in 2013
Competitiveness region		
Cardiff	47.7	32.2
Newport	41.4	26.5
Vale of Glamorgan	29.4	21.8
Flintshire	27.3	9.5
Wrexham	21.8	6.7
Powys	16.5	0.0
Monmouthshire	15.4	6.6
Convergence region		
Swansea	36.4	25.2
Merthyr Tydfil	32.7	0.0
Gwynedd	30.4	1.3
Anglesey	29.4	0.8
Ceredigion	25.5	0.0
Pembrokeshire	24.1	0.0
Denbighshire	20.3	1.4
Neath Port Talbot	19.8	20.3
Blaenau Gwent	19.2	0.2
Torfaen	19.0	11.0
Bridgend	18.9	9.8
Rhondda Cynon Taf	17.5	9.0
Caerphilly	15.9	7.7
Conwy	15.2	0.1
Carmarthenshire	14.6	0.6

Source: Welsh Government and Ofcom

Take-up relative to other areas

4.14   In its role as the lead for the UK Government's superfast broadband programme, BDUK publishes data on take-up of all superfast broadband projects across the UK that have received BDUK funding. This data can be used to provide a sense of the relative performance of the Superfast Cymru programme on take-up, although it is important to note that the programmes are all at different stages, and address areas with very different socio-economic and spatial characteristics.

4.15   Take-up levels in September 2015 across all relevant local areas are set out in Figure 4.5, which illustrates that take-up in Wales is now amongst the highest across the UK, at 23.1 per cent (a marked improvement from the position in the equivalent data for June 2015). These latest take-up figures are very encouraging, and provide evidence on the effect that the programme is now having in ensuring that Wales benefits from the subsidised infrastructure.

Figure 4.5: Take-up in intervention areas – September 2015
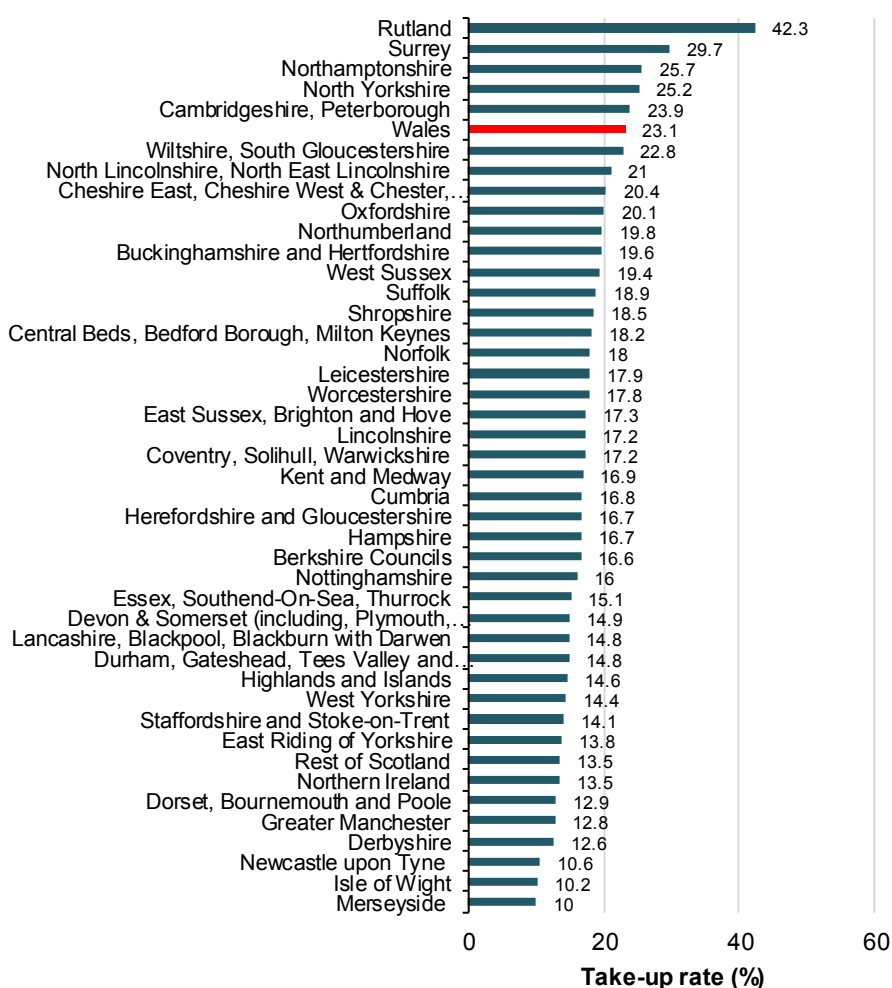
Source: Broadband Delivery UK (BDUK): Table of local broadband projects

Evidence from the survey on take-up

4.16 The surveys of businesses and households completed for this evaluation provide two further perspectives on take-up:

- evidence on existing business take-up drawing on both the completed responses and the calls made in achieving the quota of 'adopters'

- evidence on potential future take-up from non-adopters, businesses and households.

Existing business take-up

4.17 As set out in section 1, a survey quota was set to deliver a 50/50 split of adopters and non-adopters. To achieve this quota it was necessary to 'screen out' non-adopters once the non-adopter quota had been reached. Using the data from the call outcomes, this enables us to estimate that the level of business take-up is approximately 28 per cent in the intervention area (where roll-out has been completed), as shown in Table 4.4.

Table 4.4: Call outcomes data

Category	Value
Adopters – completed	140
Non-adopters – completed	141
Non-adopters – screened out	218
Total business with evidence on take-up	499
Adopters as % total	**28%**

Source: BMG Research and SQW analysis

4.18 This is broadly in line with the levels of business take-up that SQW has observed in other recent superfast broadband evaluations.

Future take-up

4.19 The surveys of enterprises and households (in those areas where the infrastructure had been rolled-out for at least six months), asked respondents how likely they were to take-up superfast broadband in the next two years. The findings for enterprises are presented in Figure 4.6.

Figure 4.6: Likelihood that non-adopter businesses will upgrade to superfast broadband in the next two years (n=141)
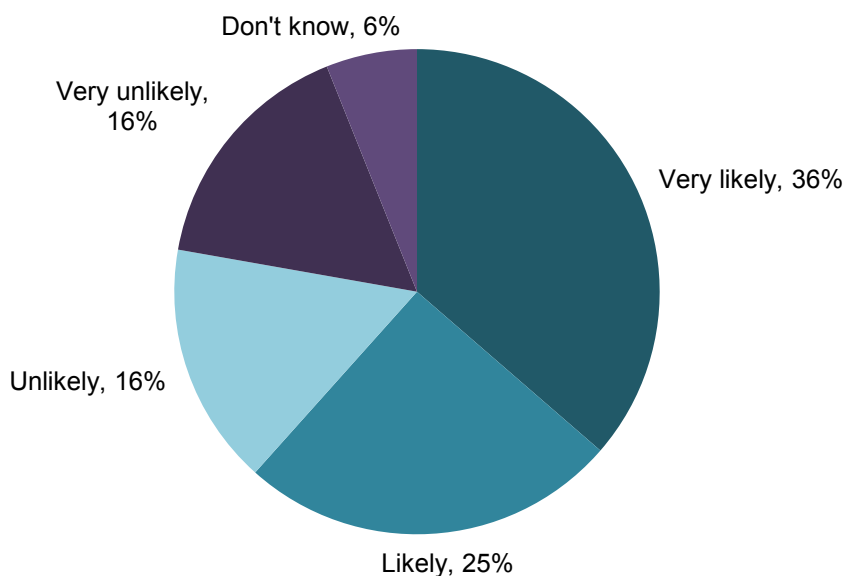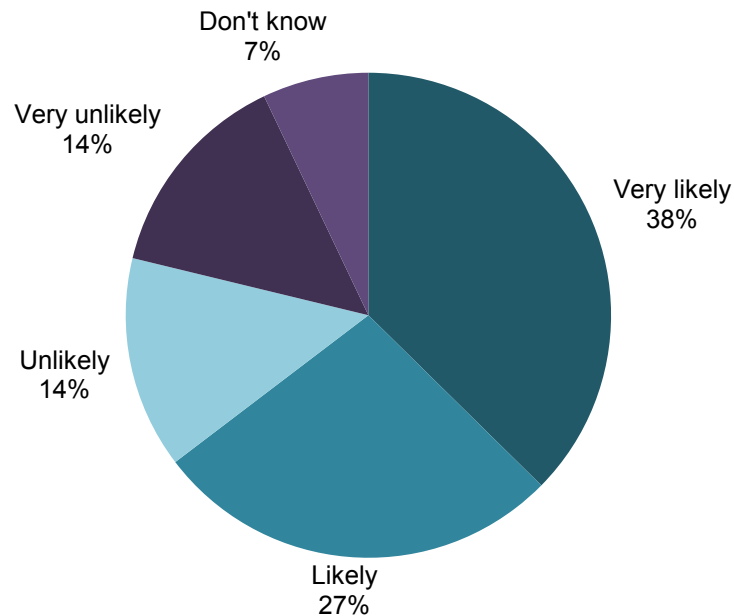

Source: SQW/BMG Welsh Enterprise Survey

4.20   As shown above, the survey results are encouraging regarding future take-up: over 60 per cent of non-adopters considered it very likely (36 per cent) or likely (25 per cent) that their business would upgrade in the next two years. The likelihood of upgrading was significantly higher for businesses with 10-49 employees (74 per cent very likely/likely).

4.21   Turning to households, the equivalent survey findings are set out in Figure 4.7. The findings are similar to those from the survey of businesses, with 65 per cent of non-adopters considering it very likely (38 per cent) or likely (27 per cent) that their household would upgrade in the next two years.

Figure 4.7: Likelihood that non-adopter households will upgrade to superfast broadband in the next two years (n=70)

Source: SQW/BMG Welsh Household Survey

4.22 Overall, the survey findings suggest that take-up levels in the order of 60 per cent would be realistically achievable over the next two years (i.e. by 2017) for both households and businesses. This would also be consistent with Analysys Mason's projections for UK superfast take-up in their recent report for BT.

5. Assessment of wider project outcomes

Outcomes for businesses

5.1 Evidence from the survey suggests that take-up of superfast broadband has led to, or is expected to lead to, a range of behavioural changes amongst businesses across Wales. In addition, the perceived impact on business performance has been broadly positive, both in qualitative and quantitative terms.

5.2 The key findings relate to these business outcomes are set out below; the focus is principally on the 'adopters' from the enterprise survey, but further details of feedback from non-adopters is provided in Annex B.

Effects on business behaviour

5.3 The vast majority (89 per cent) of adopters reported an actual or expected change in business behaviour of some kind as a result of upgrading to superfast broadband. The most common change in behaviour related to sending or receiving large files more frequently, making more use of social-media for business purposes, and/or more use of cloud-based services. Less common were behaviour changes related to doing more with e-commerce, making more use of video-conferencing and re-locating the firm's IT equipment.

Figure 5.1: Response to: 'As a result of the upgrade to superfast broadband at this site, which if any of the following changes apply to your business?' (n=140)
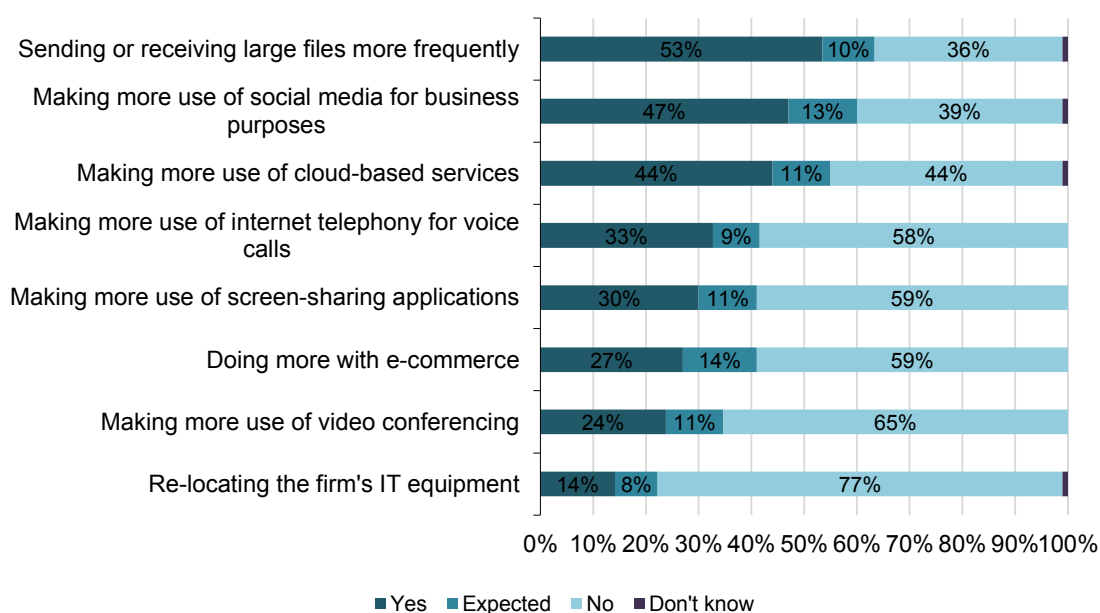
Source: SQW/BMG Welsh Enterprise Survey

5.4   These changes are broadly consistent with the drivers for take-up of superfast broadband across the survey, with around half of adopters citing issues related to speed as the reason for take-up. Other reasons included reliability and perceived business necessity.

Effects on business performance

5.5   Further to the changes in behaviour, adopters were asked whether superfast broadband will have a positive effect on their business's performance over the next three years, on a scale of 0 to 10, where 0 means that there is no chance of this, and 10 means that this is absolutely certain.

Reasons for take-up

'The old Internet connection was very slow, and our managers need to upload files, so we changed to superfast for the speed.'

'Because we upload and download files constantly and also to meet business needs. Most of [the business's work] is commissioned online so the use of Internet is important to do this.'

5.6   The findings are set out below. The average score was 6.2 out of 10, with almost 80 per cent of adopters surveyed providing a score of at least 5 out of 10. Note that positive material effects were less likely to be expected by the smallest firms (those with 1-4 employees), where the average was 5.6.

Figure 5.2: Likelihood that superfast broadband will have a material positive effect on business performance over the next three years (n=140)
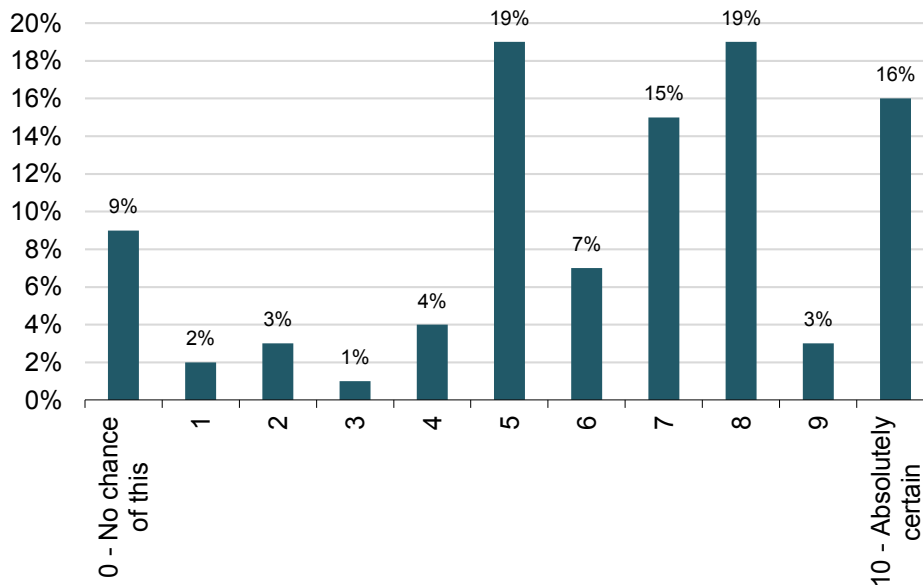
Source: SQW/BMG Welsh Enterprise Survey

5.7   When asked about how these material benefits would be realised, businesses identified time savings and new market opportunities (within the UK) as the most common areas for material impacts. Less commonly cited benefits were around new opportunities for selling to customers outside of the UK, and reductions to businesses' environmental impacts (Figure 5.3**Error! Reference source not found.**).

Figure 5.3: The potential benefits of superfast broadband for businesses (n=127)
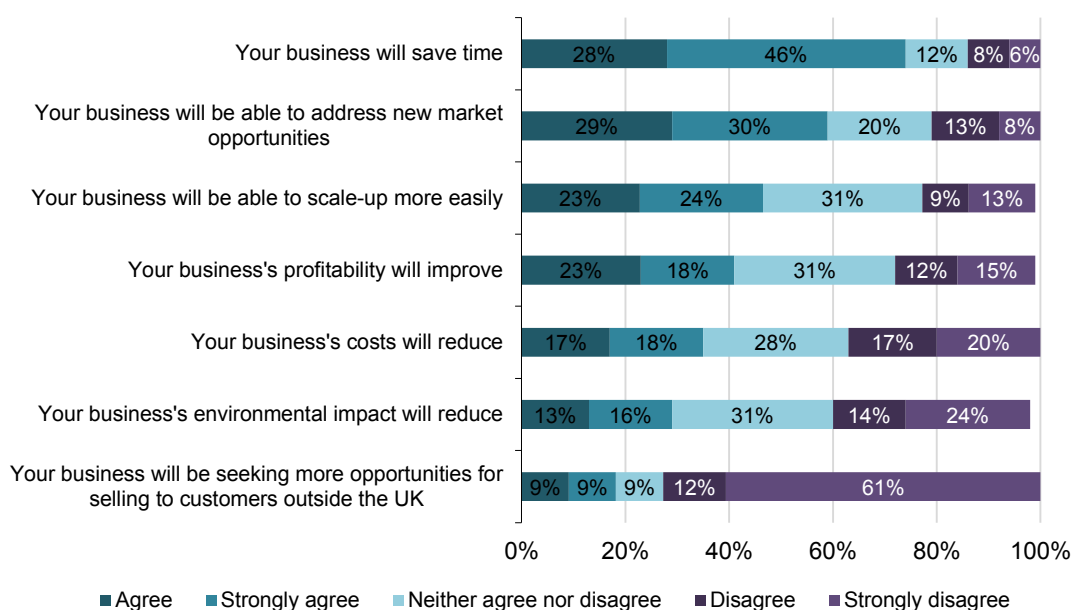
Source: SQW/BMG Welsh Enterprise Survey

5.8   Of those adopter businesses expecting some material benefit from superfast:

- 74 per cent agreed that their business will save time

- 59 per cent agreed that their business will be able to address new market opportunities

- 47 per cent agreed that their business will be able to scale-up more easily

- 41 per cent agreed that their business's profitability will improve.

5.12 Consistent with the initial driver for take-up, the most commonly cited 'most beneficial aspects of having superfast broadband' were the speed, time savings, and the ability to download or upload files more easily.

5.13 Further to the qualitative responses set out above, adopters were also asked to provide quantitative estimates of the likely impacts of superfast broadband on business turnover and employment levels.

5.14 Of the 127 respondents expecting some material benefit from superfast broadband, 43 per cent considered that their turnover would increase as a result over the next three years (Figure 5.4).

The most beneficial aspects of superfast broadband

'Biggest difference is that general Internet is more reliable and improved in size relating to video conferencing. Also there are no drop outs.'

'Cloud based activities are great, and I have changed my account package so it allows me to access it from home. The upload and download speed as also very beneficial.'

Figure 5.4: Response to 'Do you think that the benefits of superfast broadband will lead to your business's annual turnover at this site being greater than it would have otherwise been over the next three years (that is, by 2018)?' (n=127)
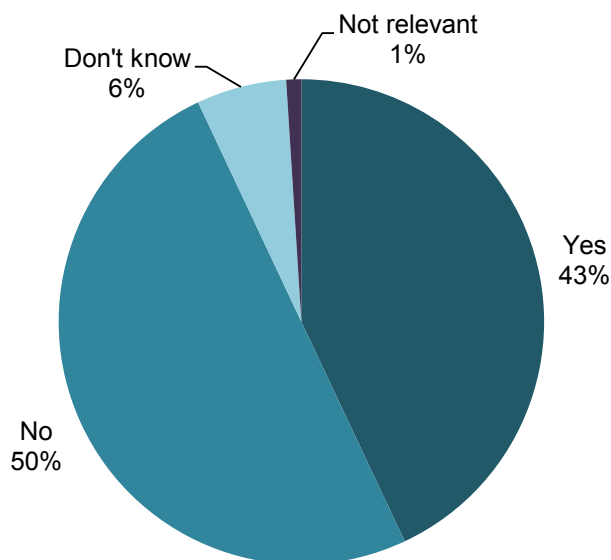
Source: SQW/BMG Welsh Enterprise Survey

5.15 Encouragingly, the businesses that had had superfast broadband for longest were the most positive about the potential turnover impacts: as set out in Table 5.1, for those businesses that had superfast broadband for over six months the proportion reporting that superfast broadband will lead to increased turnover was 54 per cent, compared to 29 per cent for those that had taken-up superfast broadband in the last six months.

Table 5.1: Response to 'Do you think that the benefits of superfast broadband will lead to your business's annual turnover at this site being greater than it would have otherwise been over the next three years (that is, by 2018)?' Split by time of take-up

	Last six months (n=41)	Over six months (n=80)
Yes	29%	54%
No	66%	37%
Don't know	5%	7%
Not relevant	0%	1%

Source: SQW/BMG Welsh Enterprise Survey

5.16 For the firms that did expect changes in turnover in the next three years, the scale of this varied substantially. Most commonly, firms thought their annual turnover will be up to £5,000 higher in three years' time as a result of superfast broadband. However, more significant effects were also reported by six firms (of the 55 that provided quantified estimates) which estimated that their turnover would be over £50,000 higher in three years' time as a result of superfast broadband.

Figure 5.5: The extent to which business turnover would be lower without the benefits provided by superfast broadband (n=55)[9]
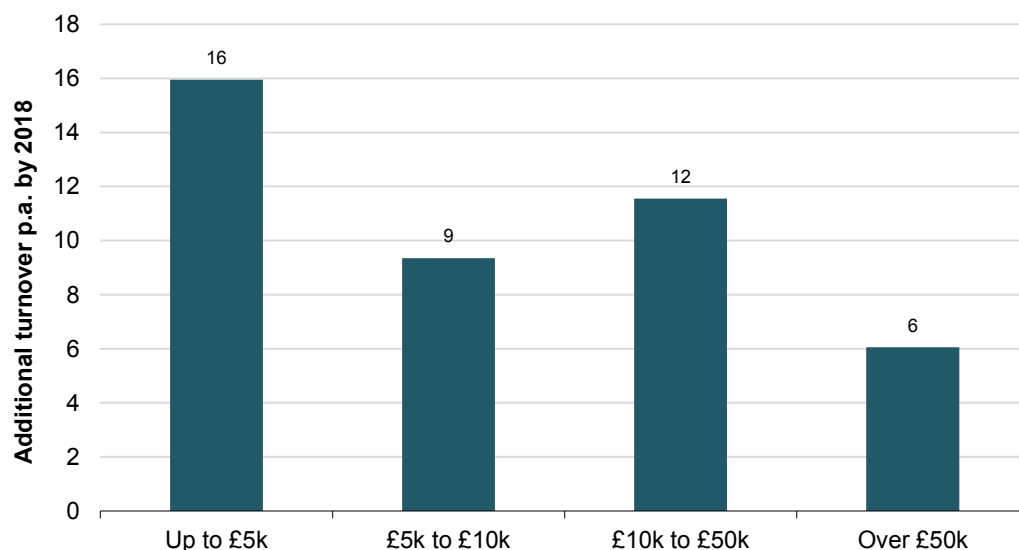
Source: SQW/BMG Welsh Enterprise Survey

5.17   The potential effects on *employment* were more modest. Of the 127 firms that reported potential material effects of superfast broadband, just 9 per cent reported that they are *currently* employing more people in Wales than they would have otherwise without superfast broadband, and 25 per cent expected that superfast broadband would lead to an increase in employment in their business in the next three years (Figure 5.6). Again, the businesses that had had superfast broadband for longest were the most positive: 30 per cent of firms that have had superfast broadband for over six months (n=80) reported expected employment effects compared to 20 per cent for those taking up superfast broadband in the last six months (n=41).

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[9] 24 businesses responded with 'don't know'.

Figure 5.6: Response to 'Do you think that the benefits of superfast broadband will lead to your business employing more people in Wales than you would have otherwise, over the next three years (that is, by 2018)?' (n=127)
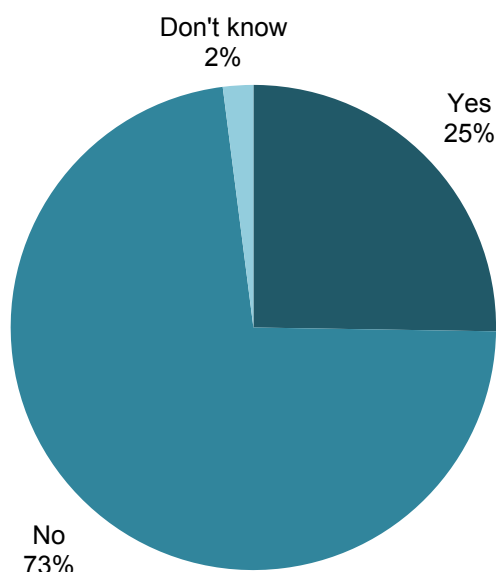
Source: SQW/BMG Welsh Enterprise Survey

5.18   Of the 32 firms that reported they would employ more people in three years' time as a result of superfast broadband, this was most commonly expected to be one more employee (eight firms) or two more employees (seven firms).

Outcomes for households

5.19   The survey of households found that superfast broadband has also resulted in a number of behavioural changes and benefits for households. The key findings related to households are set out below; again, the focus is on the adopters, further information on the feedback from non-adopters is provided in Annex B.

Effects on household behaviour

5.20   The adoption of superfast broadband has enabled households to increase their broadband usage in a variety of ways, set out in Table 5.2. The most common areas where usage has increased are in the streaming or downloading of video entertainment, general surfing of the web, and online purchasing of products or services.

Table 5.2: Ways in which SFBB has changed behaviours (n=70)

	Currently use and increase in usage since having superfast	Currently use and no change in usage since having superfast	Currently use and decrease in usage since having superfast	Don't use
Streaming or downloading video entertainment	55%	23%	3%	19%
General surfing of the world wide web	54%	41%	4%	1%
Buying products or services online	44%	54%	1%	1%
Sending or receiving large files	39%	33%	0%	29%
Streaming or downloading audio files	37%	33%	1%	29%
Social media websites	33%	50%	3%	14%
Internet video calls	31%	29%	3%	37%
Uploading video or photos to websites	29%	44%	0%	27%
Accessing online educational content	27%	40%	4%	29%
Online banking	27%	57%	0%	16%
Online backups of files held on computer(s)	26%	40%	0%	34%
Internet telephony for voice calls	26%	27%	1%	46%
Playing online games	26%	27%	3%	44%
Accessing information and services on government websites	23%	59%	1%	17%
Downloading other computer software	23%	43%	3%	31%
Downloading ebooks	21%	27%	1%	51%
Downloading game software	19%	29%	4%	49%
Accessing health-related information and services online	14%	56%	4%	26%

Source: SQW/BMG Welsh Household Survey

5.21 Of these results, arguably the most interesting is the large proportion of adopter households (44 per cent) reporting an increase in the extent to which they buy products or services online, which suggests that superfast broadband is playing an important part in driving the ongoing growth in online shopping.

5.22 There is also some evidence from the survey of a positive relationship between superfast broadband and home working:

- Levels of home working were higher for adopter households (where 35 per cent of households had someone working from home), than for non-adopter households (where the equivalent figure was 18 per cent); note that 9 per cent of adopters cited home working as a reason for taking-up superfast broadband.

- Of those households that included a home worker (n=17), a third reported that the amount of time this person works from home has increased since the upgrade to superfast broadband; although the numbers here are modest, in aggregate terms this means that superfast broadband had facilitated increased home working for around 9 per cent of the surveyed adopters (i.e. six of the 70).

Household benefits

5.23 Upgrading to superfast broadband has led to a range of benefits for households. The most common ways in which benefits have arisen include time savings, improved access to educational opportunities, better quality leisure time and increased connectivity with family and friends (see **Error! Reference source not found.**).

5.24 Of the 70 households interviewed which had taken up superfast broadband:

- 77 per cent agreed that it would help their household save time (with 53 per cent agreeing strongly)

- 65 per cent agreed that it would help their household get better access to educational opportunities

- 59 per cent agreed that it would help their household enjoy leisure time more

- 57 per cent agreed that it would help their household feel better connected with friends and family.

Table 5.3: The potential benefits of superfast broadband for businesses (n=127)

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	Don't know
Save time	53%	24%	9%	4%	10%	0%
Get better access to educational opportunities	26%	39%	21%	4%	7%	3%
Enjoy leisure time more	37%	23%	29%	3%	9%	0%
Feel better connected with friends and family	33%	24%	26%	9%	7%	1%
Feel better connected with people with similar interests	19%	34%	29%	4%	14%	0%
Get better access to government services	17%	33%	36%	4%	7%	3%
Get better access to employment opportunities	29%	20%	30%	4%	9%	9%
Achieve a better work/life balance	20%	26%	26%	11%	11%	6%
Save money	23%	20%	26%	14%	14%	3%
Keep computer files more securely	20%	17%	30%	13%	9%	11%
Reduce the need to travel by car or public transport	21%	13%	27%	17%	21%	0%
Feel better connected with your local community	9%	16%	47%	17%	10%	1%

Source: SQW/BMG Welsh Household Survey

5.25 Overall, a large majority (79 per cent) of adopter households agreed, or strongly agreed, that upgrading to superfast broadband had been a good thing for their household (Figure 5.7).

Figure 5.7: Response to 'Overall, to what extent do you agree with the statement: 'Upgrading to superfast broadband has been a good thing for your household'?' (n=70)
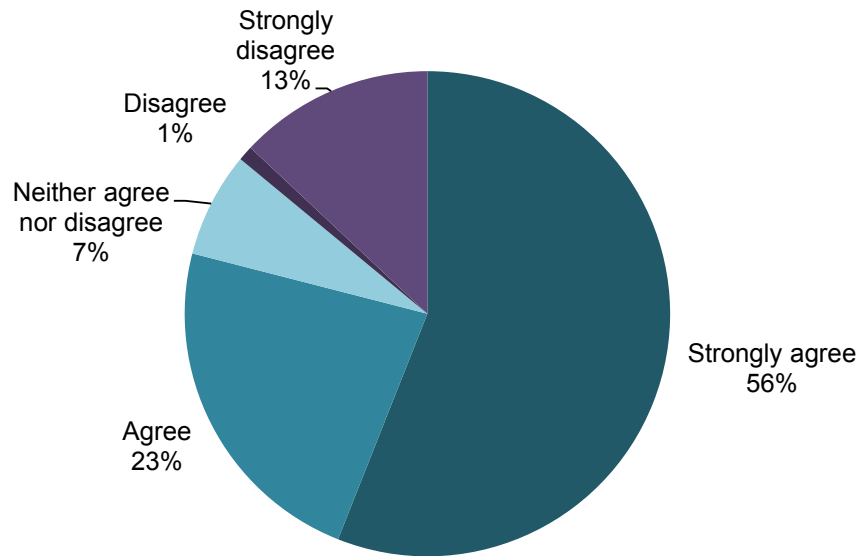
Source: SQW/BMG Welsh Household Survey

5.26　When asked what the 'worst thing about having superfast broadband' was, over half of households (53 per cent) responded 'nothing', 19 per cent cited the cost, and 11 per cent mentioned issues with speed or reliability. By contrast, saving time and the ease of uploading and downloading were the most frequently cited 'best thing' about superfast broadband.

Speed, satisfaction, and support

5.27　Both surveys asked questions on satisfaction with connection speeds and the nature of support that could be provided by the Welsh Government to help businesses and households get the most out of superfast broadband. The enterprise survey also sought evidence on connection speed.

The best thing about superfast broadband

'You don't have the frustration about quickly checking little things like online banking; [it's a] five minute job on the Internet now, when it used to take half an hour.'

'The reliability and the speed is best. I work with media so it's easier to download things quicker. The speed of playing online games is stress free.'

'When I look at broadcasts they load up faster. When I download books from the Internet with ordinary broadband it would take ages but with high speed it downloads in seconds'

Enterprises

5.28　Respondents were asked if they were able and willing to perform a 'speed test' on their computer by logging on to a website[10] and getting a measurement of the download speed (with upload speed also recorded, see Annex B): 49 per cent of businesses were able/willing to undertake this test. As would be expected, adopters reported significantly faster download speeds than non-adopters: over 60 per cent of adopters reported a download speeds of over 30Mbps.

Table 5.4: Achieved download speeds for businesses from speedtest.net

	Non-adopters (n=67)	Adopters (n=65)
< 2Mbps	9	0
2 to 24Mpbs	51	17
24 to 30Mbps	0	7
>30Mbps[11]	7	41

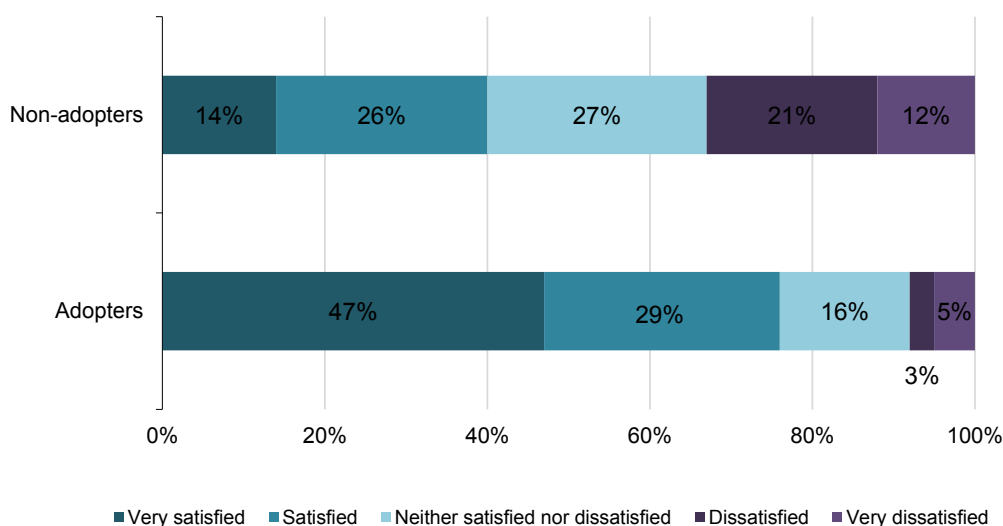Source: SQW/BMG Welsh Enterprise Survey

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[10] www.speedtest.net
[11] The fact that seven 'non-adopters' reported download speeds of over 30Mbps suggests that these respondents did, in fact, have access to superfast speeds (possibly through corporate services such as Ethernet lines), although they would have said 'no' to the relevant screening question at the start of the survey.

5.29   Note that the speeds recorded through this test would have been subject to contention with other people in the business using the connection at the same time as the test, and also potentially subject to deterioration in performance associated with in-building WiFi connection – so the reported results should be lower than the peak bandwidths actually achievable. However, the results do serve to illustrate the level of 'real-life' speed improvements for end users associated with upgrading to superfast broadband.

5.30   Satisfaction with their internet connectivity was significantly higher for superfast broadband adopters: 76 per cent of adopters were satisfied or very satisfied, compared with 40 per cent of non-adopters than non-adopters, as shown in Figure 5.8.

Figure 5.8: Business satisfaction with their current internet connection (n=140 adopters, 141 non-adopters)

Source: SQW/BMG Welsh Enterprise Survey

5.31   However, the small number of superfast adopters who were unsatisfied with their current internet connection clearly considered this to be an important issue: 73 per cent of them said that this was having a major impact on their business productivity (Figure 5.9).

Figure 5.9: Impact of unsatisfactory internet connection on business productivity (n=11 adopters, 47 non-adopters)

Source: SQW/BMG Welsh Enterprise Survey

Households

5.32 Amongst households, adopters of superfast broadband were also more satisfied with their current internet connection than non-adopters – 77 per cent of adopters were either satisfied or very satisfied with their internet connection, in contrast to 60 per cent of non-adopters.
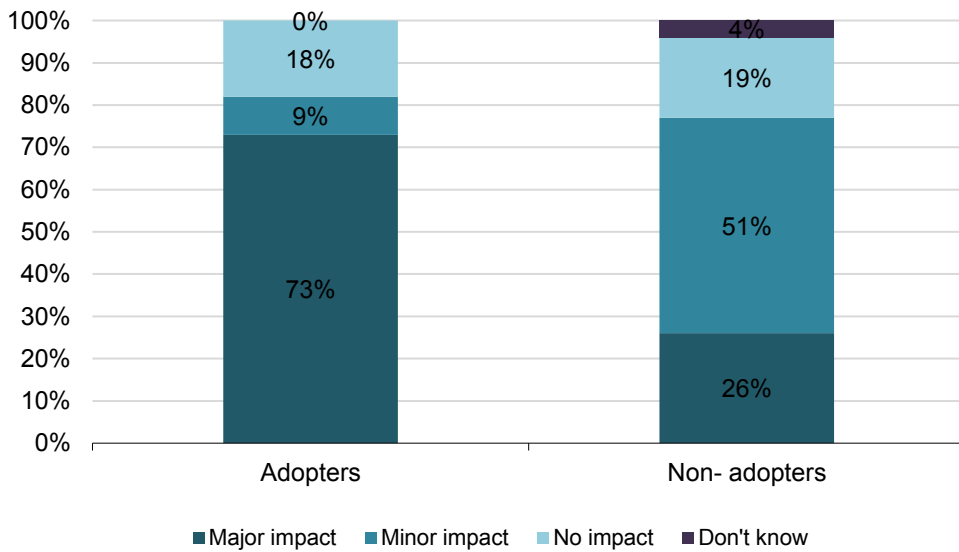
Figure 5.10: Household satisfaction with current internet connection (n=70 adopters, 70 non-adopters)
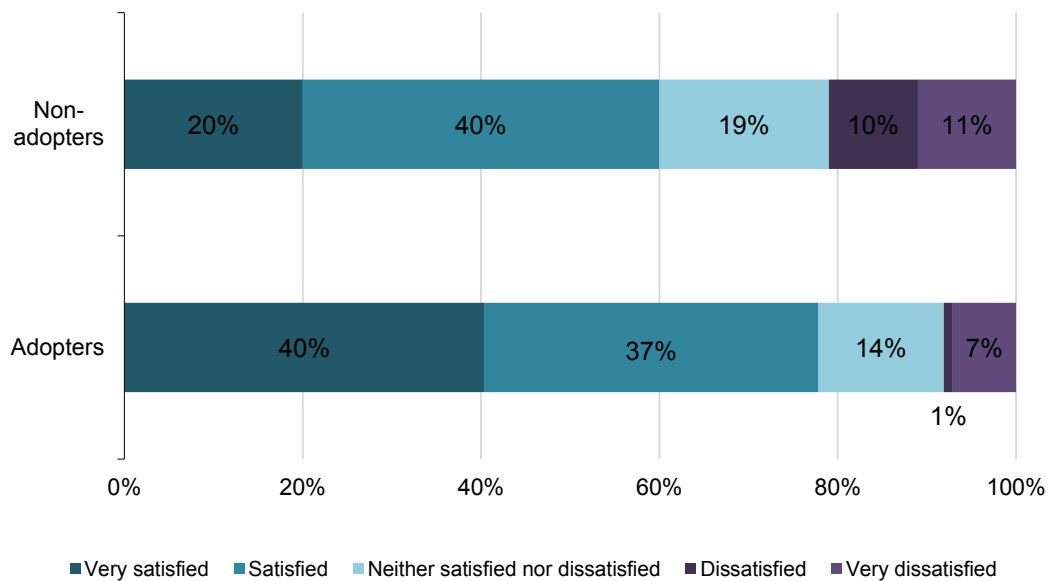
Source: SQW/BMG Welsh Enterprise Survey

Support

5.33 Non-adopters in enterprises and households were asked what further information or support they considered the Welsh Government could provide to help them get the most out of broadband and Information Technology (IT). Aside from the substantial proportions of respondents in each survey who stated 'don't know' to this question (46 per cent of enterprise survey respondents and 29 per cent of household survey respondents), the most common suggestions were around more information and awareness, and lower costs - as set out in the table below.

Table 5.5: Further information or support that could be provided by the Welsh Government to help businesses and individuals get the most out of broadband/IT

	% of enterprise survey respondents (n=281)	% of household survey respondents (n=140)
Provide more information (inc. comparing, providers)	20%	19%
Make it cheaper/free	15%	16%
Make more people aware of it (inc. more advertising)	9%	19%
Make it more available	9%	14%

Source: SQW/BMG Welsh Enterprise/Household Survey

Outcomes for apprentices

5.34 As set out in Section 4, Superfast Cymru supported 123 apprentices to find employment with BT, with 24 responses to our online survey regarding the scheme received.

5.35 Overall, the feedback from the apprentice survey was positive, indicating high levels of satisfaction and a number of positive outcomes arising from participation in the scheme:

- Asked to score levels of satisfaction out of ten (zero being very dissatisfied, ten being very satisfied), respondents scored an average of 8.3.

- 17 out 24 respondents "would speak highly of apprenticeships without being asked" and a further six would do so if asked.

- 18 out of 24 respondents felt that their apprenticeship would give them "significantly more chance" of them finding work in the future and a further three thought it would give them "slightly more chance".

5.36   The aspects of the scheme with which apprentices were most satisfied were: the feedback received on their progress, the support from BT, and the quality of training - all scoring an average of over eight out of ten for satisfaction.

Figure 5.11: Levels of satisfaction (out of 10) by apprentices with the different aspects of the BT apprenticeship (n=24)
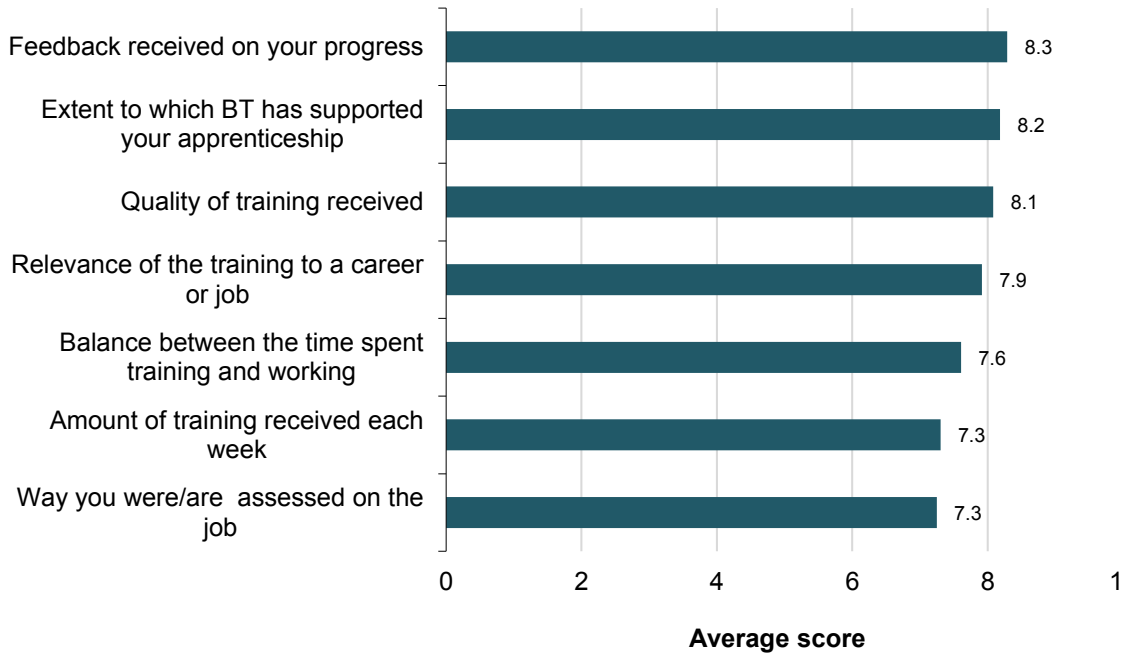
Source: SQW Apprentice Survey

5.37   Encouragingly, almost all apprentices surveyed felt that, as a result of their apprenticeship, they had better skills and knowledge, better career prospects and an improved ability to do their job.

Figure 5.12: Benefits gained by apprentices as a direct result of the BT apprenticeship - number of respondents that agreed (n=24)
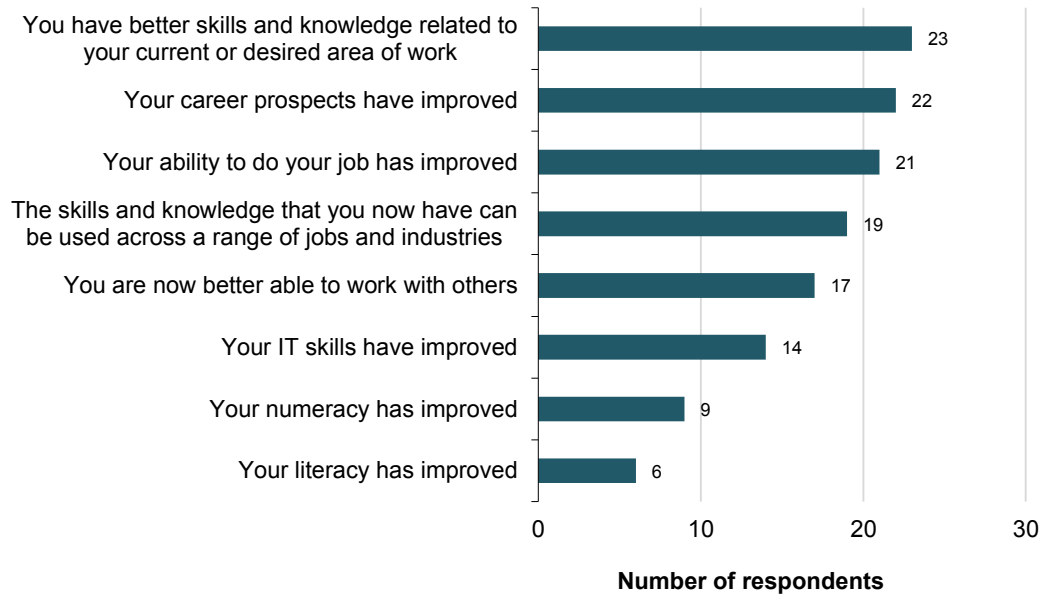
Source: SQW Apprentice Survey

5.38   Apprentices highlighted a variety of wider outcomes arising through their participation in the BT apprenticeship. In particular, all but one felt that the quality of their life had improved.

Figure 5.13: Wider outcomes of participation in the BT apprenticeship (n=24)
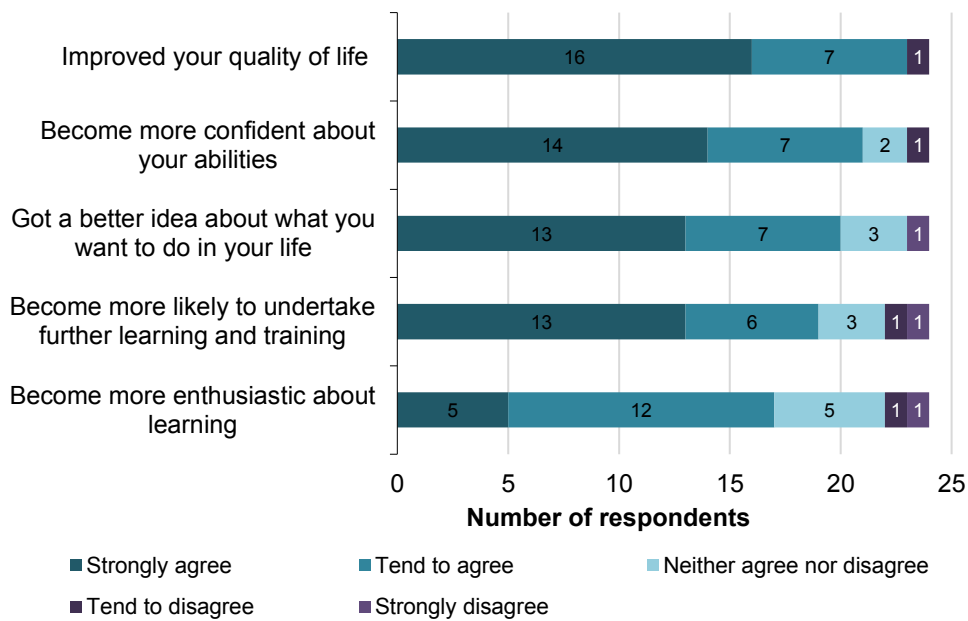
Source: SQW Apprentice Survey

5.39 Based on our case study research, the area of most value seems to have been the support structure in place when apprentices start the scheme, i.e. having a line manager, apprenticeship coach and mentor (the 'Begin apprenticeship' stage in Figure 3.1). Other aspects of the scheme that were highlighted included the exposure to many different roles across the business and the range of organised networking events which provide opportunities for apprentices to meet senior management.

5.40 Although satisfaction with the scheme was high, there were some suggestions for further improvements which tended to focus on training, particularly the need for it to be closely aligned with the practical requirements of the job. Specific suggestions are set out in the box below.

> **Suggested improvements to the scheme**
>
> *"NVQ work needs to be more specific to each role. As an engineer we should have NVQ work tailored towards that role."*
>
> *"The NVQ work we do feels so irrelevant. It would be more beneficial to go to college for the duration of the apprenticeship and do an exam at the end or something similar."*
>
> *"Our job role was relatively new in regards to the apprenticeship scheme, so the initial documents required for the apprenticeship didn't relate to any of the work we were doing (surveying)."*
>
> *"[The apprenticeship could be improved by] Slightly more training relating to specific roles as well as guidance and training for those that want to push themselves and progress through the apprenticeship and come out with a possible hire posted job."*
>
> *"The training should be in place as soon as the apprentices come over as a timeline instead of having scattered training as well as training courses being provided; vehicles and kit should be ready also."*
>
> *"More training with established engineers [is required] rather than a training course and only a week or two weeks with an engineer buddying"*

5.41 Taken together, the online survey indicates that the apprenticeship has generated important employment and wider benefits for its participants, and this is reinforced by the positive experiences of the case study apprentices (see Annex A).

6. Projected future net impacts, and value for money

6.1 To support the evaluation of Superfast Cymru, we have developed a model of the economic, social and environmental impacts of faster broadband – and of publicly funded investment in faster broadband – in Wales. This model uses a similar methodology to that developed for the UK Broadband Impact Study for DCMS, using Wales-specific data, and Annex D includes an overview of key assumptions used in the model.

Economic impacts

6.2 In order to assess the economic impacts attributable to publicly funded intervention, our model includes estimates of the 'with intervention' and 'without intervention' scenarios. The economic impact associated with intervention is simply the difference between the two net GVA impact time series.

Safeguarding of local enterprise employment

6.3 Broadband – and faster broadband in particular – has a complex relationship with employment creation at local, regional and national levels. There is a 'creative destruction' effect at work, in which employment growth may be suppressed to some extent by improvements in business process efficiency (businesses doing more with less), while the better connectivity also leads to employment growth opportunities through new business models and emerging sectors.

6.4 There is some evidence, however, that the *relative* availability and quality of broadband can have a significant impact on employment growth at a *local* level: areas with poor broadband lose out to areas with better connectivity. Our model assumes that if there were a persistent and widening digital divide, then this local effect would lead to adverse Wales-level impacts over time, as jobs lost or foregone in areas with poor broadband (which might, for example, also have advantages in other respects, such as relatively low accommodation costs or labour costs) would not be entirely replaced by jobs created in areas with good connectivity. Publicly funded intervention, to reduce the digital divide, can therefore help safeguard net employment and the associated GVA.

6.5 Our impact model estimates that the net annual GVA impact from this effect, attributable to intervention, will rise to about £23 million by 2024, as shown in Figure 6.1.

Figure 6.1: Net annual GVA impact from safeguarded employment in local enterprises in Wales, attributable to intervention – by density decile[12] (1=least dense, 10=most dense)
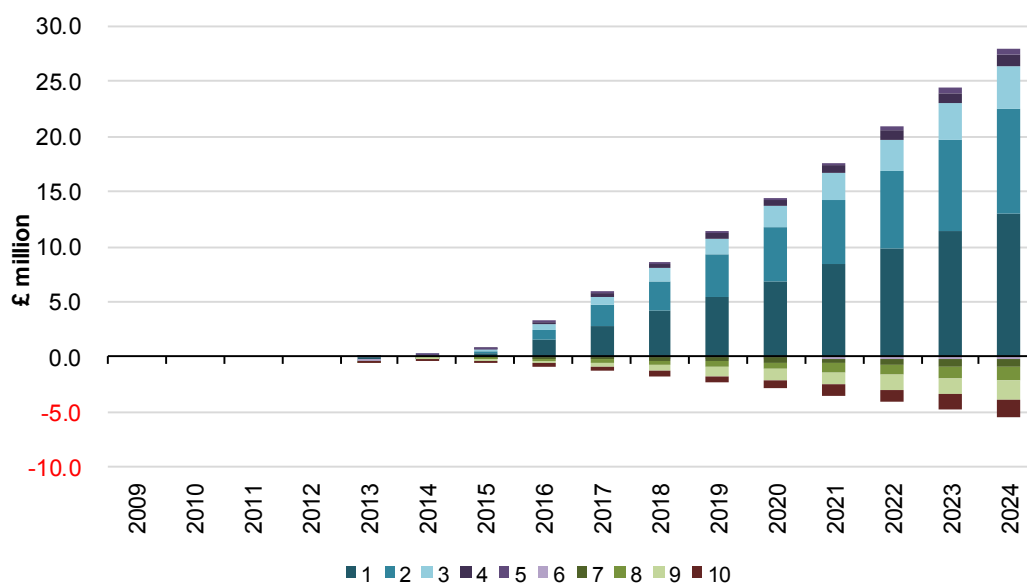
Source: NGBW Broadband Impact Model, SQW 2015

Productivity growth of broadband-using firms

6.6   It is now widely accepted that the availability and adoption of affordable broadband plays an important role in increasing productivity in economies – through, for example, supporting the development of new, more efficient, business models, enabling business process re-engineering to improve the efficiency and management of labour intensive jobs, and enabling increased international trade and collaborative innovation. Our model includes estimates of the average increase in the broadband speeds used by businesses each year (by industry group, size band and density decile), and the extent of the associated productivity benefits.

6.7   Comparing the two scenarios, our model currently estimates that over £290 million in net annual GVA impacts are attributable to intervention by 2024, through this productivity effect. The largest contributions to this come from the JKLM&N industry group (Figure 6.2) and the 1 to 9 employment band (Figure 6.3).

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[12] The model divides the UK into ten 'density deciles', ranging from the 10% of Census output areas with the fewest premises per square kilometre (sq km), to the 10% of Census output areas with the most premises per sq km, and calculates how many Welsh premises are in each of these UK deciles.

Figure 6.2: Net annual GVA impact from productivity growth for broadband-using firms, attributable to intervention – by industry
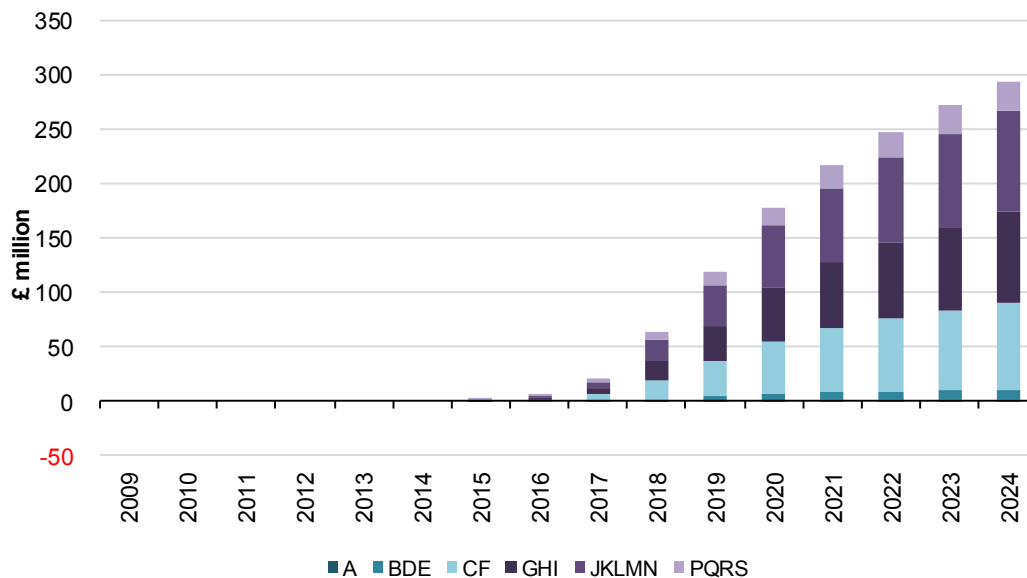
Source: NGBW Broadband Impact Model, SQW 2015

6.8   The six broad industry groupings, using SIC2007 sections, are:

- A (Agriculture, forestry and fishing)

- B,D&E (Mining and quarrying; Electricity, gas, steam and air conditioning supply; Water supply; sewerage, waste management and remediation activities)

- C&F (Manufacturing; Construction)

- G,H&I (Wholesale and retail trade, repair of motor vehicles and motor cycles; Transport and storage; Accommodation and food service activities)

- J,K,L,M&N (Information and communication; Financial and insurance activities; Real estate activities; Professional, scientific and technical activities; Administrative and support service activities)

- P,Q,R&S (Education; Human health and social work activities; Arts, entertainment and recreation; Other service activities).

Figure 6.3: Net annual GVA impact from productivity growth for broadband-using firms, attributable to intervention – by size of firm

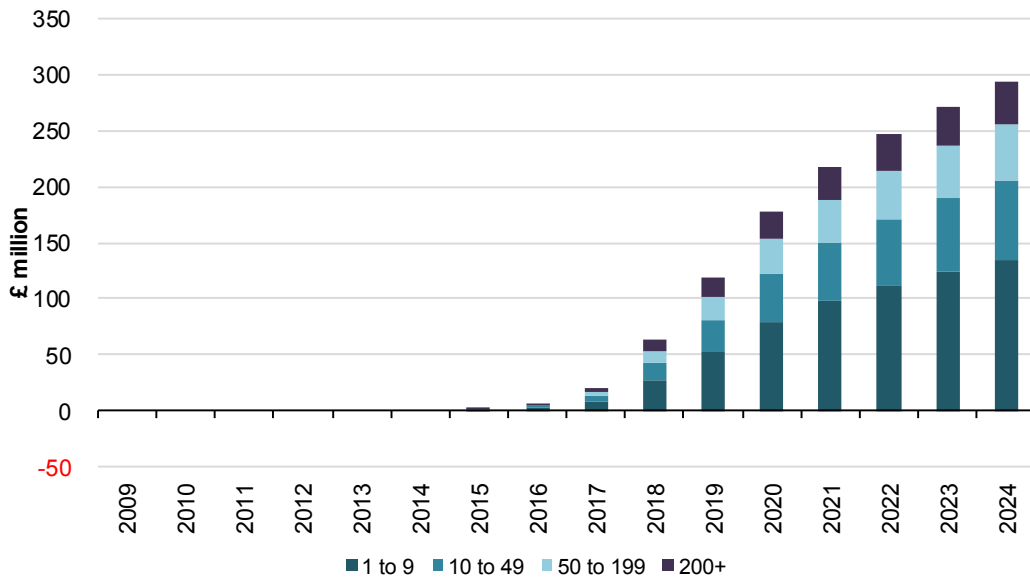Source: NGBW Broadband Impact Model, SQW 2015

Teleworker productivity

6.9   As levels of connectivity at home improve, this will tend to encourage higher levels of working from home – the majority of which will be people working a few days per month from home, rather than teleworking full-time. While some have argued that employees can be inherently more productive when working at home, our model takes a relatively conservative view, assuming that a certain proportion of the time saved by not commuting on a telework-day is spent on work: i.e. adding to the employee's productive hours per day, rather than making those hours more efficient.

6.10   We estimate that the net annual GVA impacts attributable to intervention from improved teleworker productivity will reach about £17 million by 2024 (Figure 6.4), with the bulk of these impacts in the three least dense deciles (where there are most teleworkers, and where the bulk of the intervention investment is focused).

Figure 6.4: Net annual GVA impact from increased teleworker productivity in Wales, attributable to intervention – by density decile (1=least dense)
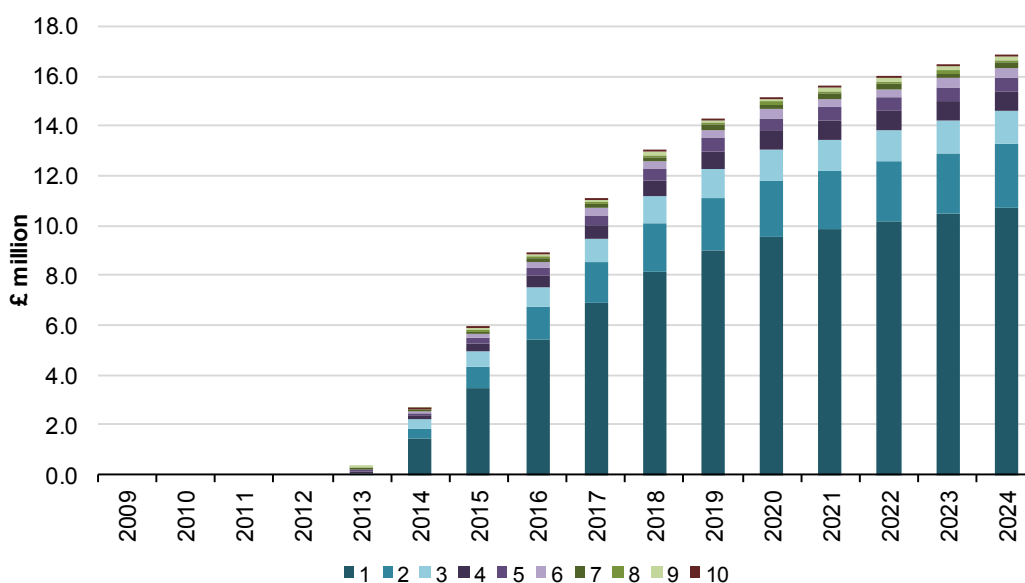
Source: NGBW Broadband Impact Model, SQW 2015

Labour force participation

6.11   The ability to work from home, using improved levels of connectivity, also reduces the barriers to employment for certain parts of the working age population. In particular, we have assumed that a proportion of carers (i.e. people who are economically inactive, because they are looking after the home or family members) would be willing and able to take up part-time employment based at home, and that the prevalence of this will increase as levels of home connectivity improve over time. Similarly, we have assumed that a proportion of unemployed disabled people would find it easier to find and retain suitable work if this were based at their own homes (levels of unemployment for disabled people have historically been persistently significantly higher than those for the workforce as a whole) – and again, that the prevalence of this will increase as levels of home connectivity improve over time.

6.12   Our model estimates that the net annual GVA impacts attributable to intervention from improved participation of carers and disabled people reaches about £14 million by 2024 (Figure 6.5). This equates to about 460 additional carers and about 200 additional disabled people gaining employment through telework, who would not have been able to do so in the absence of the intervention to provide faster broadband in under-served areas of Wales.

Figure 6.5: Net annual GVA impact from increased participation of carers and disabled people in Wales, attributable to intervention – by density decile (1=least dense)
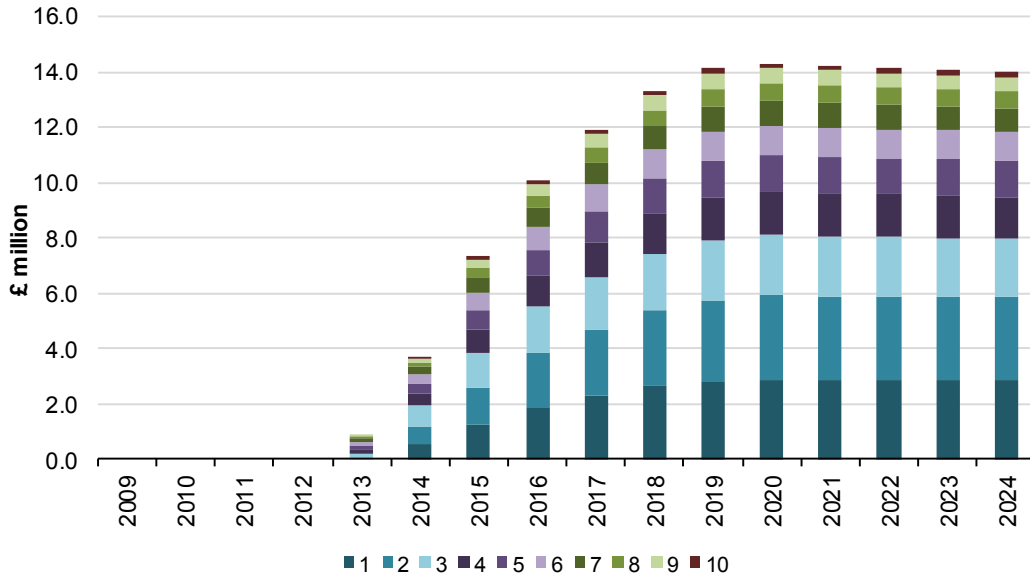
Source: NGBW Broadband Impact Model, SQW 2015

Total economic impacts

6.13 Bringing together the various sources of economic impact, we estimate that the total net annual GVA impact attributable to the intervention rises to about £348 million by 2024, the bulk of which comes from improvements in the productivity of broadband-using firms (Figure 6.6).

Figure 6.6: Total net annual GVA impact, attributable to intervention – by type of impact
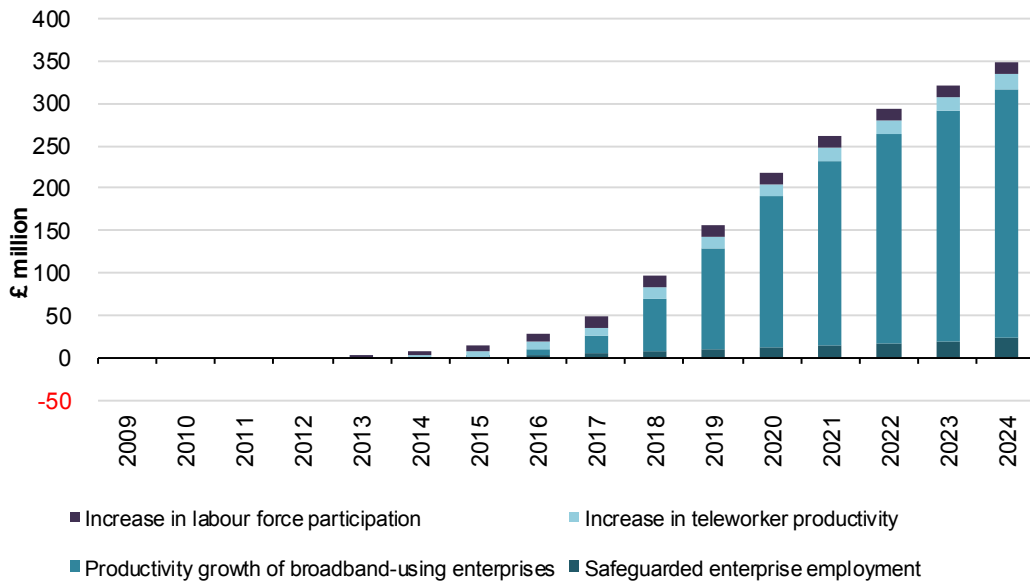
Source: NGBW Broadband Impact Model, SQW 2015

6.14   The net employment impacts from the Superfast Cymru intervention rise to about 350 jobs by 2015, and 1,050 jobs by 2024, on the model's current assumptions (Figure 6.7).

Figure 6.7: Total employment impact, attributable to intervention – by type of impact
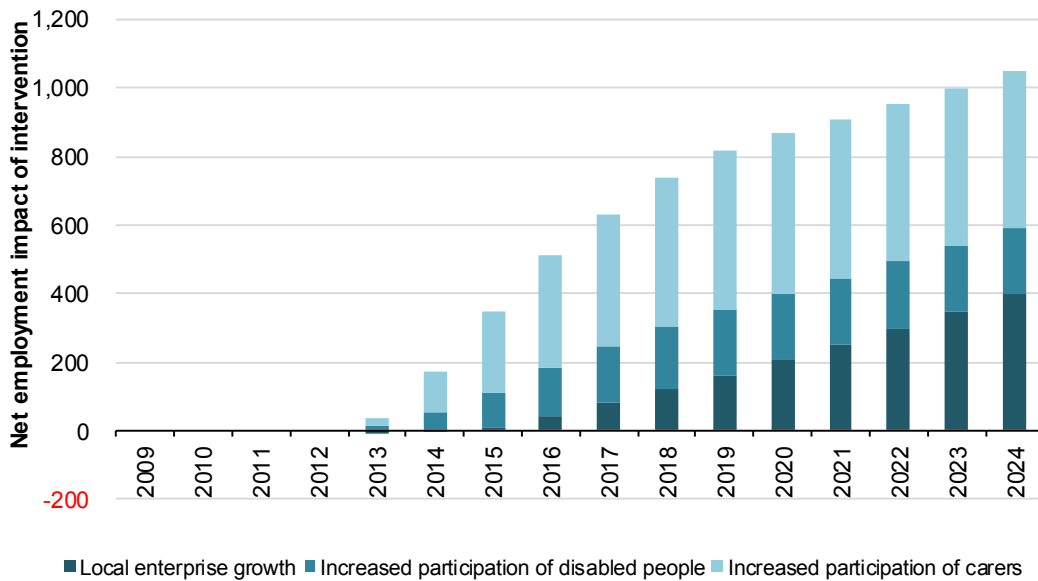
Source: NGBW Broadband Impact Model, SQW 2015

Social impacts

Routes to social impact

6.15 Beyond its economic impacts, broadband has, of course, become an integral part of modern life, affecting various aspects of our day-to-day activities as individuals, families and communities.

6.16 Our model focuses on quantifying the following three areas of social impact:

- **The digital divide** – in terms of the differences in broadband speeds available to households and businesses in different parts of Wales.

- **The value of household savings associated with additional teleworking**. By enabling more efficient, more frequent teleworking, faster broadband will reduce the need for commuting, and hence lead to household savings on transport costs. Our model estimates these savings, but also the extent of costs incurred by households in additional space heating on telework-days.

- **The value of leisure time saved through increased teleworking**. Some of the time saved in commuting, through additional teleworking enabled by faster broadband, is likely to be spent on work (as assumed in the previous economic impacts section on teleworker productivity), and some will be taken as leisure time. Our model quantifies the potential additional leisure time saved, and the associated value of this time.

Digital divide

6.17 The indicative maximum total speeds[13] (i.e. adding downstream and upstream) available to Welsh households in each density decile are shown below for the without-intervention (Figure 6.8) and with-intervention (Figure 6.9) scenarios. We use logarithmic y-axes in order to illustrate the trends and differences more clearly. Note that these are the maximum *available* speeds, rather than the average used speeds.

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[13] Note that these indicative maximum total speeds are calculated from weighted geometric means, which take account of partial coverage levels within each decile of the various technologies, and avoid the overall indicative speed being unduly distorted by very high speeds for small percentages of premises in the decile (which would be the case with arithmetic means)

Figure 6.8: Indicative maximum total speeds (down + up) available to households, <u>without intervention</u> (Mbps), by density decile – note logarithmic y-axis
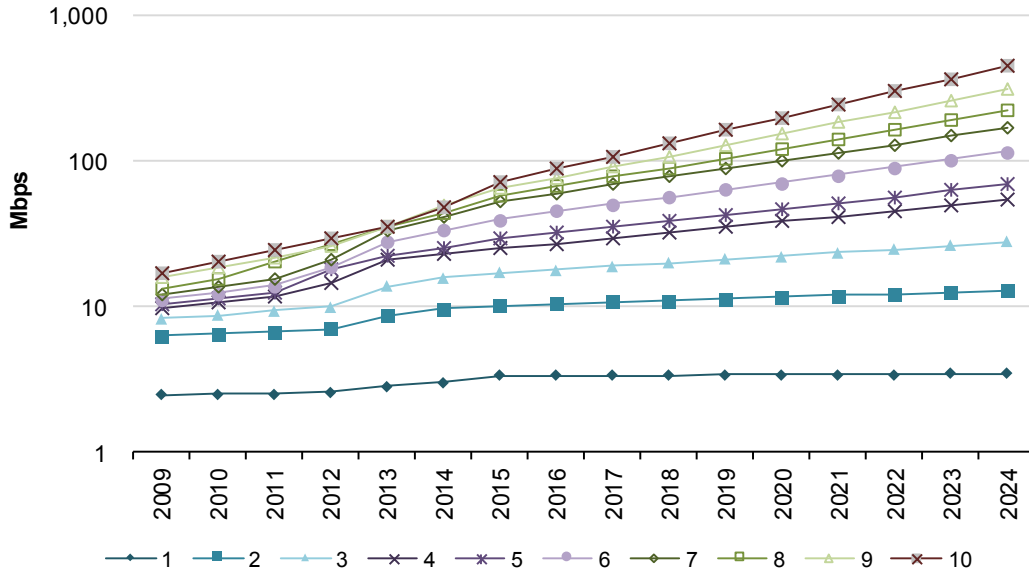
Source: NGBW Broadband Impact Model, SQW 2015

Figure 6.9: Indicative maximum total speeds (down + up) available to households, <u>with intervention</u> (Mbps), by density decile – note logarithmic y-axis
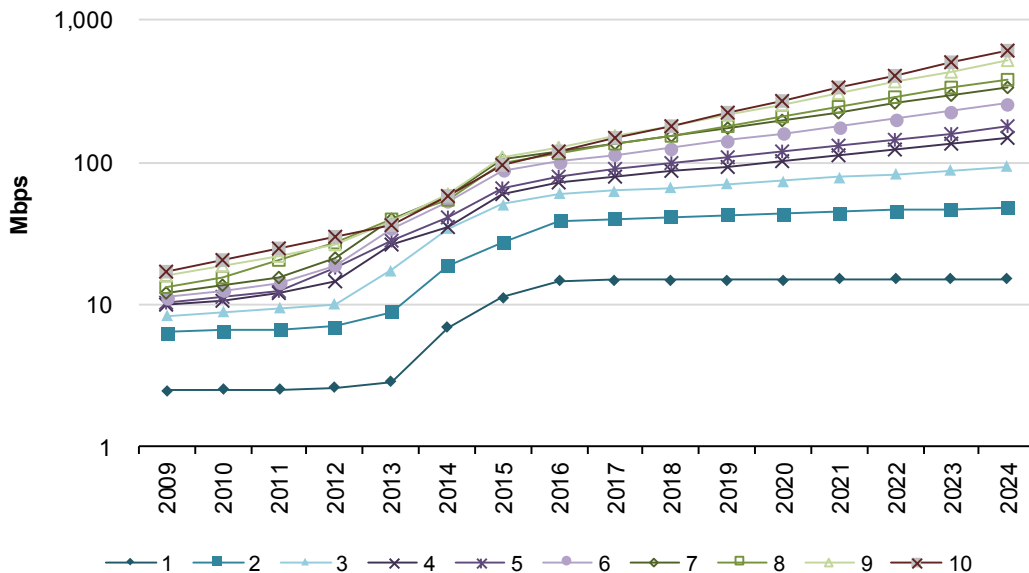
Source: NGBW Broadband Impact Model, SQW 2015

6.18   For businesses, the difference is in the availability of 'Fibre on Demand' throughout BT's FTTC footprint – which we have assumed will be fully available from the start of 2016 (following the Welsh Government's

negotiations with BT, after the product was suspended from taking new orders in early 2015), leading to a substantial increase in maximum speed from that year.

Figure 6.10: Indicative maximum total speeds (down + up) available to businesses, <u>without intervention</u> (Mbps), by density decile – note logarithmic y-axis
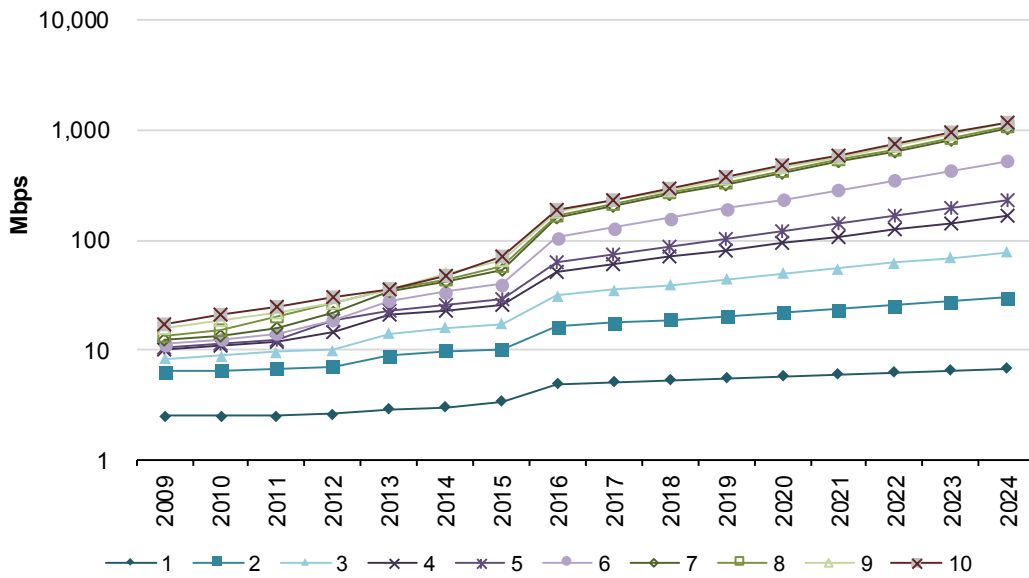
Source: NGBW Broadband Impact Model, SQW 2015

Figure 6.11: Indicative maximum total speeds (down + up) available to businesses, <u>with intervention</u> (Mbps), by density decile – note logarithmic y-axis
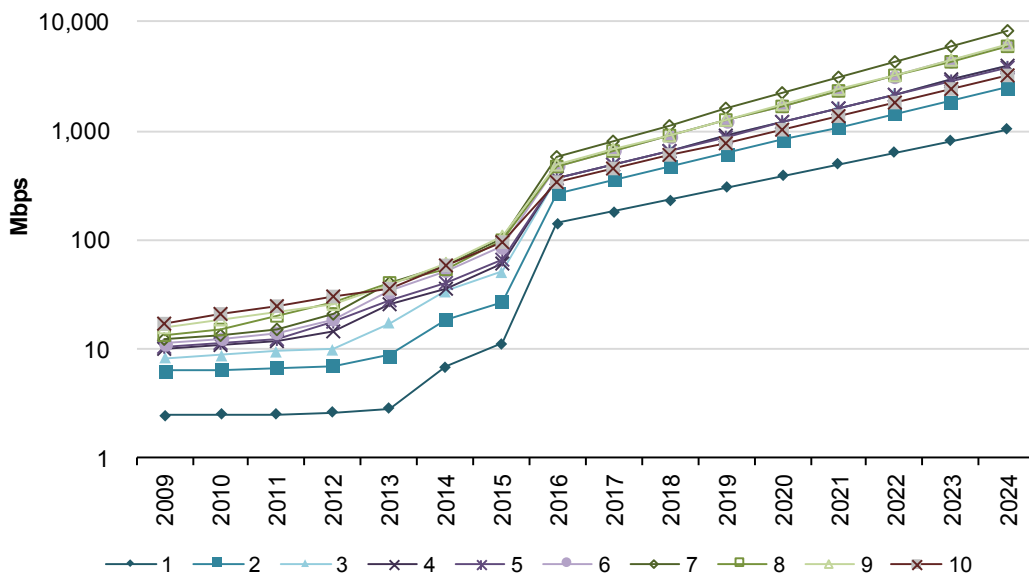
Source: NGBW Broadband Impact Model, SQW 2015

6.19 As the intervention substantially expands the Fibre on Demand footprint (by expanding the FTTC footprint), the speeds available to businesses in the least dense deciles come much closer to those in urban areas, as they can mostly now access affordable FTTP (not typically the case for households in these deciles).

6.20 From the above charts we can see that the intervention in Wales will have a material impact on reducing the coverage-related digital divide for both households and businesses.

6.21 The introduction of Fibre on Demand throughout BT's FTTC footprint should have a particularly important and sustained impact in putting the least densely populated areas of Wales onto a 'more level playing field' as far as business connectivity is concerned.

Household savings

6.22 Using the estimates derived for the environmental impacts of teleworking (see below) on the total commuting distance saved per decile, and the modes of transport used per decile, we have developed estimates for the costs saved through reduced commuting by using data on the average cost per passenger km of different modes of transport. We have also applied unit energy costs to the additional usage of the various space heating fuels, in order to estimate the additional costs to households associated with heating the home on teleworked days.

6.23 Our model currently estimates that net household savings attributable to the intervention reach over £3 million p.a. by 2024, with commuting savings of about £3.7 million in that year being offset by about £0.7 million in space heating costs.

6.24 Approximately 0.6 million hours of leisure time will be saved per annum, by 2024, due to the intervention's impact on increased teleworking – which has a value of about £5 million p.a. using standard DfT metrics for the value of time.

Environmental impacts

6.25 Our model also quantifies estimates for the *environmental* impacts of faster broadband, and from publicly funded intervention, through the following effects:

- **Teleworking**. Probably the most frequently cited environmental benefit of better broadband is that it will encourage people to work from home more, thereby reducing carbon emissions associated with the daily commute. Our model develops estimates for this, but also includes

'rebound' effects, notably the extent to which some of the commuting miles saved will actually be travelled anyway for other purposes (such as shopping, or dropping children off at school, which may otherwise be done in the course of a commuting trip), and the extent to which people working from home leads to additional carbon emissions through domestic space heating.

- **Business travel**. Large corporates have made significant inroads over the last few years into reducing their travel costs (and emissions) by reducing the need for face-to-face meetings through the use of collaboration software and video-conferencing. With affordable faster broadband with low latency now widely available, we anticipate that the next few years will see this trend increasingly applying to smaller businesses.

- **Cloud computing**. UK businesses collectively use hundreds of thousands of servers, which are typically on for 24 hours per day, 365 days per year, and which are frequently operating at very low levels of utilisation. Although the trend towards virtualisation of on-premises servers is significantly improving utilisation levels (and hence carbon efficiency), the use of the 'public cloud' for a proportion of businesses' computing needs offers the prospect of substantial further environmental benefits. Our model estimates the extent to which business use of faster broadband will encourage a shift to the cloud, and the resulting net environmental impacts.

6.26   In total, we estimate that the Superfast Cymru intervention in faster broadband will account for approximately 33 ktonnes p.a. in carbon dioxide equivalent (CO2e) savings by 2024 (Figure 6.12).

Figure 6.12: Total net CO2e emissions saved, attributable to intervention (thousands of tonnes of CO2e p.a.) – by source of saving
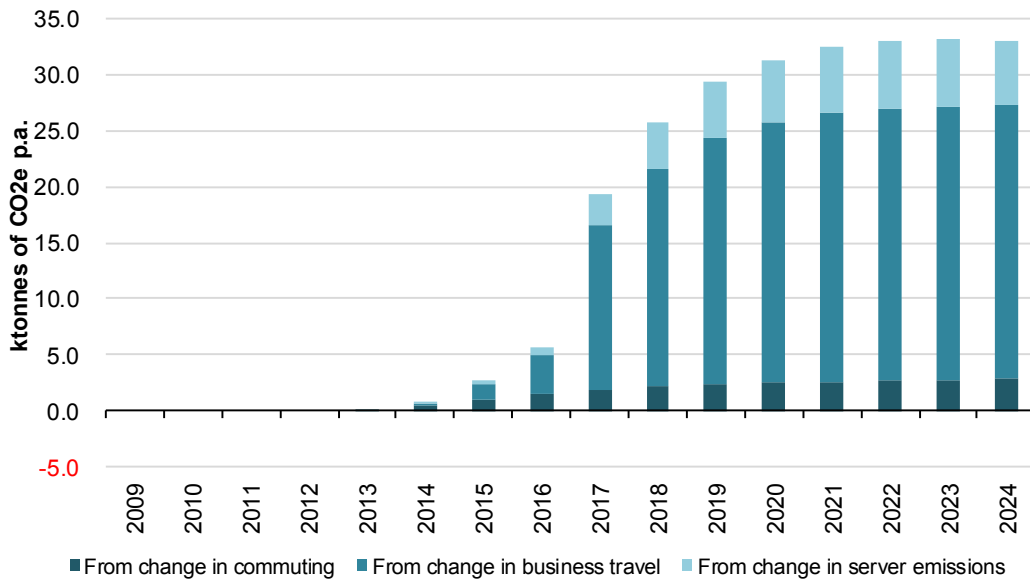
Source: NGBW Broadband Impact Model, SQW 2015

Value for money

6.27 Discounting at 3.5 per cent p.a. over the modelling period to 2024, the Present Value of the total public funding for the programme is approximately £202 million (in 2015 prices), whereas the Present Value of the net GVA impacts over the period is £1,348 million.

6.28 This gives a positive **Net Present Value of approximately £1.1 billion**, and a **Benefit Cost Ratio of 6.7**: that is, every £1 of public money invested in Superfast Cymru is expected to generate £6.70 in net economic benefits for Wales over that period.

7. Summary, lessons learned, and recommendations

7.1   This final section of the report highlights a summary of the evaluation, and the key lessons that have emerged from the evaluation process. These include aspects of good practice that have been identified through consultations with stakeholders, and areas where management and delivery could have been improved. In the light of the findings we offer a set of recommendations.

Summary of conclusions

7.2   Overall, by September 2015, Superfast Cymru has delivered some substantial achievements:

- **About 520,000 premises have been passed** by the intervention's superfast (24Mbps+) services, with 97 per cent of these able to access 30Mbps+. The roll-out is currently on course to meet its target of 691,000 premises passed with superfast services by summer 2016. Given the State Aid-related delays at the start of the programme, and the challenges associated with Wales' topography, this represents a major engineering and operational achievement.

- **Take-up has been strong**, at approximately 23% by September 2015, with Wales performing well relative to other interventions across the UK. Although no targets were initially set for take-up, the achievement is particularly striking in those areas that previously had no superfast broadband, and the clawback will ensure that coverage can be extended further, alongside the additional coverage enabled by the further funding under the next phase of the programme.

- **Business benefits are being realised** for those firms taking up superfast broadband in the intervention area. Of those adopter businesses expecting some material benefit from superfast: 74 per cent agreed that their business will save time; 59 per cent agreed that their business will be able to address new market opportunities; 47 per cent agreed that their business will be able to scale-up more easily; and 41 per cent agreed that their business's profitability will improve. When asked how likely it is that superfast broadband will have a positive effect on their business's performance over the next three years, the average score was 6.2 out of 10, with 16 per cent saying that this was absolutely certain (10 out of 10).

- **Significant benefits are being experienced by households** taking up superfast broadband in the intervention area. Of the 70 households

interviewed which had taken up superfast broadband: 77 per cent agreed that it would help their household save time (of which 53 per cent agreed strongly); 65 per cent agreed that it would help their household get better access to educational opportunities; 59 per cent agreed that it would help their household enjoy leisure time more; and 57 per cent agreed that it would help their household feel better connected with friends and family.

• Discounting at 3.5 per cent p.a. over the modelling period to 2024, the Present Value of the total public funding for the programme is approximately £202 million (in 2015 prices), whereas the Present Value of the net GVA impacts over the period is £1,348 million. This gives **a positive Net Present Value of approximately £1.1 billion, and a Benefit Cost Ratio of 6.7**: that is, every £1 of public money invested in Superfast Cymru is expected to generate £6.70 in net economic benefits for Wales over that period.

• **ERDF outputs have largely been met**. With some months left for the delivery of the programme, formal ERDF targets on Open Access Infrastructure Points and jobs created have been delivered. The perceptions of the apprentices taken on by BT, in support of this programme, have been positive. The achievement against the wider output of safeguarded jobs remains to be confirmed, but the modelling undertaken for this evaluation suggests that this will have been met by the end of 2015.

What has worked well?

7.3 Within this context, the evaluation evidence indicates that the following aspects of the programme appear to have worked particularly well:

• **Effective governance and management**. The consensus amongst consultees was that the programme has, overall, been well managed by the Welsh Government. Some key strengths were identified in the governance and management, including an effective Programme Board, a well-resourced and technically-sound project team, capacities and skills in the programme team, and full engagement with BT in governance and management, including their participation on the relevant Boards to ensure a 'partnership' approach' to delivery.

• **Testing and verification**. Unique to Superfast Cymru the programme included a dedicated process of cabinet verification and speed checking (other UK contracts do not have systems to the same level of detail). The testing process checks that premises passed will receive

the expected speed, are in the correct postcode and are eligible, with the Welsh Government only paying for premises that pass these checks. This element of the programme was regarded as 'best practice' and should be considered by other similar programmes across the UK.

- **The clawback provisions in the contract**. The clawback provisions in the contract will ensure that additional funding will be made available, as a result of demand exceeding BT's initial projections, and this can be invested in extending coverage further.

- **Integrating skills and workforce development activities into the programme, leveraging BTs existing processes**. The focus of the programme was, correctly, on the development of the infrastructure for superfast broadband. However, the programme also generated benefits for individuals supported via the apprenticeship scheme and workplace volunteering activities, and delivered against the jobs created target of the Convergence Programme.

What has worked less well?

7.4 There are also some areas in which the process has not worked so well, and/or in which things could have been done differently in order to improve the programme's effectiveness.

- **Availability of detailed historical and forward-looking information from BT**. The Welsh Government has been frustrated at times over BT's reluctance to share certain information, including the 'Premises Data Extract; which forms part of the contract with BT and forward-looking information regarding the roll-out. Bearing in mind the extent of public funding being used for the infrastructure build, greater openness to sharing such information would have been helpful for all concerned – for example, in helping to manage public expectations regarding service availability. This would have been in keeping with the programme's broader spirit of partnership working (i.e. without always having to resort to the letter of the contract).

- **Lack of visibility on business take-up**. While overall levels of take-up have been reported, the monitoring data is not able to identify the levels of take-up by *businesses*, which is the primary driver of the intervention's economic impact. The evaluation's survey provides some baseline information on business take-up – estimated at around 28 per

cent of businesses for those areas where superfast broadband has been available for at least six months – and this could be built on going forward (see recommendations below).

- **Handling of new build premises**. There has been no specific ongoing mechanism for handling premises newly built during the intervention period, and some new build properties have been developed without having superfast service available. An extension to the programme – involving additional public funding – has recently been announced that will help to address premises that had not been identified in the original Open Market Review of 2012, but were apparent in the OMR of 2014. However, in the future it would appear to be reasonable to require developers to ensure that developments over a certain size are able to access affordable superfast services (just as they are provided with access to electricity and water supplies), such that any subsidy required for this is reflected in the market prices for the properties, rather than having to rely on taxpayer funding.

- **Marketing and communications of the programme**. Significant resource has been put into marketing and communications, by BT and the Welsh Government, and recent take-up performance has been strong relative to other areas of the UK. However, consultations indicate that this has been an area of considerable challenge over the course of delivery, with issues including inconsistency in messaging regarding the timing of roll-out to local areas, and some consultees criticising the extent of communication between BT and Local Authorities and other stakeholders. Given that programmes of this type are inevitably subject to change in their detailed roll-out plans, the communications around the locations and timing of future service availability are absolutely critical. This is an area that warrants continual review, to ensure that the information provided is as accurate, timely and helpful as possible from the customer perspective. In terms of demand stimulation, we suggest that an appropriately challenging target for take-up would have helped to focus this activity.

- **Characteristics of apprentices**. The ICT sector has been notoriously poor at attracting female recruits, and the gender imbalance seen in the apprenticeship scheme does appear to be very marked, with just two females out of the 100 apprentices for whom profile data was collected. Arguably more should have been done to ensure a greater level of representation of female apprentices in order to promote the Cross Cutting Theme of Equality and Diversity.

Recommendations

7.5   In the light of our evaluation findings we offer the following recommendations:

- **Recommendation 1**. The Welsh Government should continue to stimulate demand for superfast broadband, in conjunction with the market. This will help to maximise the social and economic impacts of the intervention, but will also help to pull through further clawback funding.

- **Recommendation 2**. The Welsh Government should re-visit its (recent) target for superfast take-up, and consider setting this at a more ambitious level. A recent Analysys Mason report for BT suggests that superfast take-up could approach 80 per cent of all premises in the UK by 2020.

- **Recommendation 3**. The Welsh Government should consider conducting further surveys – potentially every two years – in order to assess how business take-up is progressing, and what outcomes businesses are experiencing from using superfast services. This survey work could be considered as part of the Superfast Exploitation Project.

- **Recommendation 4**. The Welsh Government should consider requiring new build developments over a certain scale to have access to affordable superfast broadband services (i.e. without the need for public subsidy).

Annex A: Apprenticeship case studies

Case Study 1: Nathan

Profile

A.1   Nathan is 29. He completed his GCSEs but left school half-way through his A-Levels. He had a variety of roles before joining the apprenticeship scheme, including customer service and account management roles at British Gas, SWALEC and an audio visual company. He also worked in IT recruitment.

Motivation

A.2   Nathan has always been interested in technology and wanted a job involving the use of his hands. He has always been computer-literate, teaching himself IT skills, and when he saw that BT were recruiting, "the penny dropped". He was attracted to BT by numerous features of the apprenticeship scheme, including the offer of a good wage and continuous professional development.

Value of the apprenticeship scheme

A.3   Nathan found the networking opportunities with senior management particularly valuable. One such event was "Lunch with Learners" where apprentices got to meet managers and learn more about senior roles within the company. Nathan also met the CEO at a separate event.

> *"Nothing is impossible with BT."*

A.4   The key highlight of the scheme for Nathan was that he took pride in his work. He also learned to mature in a positive way, and has got his career on track with a clear career plan and decent CV. In the absence of the apprenticeship, Nathan thought he might be writing music or "stuck in a dead end job".

Areas for Improvement

A.5   Nathan thought that the least valuable part of the apprenticeship was the Key Skills Maths and English training, but overall he was hard-pushed to find any other aspect of the scheme to criticise.

What is he doing now?

A.6   Since completing the apprenticeship early Nathan has remained at BT and been promoted twice, meaning that since starting at BT, he has moved up four grades. He has continued training using BT's self-learning portal, 'The Academy', focusing on project management. He is aiming to study a University degree in business management.

Case Study 2: James

Profile

A.7   James studied for his A-Levels at school and was a straight-A student. He did not feel University was for him so he looked into a range of apprenticeship opportunities with BA, GE, Western Power, Welsh Water and BT.

Motivation

A.8   James was never particularly interested in telecoms and he didn't know much about BT. However, after some research, he was attracted by the offer of a structured learning programme, the opportunity of earning whilst learning and the possibility of gaining a qualification without personal debt. An apprenticeship is also a nice transition between school and the world of work.

Value of the apprenticeship scheme

"It has been a fantastic journey."

A.9   A major benefit was the fact that, as an apprentice, James had two major avenues of support – an apprentice coach and a line manager. Receiving advice and support from two different people was really helpful. The extra-curricular aspects of the scheme were also valuable, e.g. the site visits, the activity days, the development and networking opportunities. James also participated in the 'Challenge Worldwide" programme, which gave him the opportunity to travel to Nairobi in Kenya to help build a primary school.

A.10   James has learned lifelong skills while also benefiting financially throughout. Professionally he has progressed to a higher level and has gained a number of qualifications - NVQs in IT and Telecoms and Prince 2 Project Management training.

Areas for improvement

A.11   James did not have a critical word to say about the scheme. The only observation he had about making the scheme better was around the organisation of the Hub Days – he thought they were not uniform across the county, i.e. in some areas, apprentices were only interviewed, whereas in other areas, they had to participate in a full assessment day.

What is he doing now?

A.12   James is now working in a management role at BT, responsible for 28 planners. He is also studying for a degree which should be completed in around six years.

Case Study 3: Drew

Profile

A.13   Drew is 22 and he joined BT in 2012. He completed his GCSEs but dropped out of A-Levels halfway through. He thought about joining the forces but speculatively applied for the BT apprenticeship scheme. He had no prior technical experience or qualifications.

Motivations

A.14   Drew was never interested specifically in a career in the telecommunications sector, rather he "fell into it". He saw the advert for the BT apprenticeships scheme and applied, along with a host of other apprenticeship programmes. He was attracted by the various perks of the job, including the wage and job security.

Value of the apprenticeship scheme

A.15   Drew highlighted the variety and exposure to so many different development opportunities as a key benefit of the scheme, including the opportunity to cover several roles, which Drew was able to access through his apprenticeship coach. He also managed to obtain a number of qualifications and a promotion. Qualifications included: NVQ Level 3 in Telecom Engineering, B-Tech Diploma in Telecoms and Key Skills Wales (a numeracy and literacy qualification).

> *"Every aspect of the scheme was valuable in its own right."*

A.16   Drew joked that, in the absence of the scheme, he would still be applying for apprenticeships! Or he would be working in the forces.

Areas for improvement

A.17   Drew felt that every aspect of the scheme was valuable in its own right and saw no room for improvement. He said that the support and opportunities are there for those that want them.

What is he doing now?

A.18   Drew completed the apprenticeship programme in and was promoted to a more senior role shortly afterwards. He is currently undertaking a manager training course.

Annex B: Further findings from the surveys

Enterprise survey

Adopters

Roughly, how long ago did your business first upgrade to superfast broadband at this site? (n=140)

	% of respondents (adopters)
In the last 3 months	17%
3-6 months ago	16%
6-9 months ago	11%
9-12 months ago	16%
12-18 months ago	16%
18-24 months ago	6%
Longer than 24 months	14%
Don't know	4%

Non-adopters

Before this survey, were you aware that superfast broadband is now available in your area? (n=141)

	% of respondents (non-adopters)
Yes	67%
No	31%
Wasn't sure	1%

Why have you not taken up superfast broadband so far at this site? (n=95)

	% of respondents (non-adopters)
Was expecting the upgrade to happen automatically/didn't realise we had to order it	0%
Not needed for the business	34%
Cost	25%
Too much hassle/haven't had time	11%

	% of respondents (non-adopters)
Don't know enough about it	2%
Concerns over security	0%
Locked into existing contract	7%
Head Office/company decision	7%
In the process of upgrading	9%
It's not available to us/haven't been offered it	11%
Other	7%
Don't know	1%

Which if any of the following changes would you like to make in your business's use of Information Technology in the future? (n=141)

	% of respondents (non-adopters)
Making more use of video conferencing, such as Skype video calls	20%
Sending or receiving large files more frequently	55%
Making more use of screen-sharing applications, such as webinars or web conferencing	25%
Making more use of cloud-based services, such as Office 365, Salesforce.com, Dropbox, and Huddle	45%
Re-locating the firm's IT equipment such as servers into more secure third party data centres	21%
Making more use of internet telephony for voice calls, such as Skype or Skype for Business	41%
Doing more with e-commerce, such as selling products or services online, and/or customers paying for products and services online	43%
Making more use of social media for business purposes, such as LinkedIn, Twitter, Google Plus, or Facebook	55%
None of the above	18%

Agreement with the following statements regarding the potential benefits, perceived by non-adopters, of upgrading to superfast broadband (n=136 to 140).

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Don't know
Your business would save time	13%	13%	18%	18%	38%	1%
Your business's costs would reduce	26%	18%	28%	13%	11%	4%
Your business would be able to scale-up more easily	15%	21%	30%	17%	14%	4%
Your business would be able to address new market opportunities	16%	16%	26%	22%	18%	1%
Your business would be seeking more opportunities for selling to customers outside the UK	59%	17%	6%	9%	7%	2%
Your business's profitability would improve	19%	23%	27%	17%	13%	1%
Your business's environmental impact would reduce	26%	23%	19%	18%	11%	2%

All

How much of an impact does your unsatisfactory internet connection have on your business's productivity at this site? (n=58)

	Adopters	Non- adopters
Major impact	73%	26%
Minor impact	9%	51%
No impact	18%	19%
Don't know	0%	4%

Does your business have a company website? (n=140/141)

	Adopters	Non-adopters
Yes	81%	77%
No	19%	23%

Does your website allow customers to order and/or pay online for your products and services? (n=114/108)

	Adopters	Non-adopters
Yes	25%	19%
No	75%	78%
Don't know	0%	3%

Household survey

Adopters

Roughly, how long ago did your household first upgrade to a superfast broadband connection? (n=70)

	% of respondents (non-adopters)
In the last 3 months	11%
3-6 months ago	16%
6-9 months ago	9%
9-12 months ago	14%
12-18 months ago	19%
18-24 months ago	3%
Longer than 24 months	24%
Don't know	4%

What made you decide to upgrade to superfast broadband? (n=70)

	% of respondents (adopters)
A good deal was offered/it was part of a package (incl. by BT)	17%
Previous broadband was very slow/kept dropping out	26%
To access faster speed/faster Internet	19%
Someone else made the decision	7%
I/family member work from home	9%
Just liked it/wanted it	4%
Download speed/TV streaming/no buffering	17%
Same/reasonable price	4%
Other	7%
No particular reason	3%
Don't know	4%

What's the best thing about having superfast broadband? (n=70)

	% of respondents (adopters)
Saves time/speed of access	36%
Faster than normal broadband	7%
Can download/upload easier	20%
Convenience/makes life easier	10%
Can stream TV from other devices	6%
Better for communication/keeping in touch	9%
Access to/receive more services	13%
Ease of working from home	6%
Other	16%
Nothing	11%
Don't know	0%

For each of these, please tell me whether your household currently uses it at all, and if so whether there has been an increase, a decrease, or no change in your usage over the last year (n=70).

	Currently use & increase in usage	Currently use & no change in usage	Currently use & decrease in usage	Don't use
General surfing of the worldwide web	34%	60%	1%	4%
Streaming or downloading video entertainment	31%	33%	3%	33%
Streaming or downloading audio files	19%	39%	3%	40%
Playing online games	23%	23%	3%	51%
Downloading game software	7%	16%	7%	70%
Downloading other computer software	4%	47%	7%	41%
Downloading ebooks	9%	36%	4%	51%
Online banking	26%	53%	3%	19%
Buying products or services online	30%	60%	3%	7%
Internet telephony for voice calls	19%	24%	1%	56%
Internet video calls	21%	27%	1%	50%
Social media websites	31%	41%	4%	23%
Uploading videos or photos to websites	21%	40%	6%	33%
Sending or receiving large files	16%	43%	6%	36%
Online backups of files held on your computer(s)	14%	33%	3%	50%
Accessing information and services on government websites	27%	56%	3%	14%
Accessing health-related information and services online	19%	40%	3%	39%
Accessing online educational content	20%	21%	4%	54%

Non-adopters

You said that you don't currently have access to superfast broadband at home. Before this survey, were you aware that superfast broadband is now available in your area? (n=70)

	% of respondents (non-adopters)
Yes	53%
No	44%
Wasn't sure	3%

Why has your household not taken up superfast broadband so far? (n=37)

	% of respondents (non-adopters)
Was expecting the upgrade to happen automatically/didn't realise we had to order it	3%
Not needed	24%
Cost	19%
Too much hassle/haven't had time	11%
Don't know enough about it	8%
Concerns over security	0%
Locked into existing contract	3%
We don't have it in the area yet	8%
Poor quality/doesn't work	8%
Other	24%

Please tell me whether you agree or disagree with each of them, using a 5 point scale where 1 indicates that you strongly disagree and 5 indicates that you strongly agree. Compared with your current internet connection, superfast broadband would help your household (n= 63 to 69).

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Don't know
Enjoy leisure time more	23%	7%	21%	20%	26%	3%
Save time	13%	4%	17%	29%	34%	3%
Save money	23%	14%	27%	9%	17%	10%
Keep computer files more securely	21%	7%	30%	13%	19%	10%
Achieve a better work/life balance	17%	9%	31%	20%	17%	6%
Feel better connected with friends and family	19%	6%	29%	19%	24%	4%
Feel better connected with your local community	31%	13%	27%	14%	11%	3%
Feel better connected with people with similar interests	23%	11%	34%	19%	9%	4%
Reduce the need to travel by car or public transport	43%	20%	13%	10%	11%	3%
Get better access to government services	16%	10%	37%	17%	19%	1%
Get better access to employment opportunities	23%	6%	27%	20%	19%	6%
Get better access to educational opportunities	17%	4%	31%	20%	23%	4%

All

Before this interview today, were you aware of the Superfast Cymru programme? (n=70/70)

	Adopters	Non-adopters
Yes	34%	29%
No	64%	71%
Don't know	1%	0%

How did you first become aware of the Superfast Cymru programme? (n=24/20)

	Adopters	Non-adopters
National press	4%	5%
Local press	8%	10%
TV	17%	5%
Radio	4%	0%
Web	17%	10%
Social media	4%	0%
Direct mail	0%	5%
Leaflet or flyer	8%	5%
Advertising (train station etc)	0%	0%
Word of mouth (incl. friends, neighbours)	4%	25%
Through work (incl. colleagues)	21%	20%
Other	13%	15%
Can't recall	0%	0%

Annex C: Consultees

Name	Organisation
Susan Bolter	Powys County Council
Colin Brew	West Cheshire and North Wales Chamber of Commerce
Viv Collins	Welsh Government
Michael Groves	Welsh Government
Mike Horrocks	Denbighshire County Council
Ed Hunt	BT
Rob Hutchison	Welsh Government / DBUK
Chris Johnson	Department for Culture, Media & Sport
Martin Jones	BT
Simon Jones	Welsh Government
Sophie Knott	Welsh Audit Office
Mike Learmond	Federation of Small Businesses
Jenny Lewis	Welsh Government
Jon Merrick	Conwy County Council
Elgan Morgan	South and Mid-Wales Chamber of Commerce
Jeremy Morgan	Welsh Audit Office
Jamie Reynolds	Carmarthenshire County Council
Simon Richards	Carmarthenshire County Council
Carolyn Roberts	Denbighshire County Council
Ynyr Roberts	BT
Martin White	Pembrokeshire County Council
Peter Williams	Welsh Government

Annex D: Summary of key impact model assumptions

D.1　The impact model developed for this evaluation is built up from many different assumptions and data sources – too numerous to be listed in detail here. In this annex we provide a brief overview of some of the key assumptions.

Economic impacts

Productivity of broadband-using firms

D.2　In estimating the productivity impacts of faster broadband, we have taken into account the following considerations:

- **Not all businesses will be using (mass market) broadband for their primary connectivity**. Our evaluation is focused on the impacts of mass market broadband services – i.e. 'affordable broadband' for SMEs and households. More expensive business connectivity services – such as traditional leased lines, and the newer Ethernet leased lines – are not included in our analysis. Hence only a proportion of each size band's businesses are assumed to be 'broadband-using' (a much lower proportion for large businesses than for micro businesses).

- **The broadband speeds available to businesses vary by geography, and will continue to change over time**. We have developed estimates of the 'do nothing' coverage of different technologies, and estimates of the additional coverage through intervention using information from the Welsh Government. This has been combined with projections as to how the availability and speeds of various technologies may continue to increase over time, in order to derive estimates of the coverage and speeds available to businesses, by density decile, and by year over the modelling period.

- **There are lags associated with businesses taking up the newly available speeds**. It takes time for increases in speed to be taken up across the business base, hence the average used speeds will be considerably lower than the maximum available speeds; we have assumed lags dependent on the size of business – up to ten years for each year's increase in available speed to diffuse, in the case of the smallest firms (employing 1 to 9 people).

- **There are further lags associated with businesses realising productivity impacts from their improved connectivity**. An improvement in a firm's connectivity does not lead to an immediate step-change in productivity. It takes time to implement process

changes – potentially involving other complementary investments in systems and training – in order to realise the productivity benefits. We have assumed that it takes three years for the productivity shock associated with each year's increase in used speed to be fully realised.

- **The productivity impacts of increased speeds are, as yet, highly uncertain.** Our model uses a curve describing the average productivity shock associated with varying levels of in-year speed increase, ranging from 0 per cent (at a speed increase of 0 per cent) up towards a defined maximum towards which the curve asymptotes. The shape of the curve is principally driven by an assumption on the impact of a doubling of speed, for which our central estimate is 0.3 per cent (i.e. an increase of 100 per cent in the used speed in a year will lead to a 0.3 per cent uplift in productivity, over the following three year period; the incremental benefits of greater speed increases progressively decline until the impact curve 'saturates'). As superfast broadband has only been introduced relatively recently, evidence of the relationship between broadband speed and productivity has yet to be fully addressed in the academic literature. However, we have drawn on some recent research findings that help approach the issue from a different angle. Using quality-adjusted deflators for telecommunications equipment prices, researchers from Imperial College and the Bank of England estimated the recent impact of telecommunications on UK productivity growth through capital deepening and spillovers[14]. By applying our own estimates of the time taken for broadband speeds to double, and of the share for broadband connectivity of this overall impact of telecommunications, we have derived the above estimate of the productivity impact associated with a doubling of speeds. It also aligns (if we assume no significant net employment effect) with research by Chalmers University of Technology[15], which found that a doubling of speed is associated with a 0.3 percentage point increase in GDP growth, using a macroeconomic framework for OECD countries.

- **The productivity impacts of increased speeds will vary by sector**. The productivity performance of some sectors is much more dependent on ICT, including connectivity, than that of others. We have varied the above average productivity effects depending on their relative ICT intensity, based on information from the EU KLEMS database on the

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[14] Goodridge, Peter, Jonathan Haskel, and Gavin Wallis. 2013. "The 'C' in ICT : Communications Capital, Spillovers and UK Growth."
[15] Rohman, Ibrahim Kholilul, and Erik Bohlin. 2012. "Does Broadband Speed Really Matter for Driving Economic Growth? Investigating OECD Countries."

consumption of ICT fixed capital vs the total consumption of fixed capital in the year 2007, by sector.

Teleworker productivity

D.3 We have assumed that teleworker productivity impacts are additional to the enterprise-level productivity impacts, because the teleworker impacts will accrue to firms which are not 'broadband-using' (e.g. large corporates with teleworking employees) as well as those firms using mass market broadband. Our analysis combines assumptions and data on the following:

- The proportion of employed people who are 'telework-eligible' varying by Standard Occupational Classification (averaging 45 per cent of all employed people); the distribution of occupations by density decile, using census data; and estimates of the proportion of telework-eligible employees who do telework to some extent, by year – rising from 40 per cent in 2008 to 72 per cent in 2024. Of these, only the proportion employed in the private sector are assumed to contribute to a net GVA effect.

- A curve estimating the relationship between days per year teleworked and the average used household speed (including a saturation level), and estimates of the relative propensity to telework by density decile, derived from an analysis of census data on those working mainly at or from home.

- The average duration of a two-way commute, by density decile, using data from the census and from the National Travel Survey (43 to 75 minutes); the proportion of saved time used for work (we have assumed 60 per cent, based on a previous Cisco survey); and the average GVA per hour worked.

Labour force participation

D.4 We assume that improved home connectivity will help to expand Wales' labour capacity, through increased participation of carers and disabled people. Our estimates combine data and assumptions on the following:

- The numbers of working age people who are economically inactive due to looking after the home or family members, by density decile; the proportion of these who would like a job; and proportion of these who would be telework-eligible.

- The number of unemployed disabled people, by density decile, and the proportion of these who would be telework eligible.

- Curves estimating the proportions of telework-eligible carers and unemployed disabled people gaining home-based employment, as functions of the average used household speed (including saturation levels).

- GVA per additional worker (assumed to be full-time for disabled people, and part-time for carers).

Safeguarding of local enterprise employment

D.5 Without intervention, we assume that the least densely populated areas of the Wales would increasingly suffer significant losses of enterprises and employment, as a result of businesses having broadband connectivity which falls further and further behind that available to competitors in urban areas (in the UK and overseas). While a majority of these lost jobs would probably be displaced into urban areas in Wales or elsewhere in the UK (through business re-locations, or through urban competitors growing faster at the expense of their rural competitors), a proportion would not – bearing in mind that the rural locations may have other factors contributing to business competitiveness such as lower accommodation costs, and/or lower labour costs, and remembering that small businesses are increasingly accessing global markets through e-commerce, in which they are competing more with overseas firms than with UK firms.

D.6 Hence, by mitigating the digital divide in the geographic coverage of faster broadband, public sector intervention has an economic impact through safeguarding employment, and the associated GVA, that would otherwise be lost to Wales.

D.7 In developing estimates of these impacts, our model uses a concept of 'Relative Broadband Quality' (RBQ), which is the indicative speed available in each decile divided by the national average[16]. The densely populated areas of Wales typically therefore have an RBQ of greater than 1.0, while the least dense deciles typically have an RBQ of less than 1.0, though the values change over time.

D.8 We have constructed curves which estimate the annual growth of enterprises and employment in an area as a function of Relative Broadband Quality in that year. The shapes of these curves have been informed by an analysis undertaken for the UK Broadband Impact Study of the differences between the years 2008 and 2012 in the number of business sites and employment in

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[16] For these impacts, it is the speed available to businesses (rather than to households) which is used. 'The 'national average' is taken to be the mean of the speeds available in the 5th and 6th density deciles.

each density decile, using data from ONS. This analysis found no convincing growth trends across density deciles for 10+ employment size bands, but there was a modest positive trend for higher growth with increasing density for the count of 1 to 9 employment firms. Adjusting for the proportion of this trend that can be attributed to changes in RBQ, our curve for the 1 to 9 employment size band results in annual growth rates of, for example, -0.05 per cent at an RBQ of 0.5, and +0.03 per cent at an RBQ of 1.5. The curves for 10+ employment size bands have been 'zeroed out', as no clear relationship was observed in the historic data. That is, the safeguarding employment impact is effectively only assumed to be relevant to the 1 to 9 employment size band.

Environmental impacts

Environmental impacts of teleworking

D.9   In modelling the net carbon impacts associated with faster broadband, we have used the following assumptions:

- The numbers of teleworkers each year, by density decile, and the days teleworked per year are taken from the analysis previously discussed in the economic impacts section. For the environmental impacts, though, we include public sector teleworkers, as well as private sector teleworkers.

- The average two-way commuting distance and the mix of transport modes used for the commute per decile, derived from census data.

- 'Rebound' assumptions for the saved commuting kms (due to trips being made anyway, which would otherwise be made in the course of a commuting trip, e.g. for shopping, or dropping children off at school). We have assumed 25 per cent rebound for car commutes, and 10 per cent for bus and rail commutes.

- Carbon emission factors per passenger km, taken from DECC/Defra guidance to companies on carbon reporting.

- Assumptions on the office energy usage avoided as a result of teleworking – varying by type of office (naturally ventilated cellular, naturally ventilated open-plan, air-conditioned, standard, and air-conditioned, prestige).

- The average domestic space heating energy per teleworked day, per density decile, taking into account differences in dwelling types (more detached homes and fewer flats in rural areas), and the relative space heating energy consumed per dwelling type.

- The mix of fuels used for space heating, by density decile (more use of heating oil and electricity for heating in rural areas, which are more likely to be off the gas grid), and the carbon emission factors of these fuels.

- The proportion of teleworkers living with an economically inactive or unemployed partner (where we assume that any heating would otherwise be on in the home anyway on teleworked days), and the proportion increase in daily space heating on teleworked days in those homes where the teleworker is not living with an economically inactive or unemployed partner (for which we estimate a 50 per cent increase).

Business travel

D.10 Our assessment of the potential impacts of faster broadband on business travel assumes the following:

- Data on business trip rates per head of population, from the National Travel Survey (NTS), which we have converted to an average number of trips p.a. per employed person, together with NTS data on average business trip distance and on total business trip miles by transport mode.

- A curve describing the proportion of business trips avoided, as a function of average business connectivity speed used.

- Unlike the case for teleworking/commuting, we do not assume any increase in space heating requirements associated with reduced business travel. Neither do we assume any rebound effects in terms of additional trips made for other purposes (e.g. shopping, or dropping children off at school).

Cloud computing

D.11 For the cloud computing impacts, we have used:

- Estimates on the electricity usage associated with servers per employee for the four different size bands (assuming fewer servers per employee for large businesses, on average), a Power Usage Effectiveness factor to account for the energy required for cooling infrastructure, and estimates on the employment in broadband-using enterprises, per size band and per density decile.

- A curve to describe the cumulative proportion of server capacity shifted to the public cloud as a function of average business speed used. We

have assumed that this will saturate at about 50 per cent, and that the rate of this shift will peak once used broadband speeds are in the order of 100Mbps (i.e. LAN-like speeds).

- Assumptions on the relative energy of public cloud versus on-premises servers. We have assumed that the public cloud can reduce emissions by about 70 per cent, on average, versus virtualised on-premises servers.

- Time-varying carbon emission factors for long run marginal consumption of electricity, from the Supplementary Green Book Guidance on valuing energy use and greenhouse gas emissions – reflecting the projected decreasing carbon intensity of the UK's grid electricity over time.