



Department for
Digital, Culture,
Media & Sport

Superfast Broadband Programme – Synthesis Report

October 2021

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Glossary of key terms and acronyms

Category	Term / acronym	Meaning
Broadband / technology terminology	NGA	Next Generation Access – This refers to new or upgraded access networks that will allow substantial improvements in broadband speeds. ¹ This includes Fibre to the Cabinet, Fibre to the Premises (Fibre to the Home), Wireless and Cable broadband connections.
	FOTP / FTTH	Fibre to the Premises / Fibre to the Home – This refers to an access network structure in which the optical fibre runs from the local exchange to the end user's living or office space.
	FTTC	Fibre to the Cabinet - An access network structure in which the optical fibre extends from the exchange to the cabinet. The street cabinet is usually located only a few hundred metres from the subscriber's premises. The remaining part of the access network from the cabinet to the customer is usually copper wire.
	Cable	Telecommunications infrastructure which utilises cable networks, such as Data Over Cable Service Interface Specification (DOCSIS-3) networks.
	Wireless	High-speed internet access where connections to the premises use radio signals rather than cables.
	ADSL	Asymmetric Digital Subscriber Line - A technology used for sending data quickly over a conventional copper telephone line. It is used in current internet services with download speeds up to 24Mbps.
	Superfast broadband	Broadband with download speeds from 30 Mbps up to 300 Mbps.
	Ultrafast Broadband	Broadband able to deliver download speeds equal or greater than 300 Mbps.
Type of telecoms provider	ISP	Internet Service Provider – An organisation which provides households / businesses access to the internet. ISPs do not always own the infrastructure used to provide services, and can utilise the infrastructure owned by network providers to provide services.
	Network provider	Telecommunications providers which own infrastructure which is used to deliver internet services.
	Programme beneficiary	One of the five network providers that were awarded Superfast Broadband Programme contracts.
	Alt-nets	Alternative network – Smaller network providers that are not reliant on the OpenReach network.
Public sector organisations involved in delivery	BDUK	Building Digital UK.
	DCMS	Department for Digital, Culture, Media and Sport.
	Local Bodies	Local authorities / devolved governments responsible for delivering local Superfast Broadband Programme projects.
Financial terms	IRR	Internal Rate of Return - a measure of an investment's expected future rate of return.
	WACC	Weighted Average Cost of Capital - the rate that a company is expected to pay on average to finance its assets.
	Capex	Capital expenditure – expenditure to buy / maintain / improve fixed assets.
	Opex	Operational expenditure – ongoing expenditure associated with delivering a product / running a business.
Economic and	Cost-benefit Analysis	A comparison of the monetary values of the costs and benefits of an intervention.
	Turnover	The amount of money generated by a business (value of sales).

¹ The term was first used by the European Commission in 2010 to refer 'to upgrades to ADSL networks which had previously relied on end to end copper connections for the delivery of broadband services' – see para 11 at <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32010H0572>

Category	Term / acronym	Meaning
evaluation terms	GVA	Gross Value Added – The additional value generated from economic activity (in monetary terms).
	Outcome	Outcomes are social or economic measures that could be affected by the Programme (e.g. jobs, turnover, life satisfaction)
	Impact	Impacts are the effects on the outcome that are attributable to the Programme over and above what would have occurred in the absence of the Programme. Impacts occur over a longer time period.
	Benefit	A measurable improvement of a positive outcome (as perceived a by one or more stakeholders), which contributes towards one or more organisational objectives
	Efficiency	A measure of the extent to which a project, or policy's associated throughputs are increased
	Opportunity Cost	The value of the best alternative use of resources or assets (the benefits foregone on alternatives courses of action when deploying resources or assets).
	Superfast Broadband Programme terms	EOI
OJEU procurements		Official Journal of the European Union procurements: Publicly funded opportunities which are advertised in the Official Journal of the European Union, so that all potential applicants can view the opportunity and submit an application
Digital Divide		Difference in connectivity between areas, with some areas having access to much faster speeds than others
Premises		A house, flat or building that are considered an individual property or business.
Implementation Clawback		A mechanism to recover underspend. In the event of any underspend, the network provider was required to place unused funds in an Investment Fund to help resource further schemes or extend the contract coverage to a greater number of premises than originally offered.
Take-up clawback		If take-up proved to be higher than anticipated at the tendering stage, network providers were required to return a share of the excess revenues generated from additional take-up to the investment fund.
OMR		Open Market Review: A process by which network providers outlined their existing broadband networks and their network roll out plans for the coming three years.
'White' areas (postcodes)		Areas identified in the OMR process where there were no commercial plans to roll-out superfast broadband within three years.
'Grey' areas (postcodes)		Areas identified in the OMR process where one provider was offering or expected to offer superfast broadband services within three years.
'Black' areas (postcodes)		Areas identified in the OMR process where multiple providers were offering or expected to offer superfast broadband.
SCT		Speed and Coverage Template - a list of premises or postcodes that were identified as 'white' in the OMR process and therefore eligible for subsidised infrastructure.
PFM		Project Financial Model – a document which includes all of the financial information (build costs, expected take-up, WACC etc.), which is developed by Programme beneficiaries at the start of the local project.
C3 reports		A list of premises or postcodes where the Superfast Broadband Programme has provided upgraded connectivity.

1. Executive summary

Ipsos MORI and partners² were commissioned by the Building Digital UK (BDUK) directorate of the Department for Digital, Culture, Media and Sport (DCMS) in May 2019 to undertake the State aid evaluation of the Superfast Broadband Programme. This document presents the final evaluation report.

The Superfast Broadband Programme was announced in 2010 in response to concerns that the commercial deployment of superfast broadband infrastructure would fail to reach many parts of the UK. The government established the Programme to fund network providers to extend provision to areas where deployment was not commercially viable, on the expectation that doing so would result in economic, social, and environmental benefits.

The scheme was initially backed by £530m of BDUK funding, with the aim of extending superfast coverage to 90 percent of UK premises by December 2016. These schemes were funded under the State aid judgement SA.33671 (2012 / N).³ This relates to Phase 1 and Phase 2 of the Programme. Phase 3 of the Superfast Broadband Programme was funded under a new State aid judgement covering contracts awarded between 2016 and 2018 (State aid SA. 40720 (2016 / N)).⁴ Contracts awarded under Phase 3 by mid-2020 involved £391m in public funding. Further contracts have subsequently been awarded and the total value of the Programme (including public and private funding) is now estimated to be £2.6 billion.

1.1 Evaluation aims and methodological approach

The aims and objectives of the Superfast Broadband Programme evaluation were set out in the Invitation to Tender (ITT), and focussed on five main evaluation questions. These questions are:

- Question 1: What are the outcomes of the scheme?
- Question 2: How has the behaviour of individuals / organisations changed for these outcomes to come about?
- Question 3: How effective and efficient has the delivery of the Programme been?
- Question 4: Was the investment cost effective?
- Question 5: What can we learn to improve future policy designs and implementation?

The evaluation used a mixed methods approach, which included quasi-experimental evaluation approaches to establish the impact of the Programme, and primary research and thematic analysis to establish how the Programme had been implemented and how and why the outcomes and impacts had been achieved.

1.2 Key findings

At the time of writing, a total of 144 contracts were awarded to network providers under the Superfast Broadband Programme to make superfast broadband services available to 5.5m premises. 5.3m premises had received subsidised coverage by the end of December 2020.

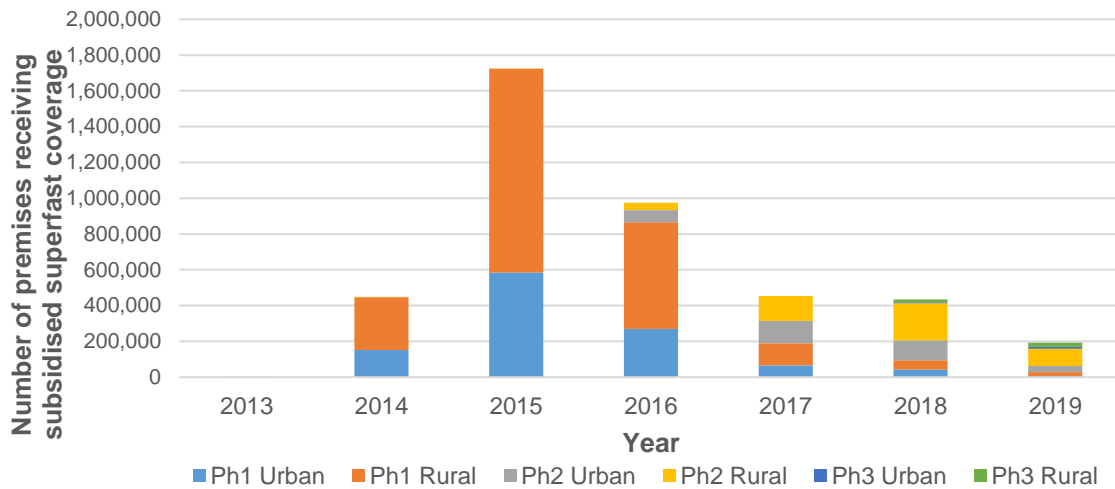
² Ipsos MORI's partners are: George Barrett, Richard George Feasey Plum Consulting and Simetrica.

³ European Commission (2012) State aid SA.33671 (2012 / N) – United Kingdom National Broadband scheme for the UK - Broadband Delivery UK https://ec.europa.eu/competition/state_aid/cases/243212/243212_1387832_172_1.pdf

⁴ European Commission (2016) SA. 40720 (2016 / N) – National Broadband Scheme for the UK for 2016-2020 https://ec.europa.eu/competition/state_aid/cases/263954/263954_1760328_135_4.pdf

Delivery of Phase 1 and 2 was largely complete at this stage, although there were some delays in the delivery of Phase 3 contracts.

Figure 1.1: Premises upgraded by Phase, rurality and by year

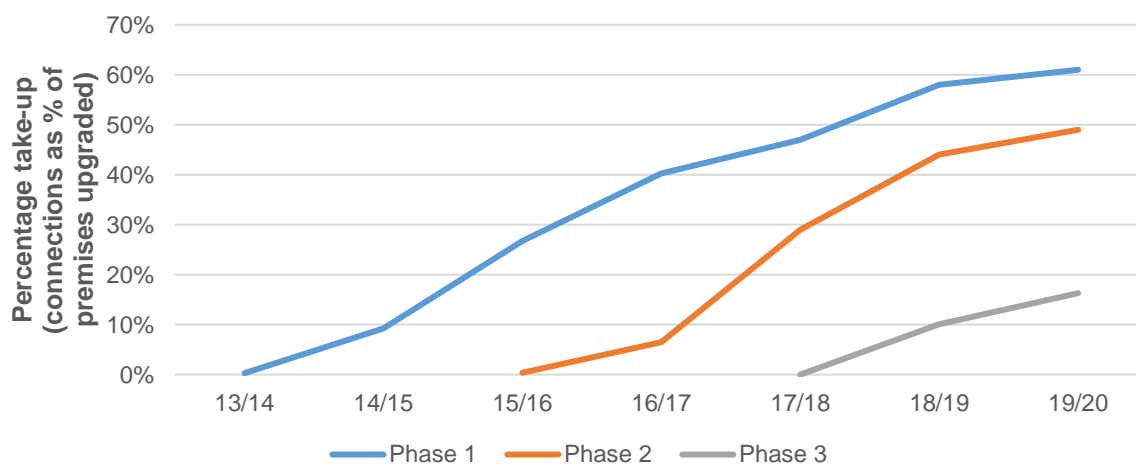


Source: C3 reports, Ipsos MORI analysis. Note that delivery has been assigned to the period covered by the relevant annual Connected Nations report and do not always cover a 12-month period.

Network providers directed subsidised investment in broadband to areas with low population density and low levels of penetration of superfast broadband technologies relative to the UK overall. These areas were also characterised by features that would be likely to increase the cost of bringing forward improved broadband infrastructure.

Take-up of superfast broadband services has steadily grown since the Programme began and has reached 60 percent for Phase 1 contracts. Take-up also exceeded the expectations of network providers when they tendered for contracts, implying that the investments made have proven more profitable than originally anticipated. Further evaluation activity in 2022 will explore whether network providers expectations of take-up have become more realistic in subsequent contracts.

Figure 1.2: Take-up over time – number of connections as a percentage of premises upgraded, 2013 / 14 to 2019 / 20



Source: Programme data (C3 reports); Ipsos MORI analysis. Note that 2019 / 20 is an incomplete year

The key findings reported below are aligned to the BDUK benefits framework.

What are the outcomes of the scheme?

Reducing the Digital Divide

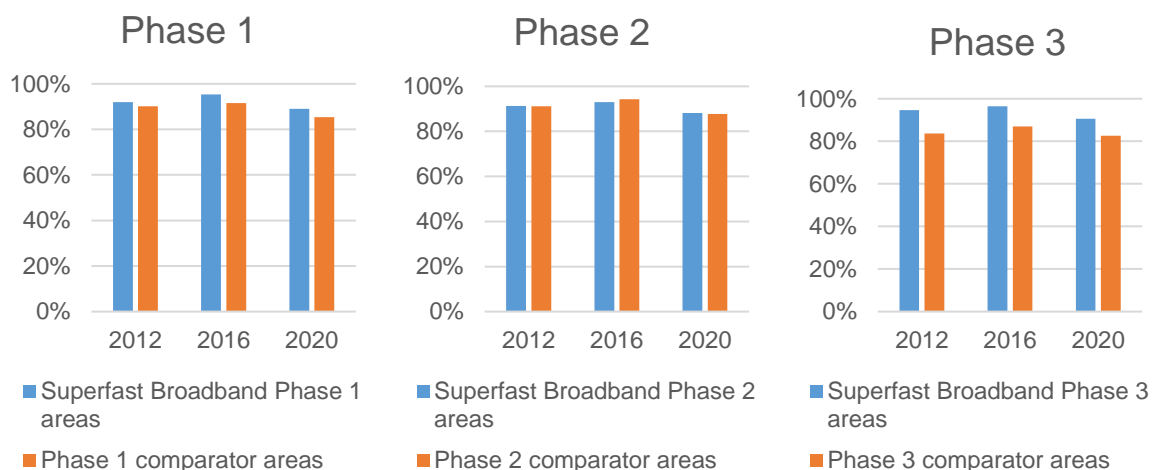
The Superfast Broadband Programme had a substantial effect in accelerating the roll-out of superfast broadband infrastructure between 2012 and 2019 and met its objectives to reduce the digital divide. It was estimated that between 39 percent and 57 percent of the premises upgraded would not have had access to superfast broadband services in the absence of the public sector funding provided by the Programme in September 2019⁵ (equivalent to between 1.6m and 2.3m premises). This has also translated into impacts on take-up of superfast broadband services, with the Programme estimated to have increased the average download speeds of connections on postcodes benefitting from subsidised upgrades by 9.1 to 9.3 Mbps, and the maximum download speeds of connections by 9.4 to 11.8 Mbps.

The Programme also enabled a substantial share of the premises upgraded to receive improved broadband services earlier than they would have done in its absence. However, the Programme has also worked to delay the availability of superfast broadband services for around 10 percent of the premises benefitting from the Programme. These are premises where the Programme delivered connectivity at a later date than unsubsidised network providers would have in the absence of the Programme, but the unsubsidised providers did not deliver these connections because of the planned roll-out of the Programme.

Stimulating the broadband market

There are indications that the Programme has helped stimulate additional competition, or at least avoided the entrenchment of local monopolies. While most contracts were awarded to BT / OpenReach, it saw its market share for superfast connections decline in areas benefitting from the Programme between 2016 and 2020. Smaller suppliers awarded contracts have been able to expand their market share. Interviewees provided the view that open access provisions may also lead to more intense competition in the future.

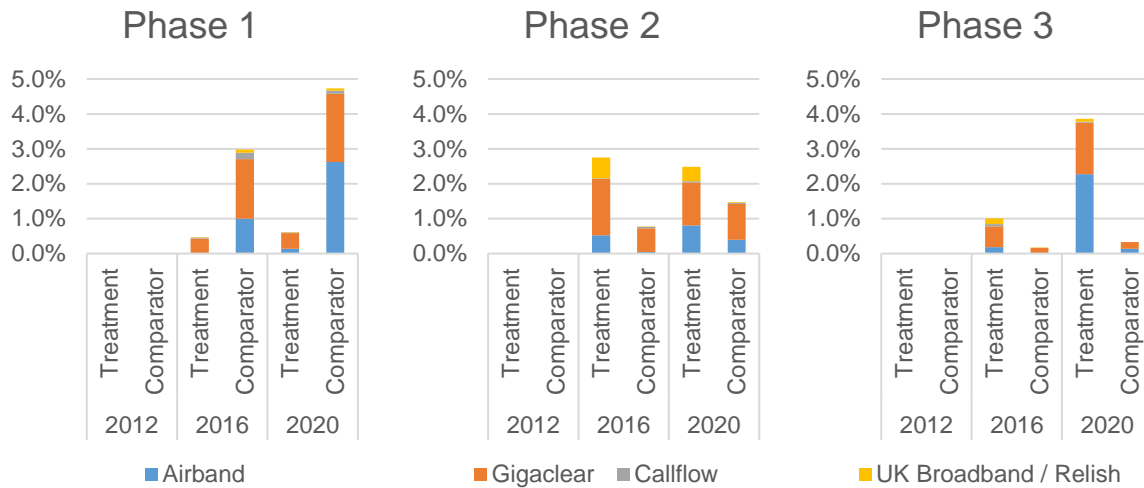
Figure 1.3: NGA broadband market share for OpenReach (including Sky and TalkTalk) in Programme delivery areas and other areas eligible for the Programme



Source: ThinkBroadband speed test data

⁵ September 2019 has been used as a point of reference for the statistical analysis of connectivity outcomes due to time lags in the data availability. September 2019 was the most recent data available at the time the analysis took place.

Figure 1.4: NGA broadband market share for all other Superfast Broadband Programme beneficiaries in Superfast Broadband Programme delivery areas and other areas eligible for the Programme



Source: ThinkBroadband speed test data

Employment growth and productivity

The Programme has produced significant local economic impacts, including creating over 17,000 jobs and enabling an increase in the annual turnover of local businesses of approximately £1.9bn. This was driven by improvements in the competitiveness of businesses already located in the Programme area and the relocation (or retention) of businesses to areas receiving improved broadband infrastructure (and potentially additional competition). These economic impacts have benefitted workers by increasing wages and reducing unemployment. At the national level, the Programme is estimated to have resulted in £1.1bn in productivity gains between 2012 and 2019.

Public sector efficiency

There was also some evidence that improved broadband has both improved the efficiency of administrative tasks involved in the day-to-day delivery of public services and stimulated greater awareness and use of online or remote delivery modes. These have proved particularly important during the COVID-19 pandemic.

However, effects on user satisfaction were not always positive and there was evidence that the Programme has indirectly led to migration to rural areas, placing pressure on the capacity of some public services.

Public value

The public value of the Superfast Broadband Programme was assessed using a range of approaches. These approaches included directly assessing the impact of the Programme of subjective wellbeing measures, and exploring the effects of the Programme on house prices – which when all other factors are controlled for can be interpreted as a proxy measure revealing the value of public value or social wellbeing.

There were mixed results in terms of how far the Programme achieved public value outcomes for residents of the Programme area. The Programme led to an increase in house prices of between £1,700 and £3,500 on average and £0.7bn and £1.5bn in total in the beneficiary areas. This suggests that buyers valued access to superfast broadband services. However,

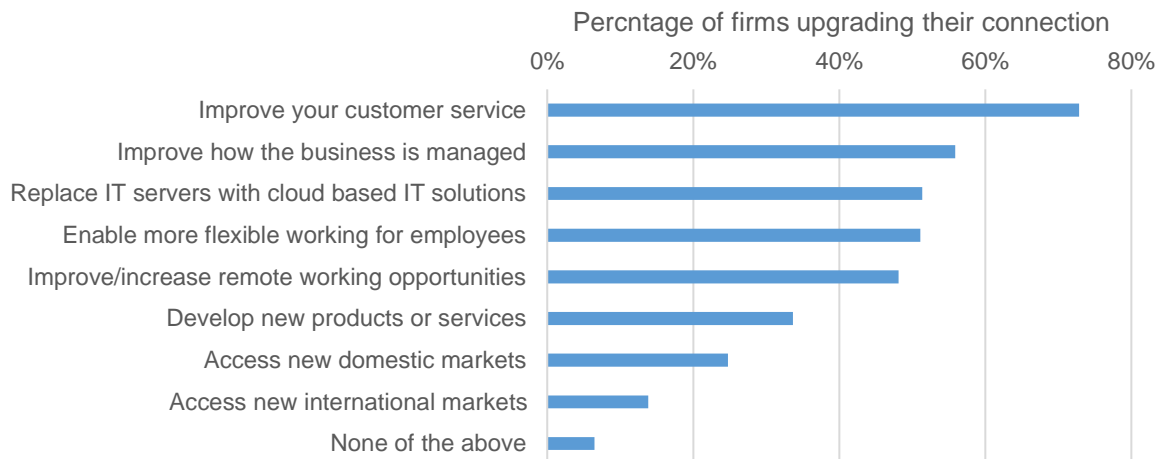
there was no robust evidence that the Programme increased a direct measure of subjective wellbeing. This could be explained by migration induced by the Programme (an indirect effect), which may have altered the composition of local populations or indirectly reduced the wellbeing of residents by placing excess pressure on the capacity of public services or disrupting settled patterns of community life.

How has the behaviour of individuals / organisations changed for these outcomes to come about?

The impacts of the Programme on the availability of superfast broadband services were enabled by the adoption of an Open Market Review (OMR) process that was broadly effective in revealing which premises would not be upgraded on a commercial basis. Analysis of the gap funding model, however, indicates that network providers consistently underestimated levels of take-up and the likely profitability of the investment. Given the large impacts of the Programme on deployment, this indicates that subsidies were critical in encouraging network providers to accelerate their investment plans. However, it is likely that it would have been commercially viable to upgrade many premises eventually (within five years of delivery). An estimated 60 percent of premises would have been passed by superfast broadband within four years of the Programme delivery in the absence of the Programme.

Around 50 percent of businesses in the Programme area have taken up faster connections since improved broadband networks have been available. The adoption of faster connections was reported to bring about a range of incremental efficiency gains, largely driven by the improvements to administrative processes. There was also evidence that firms had moved to more flexible working practices, which have produced reported benefits for employees. These incremental gains are consistent with the estimated impacts of the Programme on productivity, which while large in total were relatively modest on a per firm basis.

Figure 1.5: Actions enabled by upgrading to superfast or ultrafast connectivity



Source: Business survey. Base: 296

Overall, the Superfast Broadband Programme was viewed by local authorities as a catalyst to help them advance their local digital plans by reducing pressure to facilitate improvements in broadband connectivity and enabling them to focus on other aspects of digital inclusion (such as digital skills). Schools engaged in the research also highlighted that improved access to online materials has helped improve pupil engagement, although they were less confident that this would necessarily translate into improved educational attainment due to the wide variety of factors which influence attainment. This evaluation has not involved a large amount of research with households, and despite research to identify the scale and value of the public

value outcomes, an understanding of how the Programme has led to public value outcomes, such as quality of life and wellbeing, remains an evidence gap.

How effective and efficient has the delivery of the Programme been?

The Superfast Broadband Programme was delivered using matched funding, whereby Local Bodies were required to find resources to complementary resources from other Programmes or budgets. Local Bodies did not report difficulties in obtaining these resources in earlier phases. However, increased dependence on match funding in Phase 3 (compared to Phase 2) may have led to some schemes being scaled back owing to resource constraints.

There was a high level of engagement with the OMR process and Local Bodies were able to secure responses from most relevant network providers. However, there were some issues with the quality and accuracy of data provided and challenges in assessing the realism of plans put forward (with some suspicions that some network providers were overstating their ambitions to prevent the emergence of subsidised competition). Additionally, the investment cycles of many network providers were determined over relatively short time horizons (12 to 24 months) which did not match the three-year period covered by the OMR. The snapshot provided by the OMR also became out of date as network providers' plans evolved in response to changes in demand and regulation.

There was no evidence that using an alternative tendering and / or contracting approach to that recommended by BDUK had beneficial outcomes for Local Bodies (in terms of the value for money achieved or project delivery). However, dividing contracts into lots in Phase 3 did appear to improve value for money and increase competition at the margin.

Most Local Bodies used similar project management approaches, with day-to-day project managers overseen by steering groups / committees and where required support was provided by BDUK. A small number of projects described working with the Programme beneficiary as being a partnership rather than a client-contractor relationship. These bodies felt they got more out of the provider on the delivery of the project with barriers addressed through close partnership working.

The delivery of Phase 3 contracts has been delayed, with only 17 percent of contracted Phase 3 premises having been delivered to by September 2019 (see figure below). Reasons for this included the capacity of Programme beneficiaries to deliver their contracts, the duration of time required to resolve change requests and the enforcement of 'milestone zero' within contracts.⁶ BDUK has been working to develop new approaches to ensure change requests are resolved in a timely manner and this should help to resolve this issue, but Local Bodies also need to ensure that their processes allow for a rapid response to change requests and escalate difficult change requests to BDUK expediently.

Was the investment cost effective?

Contracts have been designed in such a way that network providers are required to return resources to the public sector if build costs are overstated or if take-up proves higher than expected. The protections put in place by BDUK appear to have been (and continue to be) highly effective in protecting the public sector from the risk that it has provided more than the minimum subsidy needed for projects to go forward. As costs and provider take-up expectations were systematically lower than observed, the public sector cost of the Programme is expected to fall from £1.7bn to £0.8bn.⁷

⁶ Milestone zero involves the selected provider undertaking a detailed survey of the proposed build, to ensure that the postcodes do not have any superfast coverage and that the build can be completed for the value specified in the contract.

⁷ All monetary values in this section are presented in 2019 prices.

These mechanisms have substantially improved the value for money obtained from the Programme. At the point of contracting, the expected public sector costs per premises upgraded was £342. However, after allowing for clawback, this is expected to fall to £140 per premises upgraded. Even after accounting for the likelihood that a share of the premises upgraded would have received improved broadband connectivity anyway, a net cost per additional premises upgraded of £250 is expected. While there are few available comparators, the Superfast Broadband Programme appears to be one of the most efficient Programmes supporting broadband deployment in the EU.

The benefits of the Programme are also expected to significantly exceed its costs. The estimated Benefit to Cost Ratio (BCR) was between £2.70 and £3.80 per £1 of net public sector spending based on its impacts between 2012 and 2019. Allowing for future benefits to 2030, the BCR is estimated to rise to between £3.6 and £5.1 per £1 of net public sector spending.⁸

What can we learn to improve future policy designs and implementation?

In terms of the key lessons from the evaluation for future Programme design and implementation:

- **Role of subsidies:** The central finding of the evaluation is that faster broader connectivity is socially beneficial. However, there are important market failures that slow down the deployment of those networks even where investment would be commercially viable. Subsidising network deployment has proven an effective means of accelerating these investments and has significant economic and social benefits that substantially exceed the costs involved. Alternative delivery models are unlikely to have produced outcomes on a similar scale or offered equivalent value for money.
- **Open Market Review process:** The Open Market Review process is an important element of the design of the Programme which has helped direct resources to areas that would otherwise receive improved broadband infrastructure at a much later date or not receive improved broadband at all. However, static snapshots of commercial delivery plans offered by the process can become outdated as network providers respond to changes in demand or regulation. There may be opportunities to maximise the value for money for the Programme by using the results of the Open Market Review more flexibly in defining areas eligible for subsidies and in structuring project delivery. Smaller projects of shorter duration should also minimise the risk that the Open Market Review gets 'overtaken' by external events and maximise the number of network providers with capacity to provide responses.
- **Clawback mechanisms:** The clawback mechanisms employed in the delivery of the Programme are likely to prove effective in protecting the public sector from the risk that subsidies result in network providers earning excess profits (and have been a key contributor to the strong value for money offered by the Programme). However, it is also important to note that clawback payments are recovered over a period of seven years and the public sector will incur opportunity costs by tying up resources in the Programme. BDUK may wish to consider whether seeking to contain these opportunity costs in future procurements could be justified. Increased levels of competition in Phase 3 have limited the extent to which network providers can transfer risk to the public sector (as transferring the risk will result in a less competitive tender from the

⁸ The range in the Benefit to Cost Ratio is driven by high and low estimates of the benefits of the Superfast Broadband Programme

network provider) and there were signals that the process of dividing contracts into smaller 'lots' has helped increase competition and value for money.

- **Capacity of the market:** The findings of the evaluation suggested that the delivery of Phase 3 contracts have partly been delayed by insufficient capacity amongst network providers to deliver at the scales required by the contracts awarded. This is clearly a risk for any future Programme and will need to be considered carefully.
- **Population migration:** The findings of the evaluation also highlight that improved broadband infrastructure in rural areas can encourage migration of population and stimulate rural population growth. This process has the potential to produce negative social outcomes by placing additional pressure on public services or disrupting settled patterns of community life. These issues need to be understood in more detail. However, given the centrality of broadband to the government's infrastructure investment plans, broader thought could be given to the implications that may arise from greater decentralisation of population (e.g. in terms of pressure to develop land). Accommodating rural population growth stimulated by improvements in rural broadband connectivity could require actions to be taken by other government departments.
- **Implementation:** The findings from the evaluation also point to several lessons for the successful implementation of publicly funded projects. These include:
 - A consideration of the sources of match-funding, to ensure that the projects target appropriate areas / premises for the BDUK funding source, rather than those areas required for the match-funding.
 - Revising business cases for new funding to ensure that these include the most recent evidence and include all benefits and disbenefits of the intervention.
 - Building strong relationships with network providers to ensure appropriate responses to future OMR and public consultation processes and a high number of applications to deliver local contracts.
 - Implementing systems within the Local Body to ensure change requests are managed in an expedient manner.
 - Ensuring both the Local Body and Programme beneficiary undertake activities to promote take-up of superfast connections, to ensure that the Programme outcomes are achieved.

2. Introduction

Ipsos MORI and partners⁹ were commissioned by the Building Digital UK (BDUK) directorate of the Department for Digital, Culture, Media and Sport (DCMS) in May 2019 to undertake an evaluation of the Superfast Broadband Programme. This report provides the final evaluation findings.

2.1 Superfast Broadband Programme

The Superfast Broadband Programme was announced in 2010 in response to concerns that broadband infrastructure capable of delivering download speeds of 30 megabits per second (Mbps) or more would fail to reach many parts of the UK without public intervention. These speeds are needed to enable data intensive applications, particularly for multiple users (such as video streaming). In June 2010, almost 3 million homes and businesses did not have access to broadband speeds of 2Mbps or more.¹⁰ In June 2011, superfast broadband connections were available to just 58 percent of premises in the UK.¹¹

The government established the Programme to fund broadband network providers to extend provision to areas where delivery of superfast networks (the name given to technologies capable of delivering download speeds of 30Mbps or more) was not commercially viable. It was hoped that this would both reduce the number of areas that were not benefitting from infrastructure improvements, and deliver a variety of economic, social and environmental benefits. The scheme has been delivered in three Phases:

- **Phase 1:** The scheme was initially backed by £530m of BDUK funding, with the aim of extending superfast coverage to 90 percent of UK premises by December 2016.
- **Phase 2:** The Programme was expanded in 2015, with a further £250m made available to extend coverage to 95 percent of premises by December 2017.
- **Phase 3:** Phase 3 of the Superfast Broadband Programme covered a further group of contracts awarded between 2016 and 2020. Contracts awarded under Phase 3 by mid-2020 involved £391m in public funding. The third phase aims to provide superfast broadband coverage (or faster networks) in areas where availability remained below the 95 percent coverage target and extend superfast coverage beyond 95 percent where possible.

The total value of the Programme (including public and private funding) is now estimated to be £2.6 billion.

2.2 Evaluation aims and objectives

The aims and objectives of the Superfast Broadband Programme evaluation were set out in the Invitation to Tender (ITT), and focussed on five main evaluation questions. These questions are:

- Question 1: What are the outcomes of the scheme?
- Question 2: How has the behaviour of individuals / organisations changed for these outcomes to come about?

⁹ Ipsos MORI's partners are: George Barrett, Richard George Feasey Plum Consulting and Simetrica.

¹⁰ <https://www.gov.uk/government/publications/2010-to-2015-government-policy-broadband-investment/2010-to-2015-government-policy-broadband-investment#appendix-2-superfast-broadband-Programme>

¹¹ Ofcom (2011) Communications Infrastructure Report 2011: Fixed Broadband data; Available at: <https://webarchive.nationalarchives.gov.uk/20200803095351/https://www.ofcom.org.uk/research-and-data/multi-sector-research/infrastructure-research>

- Question 3: How effective and efficient has the delivery of the Programme been?
- Question 4: Was the investment cost effective?
- Question 5: What can we learn to improve future policy designs and implementation?

2.3 Methodology

The evaluation used a mixed methods approach, which included quasi-experimental evaluation approaches to establish the impact of the Programme, and primary research and thematic analysis to establish how the Programme had been implemented and how and why the outcomes and impacts had been achieved.

The evaluation design was informed by the National Broadband Scheme (NBS) evaluation plan¹², which was developed to underpin a State Aid assessment of the Superfast Broadband Programme. The NBS evaluation plan set out the methodological approaches to be used to assess the extent to which the Programme had increased superfast broadband access and take-up, the effects the Programme had the broadband providers awarded contracts (Programme beneficiaries), the effects the Programme had on the broadband market and how efficient the Programme had been. The proposed methodologies were quasi-experimental approaches where possible.

The evaluation approach used built upon the requirements in the NBS evaluation plan and enhanced the quality, coverage and robustness of the findings. A brief summary of the evaluation methodologies is presented below, followed by a description of the ways in which information was collected for the evaluation.

2.3.1 Evaluation approach

The following evaluation approaches were used to deliver the evaluation of the Superfast Broadband Programme:

- **Development of Theories of Change to underpin the evaluation:** The NBS evaluation plan presents some of the outcomes that the Superfast Broadband Programme aimed to achieve and how to measure these outcomes. However, it did not provide any information about how and why these outcomes would be achieved. Therefore, the first stage of the evaluation was to develop a series of Theories of Change for the Programme, to show a causal pathway from the provision of public funding through to economic, social and telecommunication market impacts. These Theories of Change are presented in Section 3 and tie in to the BDUK Benefits Framework.
- **Quasi-experimental¹³ approaches to robustly identify the outcomes and impacts achieved where possible:** In the scoping stage of the evaluation, the research team identified outcomes and impacts which could be assessed using quasi-experimental evaluation designs (econometric analysis). The way in which the Superfast Broadband Programme has been implemented allowed quasi-experimental approaches to be used to identify economic and social impacts. The underlying quasi-experimental methodology was as robust as could be achieved within the constraints set by the design of the Programme (achieving Level III on the Maryland Scientific Methods

¹² DCMS (2017) National Broadband Scheme Evaluation Plan Available at: <https://www.gov.uk/government/publications/national-broadband-scheme-evaluation-plan>

¹³ Quasi-experimental approaches aim to identify the causal impact of an intervention by comparing the outcomes achieved by the area / group targeted by the intervention with those achieved by a comparable group / area.

Scale¹⁴). The quasi-experimental analysis explored the impacts of the Programme on the availability and take-up of superfast broadband services, the performance of businesses located in the Programme area, the labour market, house prices, and the wellbeing of residents.

- **Descriptive and Thematic analysis:** Where quasi-experimental approaches were not feasible, the research team undertook thematic analysis using findings from primary research, Programme Management Information and secondary data sources to identify and form conclusions about the likely impact of the Superfast Broadband Programme. Thematic analysis was also used to assess how effectively the Programme had been implemented.

The thematic analysis involved the research team reviewing transcripts of all interviews to identify key themes in the responses, and the responses were entered into a coding framework to be analysed. The research team then explored how frequently each theme occurred in the interviews. A further step in the analysis was to explore whether there were commonalities between the interviewees that had responded in a similar way.

- **Cost-benefit analysis and Cost effectiveness analysis:** A cost-benefit and cost-effectiveness analysis (the cost per premises passed) of the Programme were completed to explore issues relating to the cost effectiveness of the Superfast Broadband Programme and the degree to which its costs were justified by its benefits. The analysis was completed in line with the guidance set out in the HM Treasury Green Book¹⁵ and the approaches put forward for valuing economic and non-market impacts.

In order to undertake these evaluation approaches, the research team collected information using primary research and information from secondary data sources. A description of the data is presented below.

Primary research

The evaluation included multiple strands of primary research to explore how the Superfast Broadband Programme has been delivered and what impact it has had in the areas where enhanced broadband infrastructure has been provided:

- **Telephone survey of businesses:** A large-scale telephone survey of 1,200 businesses that were either located in areas where the network had been upgraded by the Superfast Broadband Programme in the years since 2016, or were located on postcodes with planned upgrades that were yet to receive superfast broadband coverage was undertaken. The achieved sample for the business survey included quotas for business size and sector, to ensure some control over the profiles of the businesses included in the survey.
- **Depth interviews with businesses:** Following the large-scale survey of businesses, 40 depth interviews with businesses were completed. These businesses were selected from the population that had taken part in the survey and had agreed to take part in further research. The interviews were used to collect more information about how and why improved broadband connectivity contributes towards business performance.

¹⁴ Sherman LW, Gottfredson D, MacKenzie D, Eck J, Reuter P, Bushway S. Preventing Crime: What Works, What Doesn't, What's Promising: A report to the United States Congress, Prepared for the National Institute of Justice. Baltimore, MD: University of Maryland, Department of Criminology and Criminal Justice; 1998

¹⁵ HM Treasury (2018) The Green Book: Central Government Guidance on Appraisal and Evaluation. Available at: <https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-government>

- **Research with employees:** A further nine interviews were undertaken with employees from businesses that had agreed to take part in further research. These interviews were used to explore how enhanced broadband connectivity has affected employees.
- **Depth research with Local Bodies:** 40 depth interviews were undertaken with Local Bodies responsible for delivering Superfast Broadband Programme contracts. These interviews were used to explore the mechanisms used to deliver the Superfast Broadband Programme contracts and what the impacts the Programme had on the take-up of superfast broadband connections.
- **Depth research with public service providers:** The evaluation also involved depth interviews with 33 providers of public services (covering education, health, and other services provided by local authorities). These interviews explored how enhanced broadband connectivity impacted on organisations providing public services, how the services they offer are changing, and what impact this has on public service users.
- **Depth research with telecommunication providers:** The evaluation was supported by a Programme of in-depth research with 16 telecommunications providers (including all direct beneficiaries of the Programme, network providers that tendered for but were not awarded contracts, network providers that did not tender for contracts, and internet service providers that could potentially make use of the infrastructure made available through the Programme). The focus of the interviews was on understanding the impact of the Superfast Broadband Programme on the telecommunications market.
- **Programme MI:** The Programme MI was used in the descriptive and thematic analysis described above. The MI provided information about the Programme, including the cost of the Programme, premises delivered to and the take-up of connections by contract area, change requests submitted to BDUK, and postcodes without superfast broadband coverage that were not going to receive subsidised coverage through the Programme or were expected to receive subsidised coverage through the Programme rollout. The Programme MI was also linked to secondary datasets to support the quasi-experimental evaluation approaches described above.
- **Pilot survey of households:** The evaluation also aimed to include a large-scale survey of households, to explore the social impacts of the Superfast Broadband Programme. A pilot study was completed (with 143 households), which demonstrated the feasibility of this approach to capture the social impacts and provided some indicative findings. However, due to the COVID-19 pandemic it has not been possible to undertake a planned large-scale survey yet. This is expected to take place in late 2021.

Secondary data sources

The evaluation design involved multiple strands of research using secondary data sources, including Ofcom Connected Nations data, ThinkBroadband data and Office for National Statistics (ONS) data made available through the Secure Research Service (SRS). These data sources are described in more detail below:

- **SRS datasets:** The quasi-experimental evaluation designs utilised several datasets in the ONS SRS. These were:

- **Business Structure Database (BSD):** This dataset includes information about the number of businesses, their turnover and employment by geographic area, and was used to explore the economic impacts of the Programme.
 - **Annual Survey of Hours and Earnings (ASHE):** This dataset includes information about the wages earned by workers at businesses in Superfast Broadband Programme delivery areas and comparator areas, and was used to explore the impact of the Programme on earnings.
 - **Annual Population Survey / Understanding Society:** These datasets include information about the levels of subjective wellbeing reported by individuals, and was used to explore the public value outcomes of the Superfast Broadband Programme.
- Other official statistics: The evaluation team also sourced other official Government statistics to support quasi-experimental evaluation designs. These were:
 - **Department for Work and Pensions (DWP) claimant count data:** This data presents the monthly claimant count by Lower Super Output Area (LSOA), which was used to explore the effect of the Programme on unemployment.
 - **Department for Education Explore Education Statistics:** This data provides a wealth of information about English schools staffing, financial and demographic profile and academic achievement, and was used to explore the impact of the Superfast Broadband Programme on public service provision.
 - **Department for Health and Social Care General Practice dataset:** This dataset provides details of the size of patient list and staffing and financial information for GP practices in England. Additionally, the **GP Patient Survey (GPPS) dataset**, which provides information about patient experience of their GP practice was also accessed. These data sources were used to explore the impact of the Programme on public service provision.
 - **ONS house price data:** This information provided data about the value of houses sold in the UK, and has been used to explore the public value outcomes of the Superfast Broadband Programme.
 - **Data from Programme beneficiaries Project Financial Model:** This information was used to undertake an assessment of the extent to which subsidises provided by the Programme were needed to make the investments in broadband infrastructure commercially viable.
 - **ThinkBroadband market data¹⁶:** This extensive dataset provided information about Broadband coverage and take-up of services by telecommunications providers. This data was used to undertake a descriptive analysis of the effect of the Programme on the local broadband markets. This involved examining changes in the number of network providers active in the Programme area and their market shares between 2012 and 2020. This was completed using network provider level data compiled independently by ThinkBroadband.

2.4 Limitations to the evaluation

There are some limitations to the evaluation that should be considered when interpreting the findings of the analysis. These are:

¹⁶ ThinkBroadband is an independent organisation which collects information and data about internet coverage in the UK. It also runs an online 'speed test' function, where individuals can provide a limited amount of data about their broadband package and test the connection speed that they receive (www.thinkbroadband.com).

- **Causality:** The Programme was not delivered as a Randomised Control Trial and econometric methods have been used to establish estimates of the causal effects of the Programme. These methods are based on comparisons between postcodes that benefitted from coverage subsidised by the Programme and other postcodes that were eligible for investment but not chosen by beneficiaries when developing their proposals to deliver the schemes. There may be systematic differences between those areas benefitting from the Programme and the comparison group that could bias findings. While steps have been taken to mitigate this risk, the results may overstate the impact of the Programme due to unobserved confounding factors.
- **COVID-19:** The data deployed in many of the analyses described above ran to mid-2019 and do not allow for an analysis of the impacts of the Programme in relation to COVID-19. It is plausible that the Programme enabled benefits such as remote working, the delivery of public services online and increased local resilience. However, if COVID-19 has induced greater demand for superfast services amongst residential consumers, the rates of return earned on Superfast Broadband Programme contracts will also be higher than when projected based on historic growth in take-up. This could make some upgrades commercially viable that previously were not (implying that additionality in the longer term was overstated). These issues will be considered in a future assessment of the Programme, as part of the final round of evaluation.
- **Impact of COVID-19 on primary research:** Additionally, the COVID-19 pandemic impacted upon the primary research undertaken for the evaluation. The primary research ran in multiple phases from autumn 2019 until January 2021. The national lockdowns, restrictions and availability of potential interviewees impacted on the timing of some of the primary research. In some instances, this was beneficial for the evaluation, as it allowed the research to collect some information about how enhanced connectivity was being utilised during the pandemic. However, the restrictions also led to the postponement of a large-scale household survey to explore the potential societal benefits of the Superfast Broadband Programme – and as a result there is still an evidence gap exploring how and why the Programme has contributed towards public value outcomes.
- **Data availability:** The NBS evaluation plan identified data sources to be used to undertake the analysis of the impact of the Superfast Broadband Programme. However, not all this data could be made available to the evaluation team. Where data was not available, the research team (and BDUK) sourced alternative data sources where available. However, there were still some gaps in the data, which are highlighted throughout the document.

2.5 Structure of the report

The remaining sections of this report are structured as follows:

- Section 3 provides an overview of how the Superfast Broadband Programme was expected to generate its intended outcomes and impacts;
- Section 4 discusses the delivery of the Superfast Broadband Programme;
- Section 5 details the outcomes achieved by the Superfast Broadband Programme;
- Section 6 describes the behaviour changes that have led to the outcomes being achieved;
- Section 7 presents an assessment of how effectively and efficiently the Programme has been implemented;
- Section 8 discusses the cost effectiveness of the Programme; and
- Section 9 outlines the key learnings from the Programme.

3. Superfast Broadband Programme

This section provides an overview of how the Superfast Broadband Programme was expected to deliver its intended outcomes. This includes a description of the aims and objectives of the Programme, the outcomes and impacts it was expected to achieve. This serves as an analytical framework guiding the definition of the evaluation questions and the interpretation of results.

3.1 Policy Aims and Objectives

The first Ofcom Infrastructure report in November 2011 showed that 58 percent of UK households had access to Next Generation Access (NGA) services capable of delivering superfast broadband speeds (download speeds of 30Mbps or more). NGA technologies encompass the installation of fibre-optic networks to connect the telephone exchange to the cabinets serving customers (Fibre-to-the-Cabinet) or to their premises (Fibre-to-the-Premises), improvements to cable networks, and wireless technologies that allow customers to obtain broadband services without a cabled connection to the network.

At the time, private investment in NGA infrastructure was expected to be limited in less densely populated areas of the UK. The costs of investing in the fixed infrastructure needed to provide these services are usually substantial. Where population density is low, this will reduce commercial viability as the consumer base will be smaller and the costs of network build may be higher (e.g. if properties are more distant from the serving telephone exchange).¹⁷

The Superfast Broadband Programme was announced in 2010 to respond to these concerns. On the expectation that extending superfast broadband coverage to these areas would produce economic, social and environmental benefits, the government established the Programme to provide £530m of public resources to fund further deployment with the aim of increasing coverage to 90 percent of UK premises by early 2016. The Programme was extended in 2015, with a further £250m made available to extend coverage to 95 percent by the end of 2017.

The Superfast Broadband Programme was extended a second time to cover the 2016 to 2020 period (commonly known as Phase 3). These projects had a greater focus on gigabit connectivity (download speeds of 1000Mbps) than those funded in prior phases, which can normally only be achieved by installing a fibre optic cable from the telephone exchange to the premises of the business or household. This third phase evolved from a series of pilots that sought to explore how coverage could be extended to reach more than 95 percent of UK premises.

3.2 BDUK Benefits framework

The Superfast Broadband Programme was expected to produce a variety of downstream benefits for businesses, workers, households, the public sector and the environment. These expected benefits were captured in the BDUK Benefits Framework set out in the table below. This report does not cover all anticipated benefits of the Programme – for example, environmental benefits have been considered out of scope due to lack of robust data.

¹⁷ Population density is also a proxy measure for how well linked a place is in terms of transport and the presence of physical factors like steep gradients, water or forests / woodland, which could also impact upon the ability of network providers to offer superfast broadband networks.

Table 3.1: BDUK Benefits Framework¹⁸

Benefit type	Outcome / Impact	Covered in the evaluation?
Productivity Growth	Increased Business Productivity	✓
	New Businesses Established	✓
	Increased ICT Skills and Wider Educational Attainment	✓
Employment	Employment (safeguarded or new)	✓
Public Sector Efficiency	More Efficient Delivery and Increased Access to Public Services	✓
	Cross-government Learning for Large Procurement Programmes	✓
Digital Divide	Reduced Digital Divide	✓
Public Value	Improved Quality of Life and Wellbeing	✓
Public Value	Consumer Savings	
Stimulating the Broadband Market	Stimulated Private Sector Partnerships and Investment	
	Market Failure Addressed Through Appropriate Intervention	✓
	Increased Competition in the Market, Including Small Suppliers	✓
	Innovation and Knowledge of New Technologies	
	Increased Community Capacity in Procuring Infrastructure	
Environmental	Reduced Impact on the Environment	

Source: BDUK (2015) *Benefits Realisation Framework*

3.3 Theory of Change

This section provides an overview of how the Programme was expected to deliver the benefits described in the BDUK Benefits Framework.

3.3.1 Digital Divide and Stimulating the Broadband Market

The Superfast Broadband Programme provides subsidies to providers of broadband networks to extend superfast broadband infrastructure to areas that would not otherwise benefit from commercial deployments or would benefit at a later date. Subsidising network providers involves a risk that they seek public funds for (deadweight) investments that they would have made anyway, enabling them to earn greater profits. The delivery of the Programme involved several steps to mitigate these risks:

- **Open Market Review (OMR) and public consultation:** Local Bodies were required to manage an OMR and public consultation process before they issued tenders. The first stage of this process involved requesting network providers to provide details of their existing networks and commercial plans to roll-out improved broadband coverage over the next three years – this request was made after the announcement of the funded Superfast Broadband Programme. This allowed BDUK and Local Bodies to identify three types of area:
 - **‘White areas’** where there were no commercial plans to roll-out superfast broadband within three years. Only these areas were eligible for funding through the Programme;
 - **‘Grey areas’** where one provider was offering or was expected to offer superfast broadband services within three years; and
 - **‘Black areas’** where multiple providers were offering or were expected to offer superfast broadband.

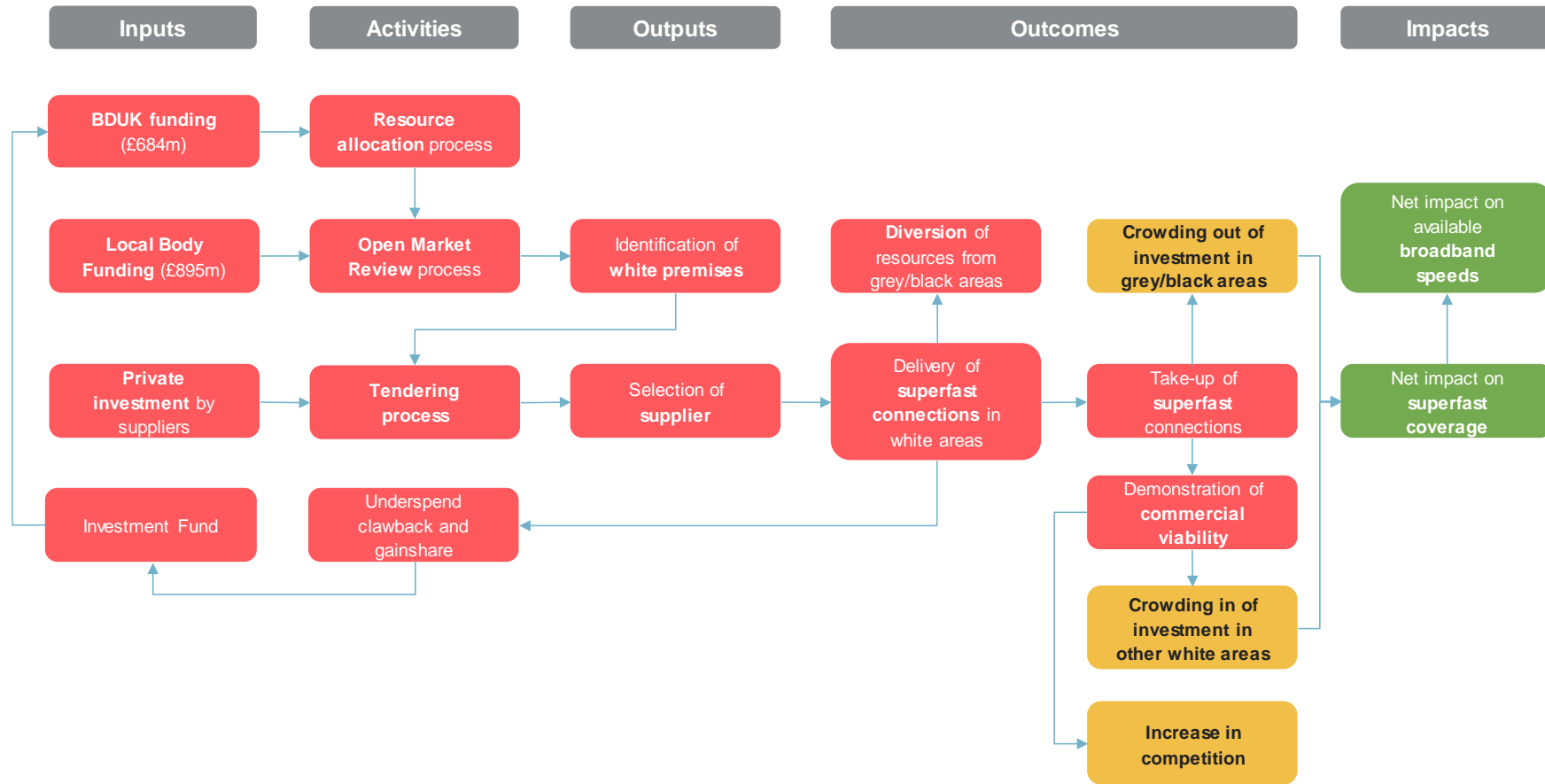
¹⁸ Some of the benefits included in the framework are linked and will contribute to the achievement of other benefits.

- **Tendering process:** Following the OMR and public consultation process, Local Bodies commissioned network providers to deliver superfast coverage in ‘white’ postcodes. In the first two phases, contracts were mainly awarded through a framework contract.¹⁹ In Phase 3, Local Bodies used an open procurement process and were free to split the project into multiple lots (allowing different network providers to bid for different lots). Network providers submitting tenders were asked to provide information on the expected costs and revenues associated with the project, to inform an assessment of what level of public subsidy would be needed to make the project sufficiently profitable.
- **Implementation and take-up clawback:** The contracts awarded to successful network providers (Programme beneficiaries) included provisions to allow the public sector to recover unused funds if the beneficiary had overestimated their delivery costs. Additionally, if take-up of the broadband infrastructure proved to be higher than was expected at the tendering stage, beneficiaries were required to return a share of the excess revenues generated to an Investment Fund which could be recycled to fund further coverage. This aimed to limit the amount beneficiaries could earn excess returns on investments subsidised by the public sector.
- **Crowding out and crowding in:** The provision of subsidies for investment in superfast broadband infrastructure could reduce investment in other areas or by other network providers. If network providers faced limits on their overall capacity, this could delay the delivery of other investments in other areas. The plans for subsidised investments were also published, potentially discouraging other network providers from extending their networks to those areas. Conversely, if the Programme helped to demonstrate that investments in superfast broadband infrastructure were profitable in rural areas, then this may have encouraged additional investment.
- **Competition:** Finally, the Programme may have led to changes in the parameters of competition and the market shares of network providers. The Programme required beneficiaries to provide open and non-discriminatory wholesale access to the infrastructure delivered with public subsidy. These requirements could stimulate competition in wholesale or retail markets in the long term. However, the nature of the technologies provided could have resulted in beneficiaries extending their networks to a small number of premises that were already served by superfast broadband infrastructure, leading to some competitive distortions.

The figure below presents a summary of the discussion above.

¹⁹ A framework contract is an agreement between a procuring organisation and suppliers whereby all contracts issued under the framework agreement are only made available to the suppliers included in the framework.

Figure 3.1: Connectivity impacts of the Superfast Broadband Programme



3.3.2 Productivity growth and employment

The impacts of the Programme on businesses are expected to involve the following processes:

- **Take-up:** It is expected that the benefits of the Programme will be driven by firms taking up superfast broadband connections made available through the Programme.
- **Direct impacts on productivity:** Numerous studies have shown that faster broadband stimulates productivity growth. Adoption of superfast broadband could raise the productivity of local firms by allowing them to adopt new technologies or drive product, process, or service innovation. This would allow them to provide their products or services at lower cost or attain higher prices (from the same inputs), resulting in improvements in productivity.
- **Turnover and employment growth:** Adoption of superfast broadband may also aid firm growth by helping them to access new markets or by making them more competitive in their existing markets. This will allow them to increase their sales, turnover and economic output (Gross Value Added). Firms that increase their sales may also need to recruit additional workers to meet the additional demand.
- **Relocation of firms:** Several studies²⁰ have shown that the availability of broadband enables important economic activities to take place in less central locations. Providing enhanced broadband infrastructure may create an incentive for firms to relocate to the Programme area, leading to further creation of jobs at the local level. Enhanced broadband may also help retain businesses that would have otherwise been lost to other areas with superior infrastructure.
- **Impacts on workers:** Workers could expect to benefit from these outcomes through greater numbers of employment opportunities and higher wages. These could be particularly large if enhanced broadband coverage helps avoid the emergence of issues associated with long-term unemployment. Faster connectivity also has the potential to transform the nature of work by enabling efficient remote working. This could deliver benefits for workers by reducing their commuting time and altering the time that they work. It could also encourage economically inactive workers to seek employment.²¹
- **Displacement:** However, it should be noted that positive impacts on local economies benefitting from the Programme could be offset by negative effects elsewhere in the economy. Firms that grow as a result of the Programme may take market share from their competitors located in other areas of the UK, causing loss of sales and encouraging them to reduce their employment and GVA. The movement of firms into areas benefitting from the Programme would also result in losses of jobs in those areas from which they relocated.
- **Price effects:** If firms increase their demand for workers (or other inputs) to support their growth, this could also place upward pressure on wages or other prices. The increase in prices could also encourage other firms to reduce their levels of activity.

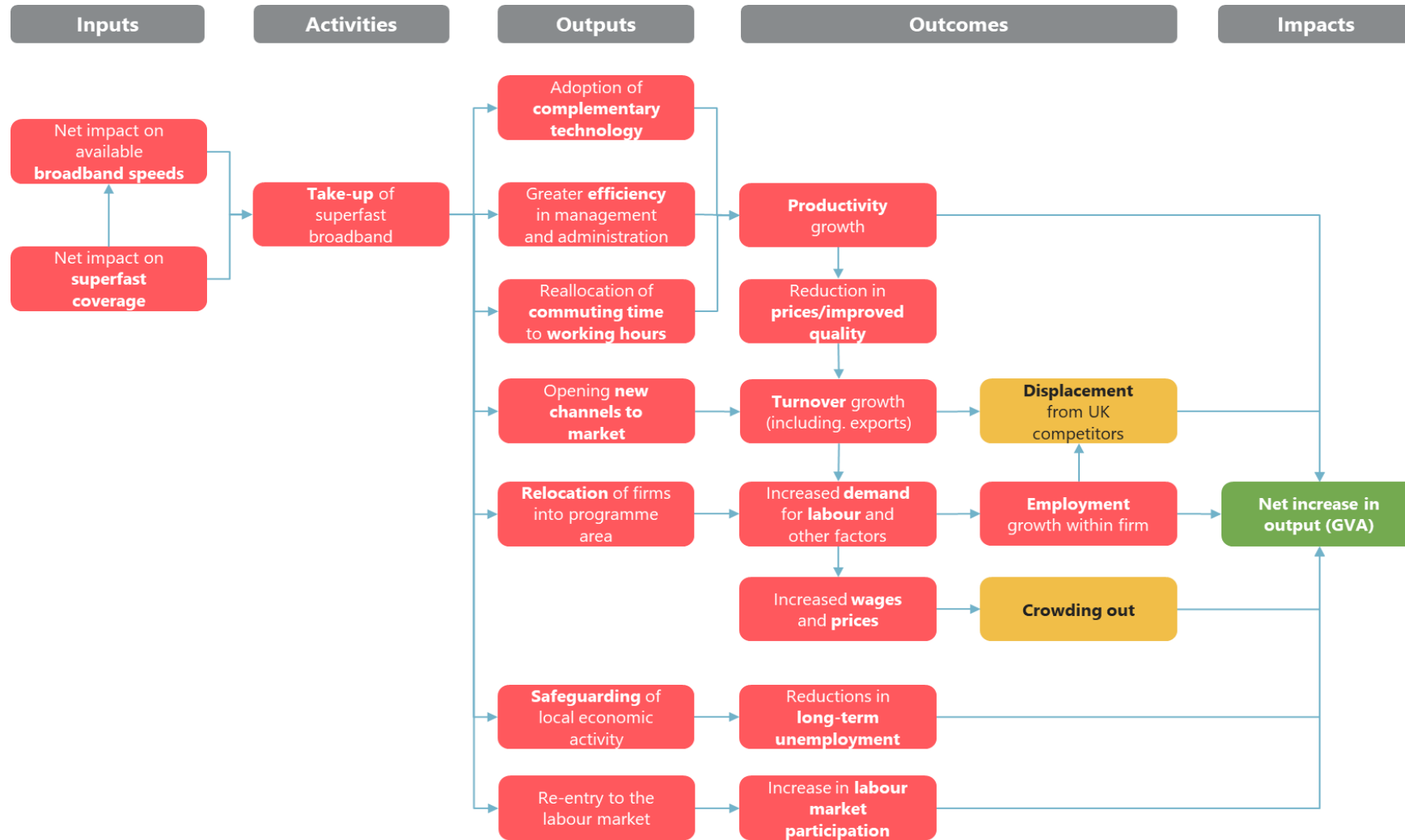
²⁰ Broadband's contribution to economic growth in rural areas: Moving towards a causal relationship, Whitacre, B., Gallardo, R., and Stover S, Telecommunications Policy, 2014

²¹ Some of these outcomes could be offset by increasing the active labour pool and potentially the number of qualified workers to take these additional roles – through reducing long-term unemployment and allowing more workers to apply for roles through remote working arrangements.

- **National economic benefits:** As a result of these offsetting effects, the economic benefits of the Programme at the national level will stem from the improvements in productivity enabled by enhanced broadband.

The discussion above is summarised in the figure below:

Figure 3.2: Logic model of effect of enhanced broadband connectivity of the economy



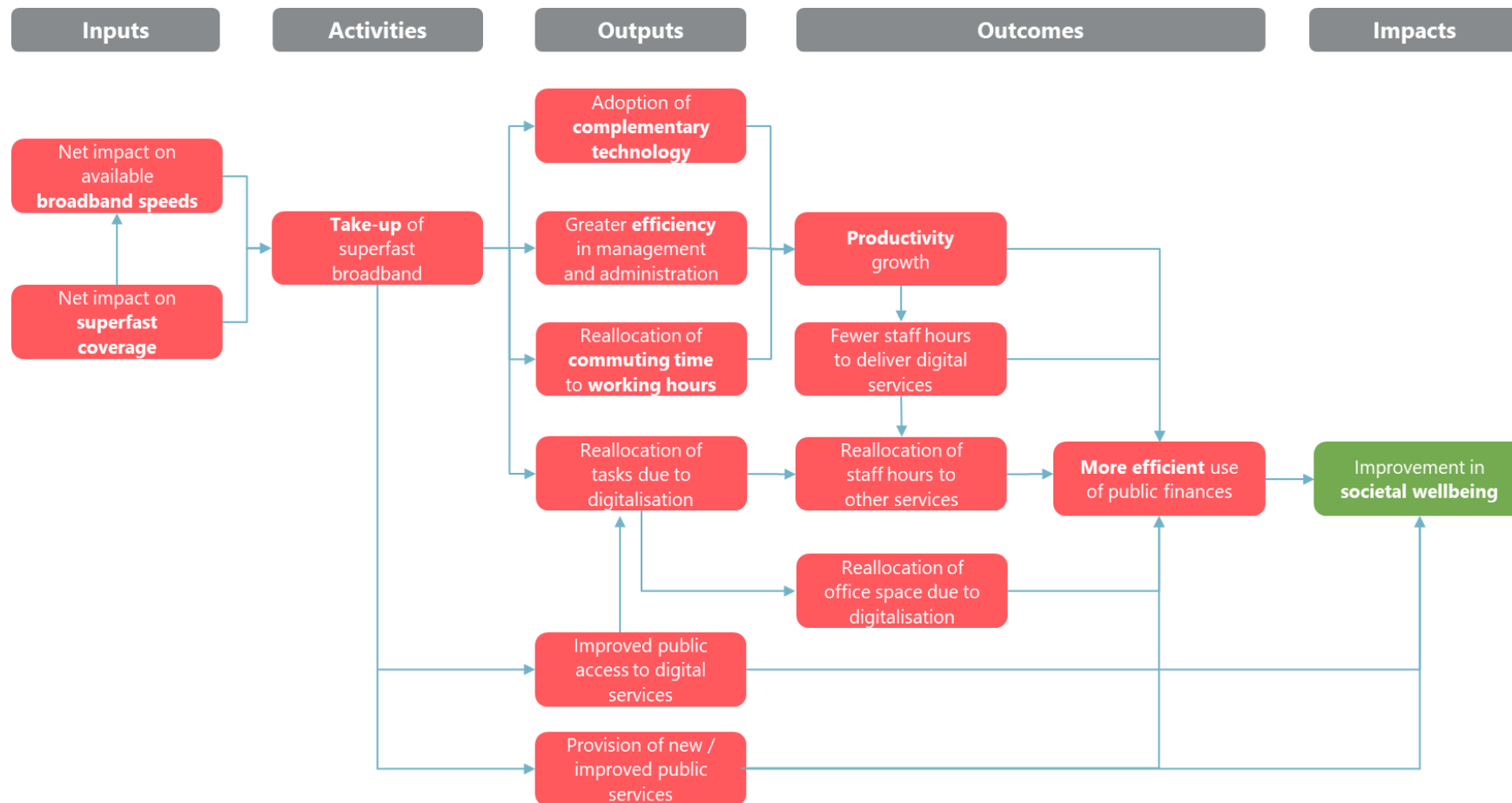
3.3.3 Public sector efficiency

The Programme may also have a range of direct and indirect effects on the delivery of public sector services:

- **Efficiency gains:** Subsidised coverage may allow public sector organisations to benefit from the faster broadband connectivity. This will potentially allow them to generate efficiency gains or realise cost savings by adopting cloud computing and allowing public sector workers to work more flexibly. Cost savings realised could be channelled into improving the quality-of-service delivery.
- **Service transformation:** Improved connectivity may also facilitate the digitalisation of public services that could deliver further cost savings or improve the quality-of-service delivery. The range of possible applications are extensive. These might include enabling simple transactions to be undertaken on-line, such as payment of bills, booking systems for leisure facilities, or renewal of prescriptions. Greater bandwidth could also enable remote delivery of public services. For example, digital health applications can enable remote diagnosis of health conditions through telemedicine platforms (e.g. the GP at Hand service developed by Babylon Health), diagnostic or therapeutic smart-phone applications (e.g. the Changing Health diabetes management application), or using remote sensors to provide real-time information to clinicians to support patient management. The COVID-19 pandemic has also illustrated how other public services – such as education – can be provided online.
- **Digital divide issues:** The ability of resident populations to benefit from digitalisation of public services will be partly dependent on how far they can access digital services. If they do not take-up faster broadband services or if they do not have the confidence or skills to use online platforms, then some residents may be locked out of new modes of service delivery. This risks negative social impacts if physical modes of delivery are withdrawn or scaled back.
- **Population growth:** Subsidised coverage may also have indirect effects on public services if it induces the migration of population to rural areas. If the supply of public services does not expand to accommodate the additional demand this may bring, this could place pressure on public services (leading to greater rationing and reduced access, rather than a widening of access).

The discussion above is summarised in the figure below:

Figure 3.3: Logic model for public sector organisations



3.3.4 Public value

Households will also benefit through their use of superfast broadband services:

- **Consumption benefits:** Access to faster broadband may benefit households by allowing them to access a wider range of choice and quality of products and services. Most obviously, faster broadband speeds will allow consumers to access entertainment and media services that depend on high bandwidths (e.g. streaming services or smart devices). Benefits may also arise from access to more extensive online marketplaces that allow consumers more choice, obtain savings or free up time that would have otherwise been spent travelling to retail or other centres.
- **Teleworking and leisure time:** Households newly able to work remotely may also gain leisure time if commuting times are reduced.
- **Social interaction:** Faster broadband may also open new modes of communication between residents. While email and social media may not be dependent on higher bandwidths (and can be straightforwardly used through mobile phones), the COVID-19 pandemic has popularised the use of video conferencing as a mode of interpersonal communication. This technology requires greater bandwidths and subsidised coverage has the potential to improve wellbeing by supporting more extensive social interactions within and beyond the communities in which residents live.
- **Distance learning:** Superfast broadband could also offer a wider range of distance learning options. This could have economic benefits by helping people upskill and find better paid work or wellbeing benefits for those who undertake courses for pleasure.
- **Health benefits:** Households may also see improvements in their physical or mental health. For example, increased leisure time could allow individuals to increase their levels of physical activity, while greater social connectivity could reduce levels of social isolation or loneliness. Further health benefits may also arise if the use of digital health applications enables better access to care or self-management of conditions.
- **Perceptions of inequity:** The Superfast Broadband Programme also has the potential to address perceptions of inequity relating to the locations of major investments in infrastructure. For example, focus groups undertaken by University College London²² revealed a perception that recent investments in infrastructure have exacerbated disparities in amenities and mainly benefitted those that were already affluent. While the Programme cannot tackle these issues in their entirety, bringing superfast broadband coverage to rural areas has the potential to at least ameliorate these types of public concern.
- **House prices:** If households place a value superfast broadband connectivity, changes in the availability of superfast broadband connections in an area could lead to increases in house prices.

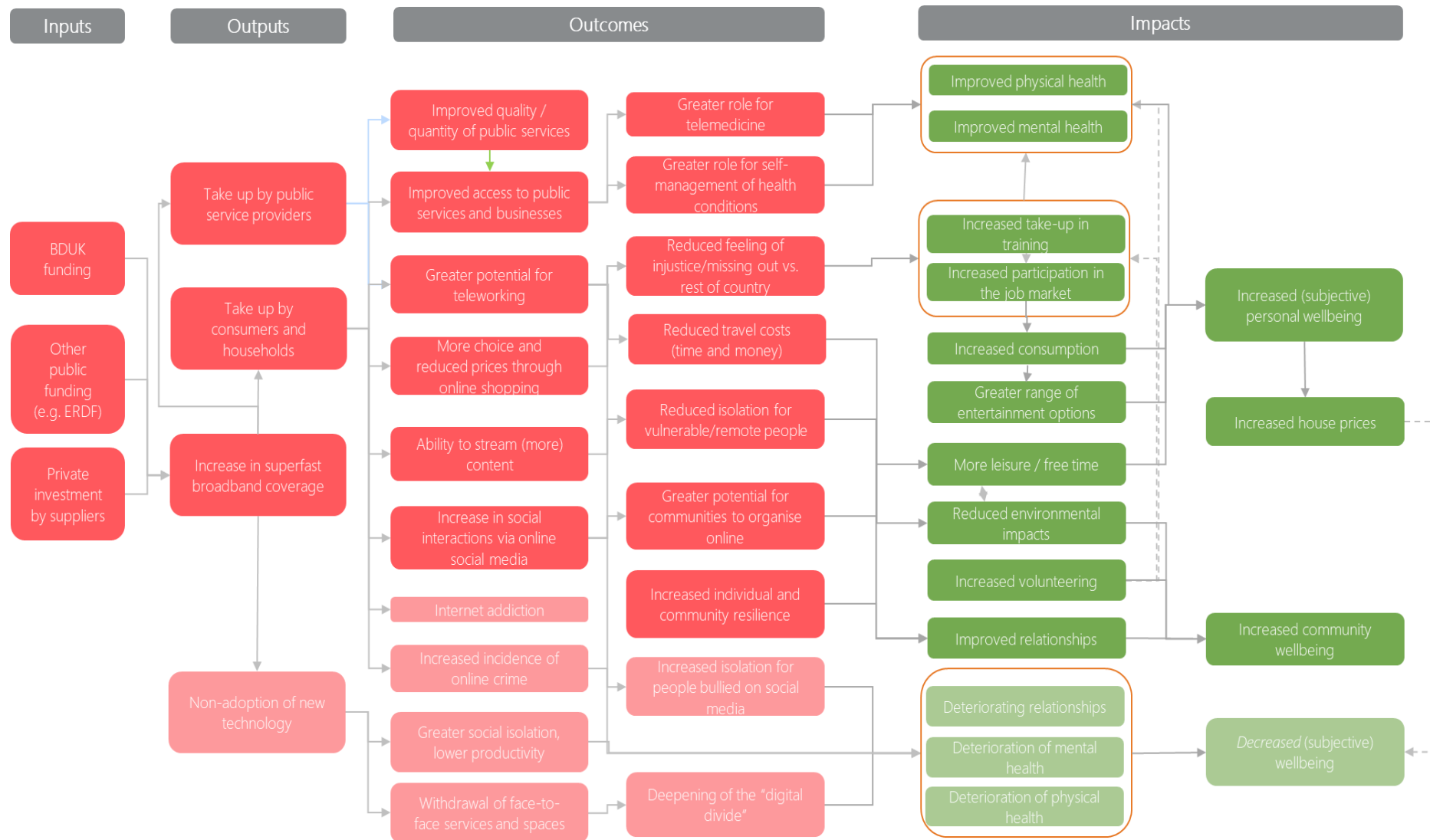
However, the impacts of superfast broadband on the wellbeing of residents may not always be positive:

²² Natarajan et al (2020) Civil Society Perspectives on Inequality: Focus Group Research Finding, Submission to UK2070 Commission.

- **Health:** Improved access to superfast broadband could have negative health impacts. For example, increased access to entertainment at home could reduce physical activity or expose individuals to online criminal activity, issues of internet addiction, or cyber-bullying. There may also be negative effects on wellbeing if superfast connectivity encourages individuals to work more intensively outside of normal working hours. These types of issue are being explored by BDUK in on-going work to understand the public value impacts of the Programme.
- **Vibrancy of town centres:** Shifts to online consumption could reduce the commercial viability of in-store retail services. Loss of retail outlets may reduce the vibrancy of town centres (reducing the wellbeing of residents of those communities).
- **Rural population growth:** The availability of superfast broadband services may encourage people to migrate to rural areas. This may have a negative impact on the wellbeing of residents if it increases rents, stimulates housebuilding activity on previously undeveloped land, places additional pressure on public services or leads to greater congestion on rural road networks. Migration could also reduce community cohesion if it disrupts settled patterns of community life.

The discussion above is summarised in the figure below:

Figure 3.4: Logic model for public value



4. Programme delivery

This section provides an overview of the delivery of the Superfast Broadband Programme between 2012 and 2020. This gives a description of the areas benefitting from the Programme, the value of the contracts awarded, and the progress made in enhancing coverage and promoting take-up of superfast broadband services.

Key findings:

In summer 2020, a total of 144 contracts had been awarded under the Superfast Broadband Programme to Programme beneficiaries to make superfast broadband services available to 5.5m premises. 5.3m premises had received subsidised coverage by the end of March 2019. Delivery of Phase 1 and 2 was largely complete at this stage, although there were some delays in the delivery of Phase 3 contracts.

Network providers directed subsidised investment in broadband to areas with low population density and low levels of penetration of superfast broadband technologies relative to the UK overall. These areas were also characterised by features that would be likely to increase the cost of bringing forward improved broadband infrastructure.

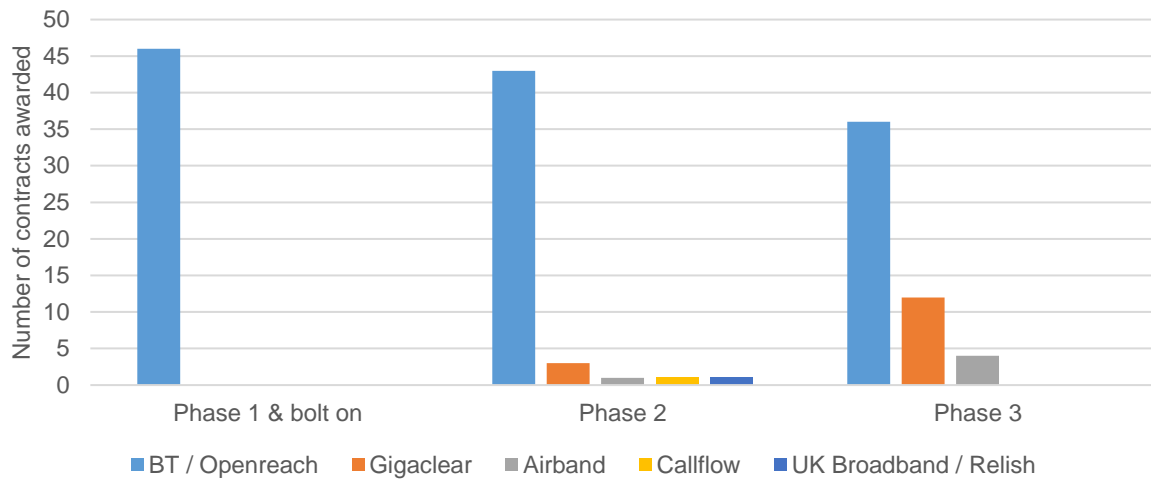
Take-up of superfast broadband services has steadily grown since the Programme began and has reached 60 percent for Phase 1 contracts. Take-up also exceeded the expectations of network providers when they tendered for contracts, implying that the investments made have proven more profitable than originally anticipated in the absence of the clawback mechanism.

4.1 Superfast Broadband Programme contracts awarded

A total of 144 contracts had been awarded through the Superfast Broadband Programme at the time of this evaluation (summer 2020):

- These contracts aimed to provide superfast broadband services to 5.5m premises across the three phases of the programme.
- Most (85 percent) contracts were awarded to BT / OpenReach. Use of alternative providers – including wireless network providers and smaller providers specialising in fibre optic networks - increased in Phases 2 and 3.

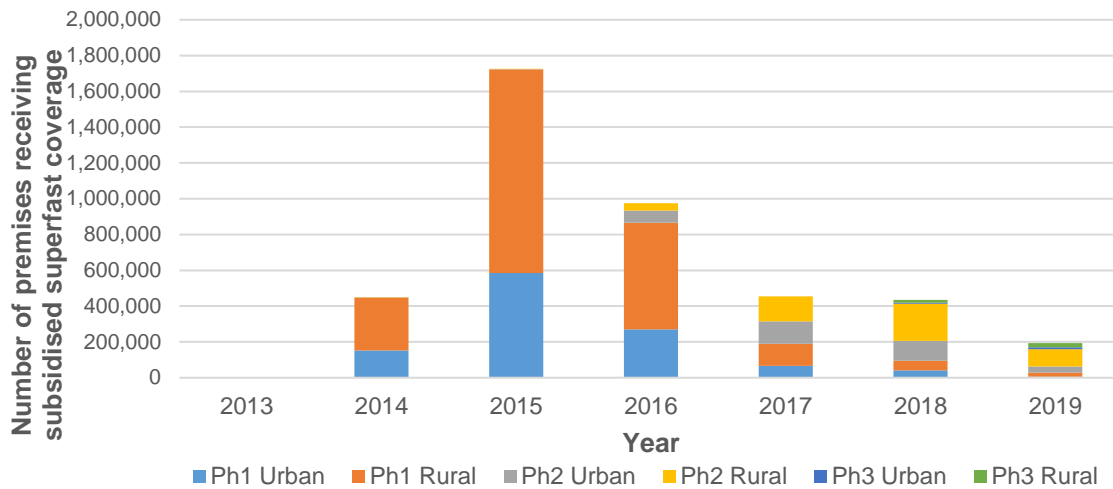
Figure 4.1: Number of contracts awarded by beneficiary and Phase of Programme



Source: Cora Management Information, June 2020

- A total of 5.3m premises had been upgraded by the end of March 2019. Contracts awarded under Phase 1 of the Programme tended to be larger and peak delivery volumes were experienced during 2015.
- Delivery of Phases 1 and 2 were largely complete at the end of March 2019. Around 17 percent of 322,000 contracted premises to be upgraded under Phase 3 were complete at this stage and delivery of this group of projects was behind schedule.
- Delivery of the Programme by March 2019 was expected to have involved gross public sector costs of £1.3bn. However, BDUK was expected to recover more than £500m because delivery costs were less than expected and take-up exceeded network providers' expectations at the tendering stage. If these funds are recovered as expected, this reduces the net cost of the Programme to £730m.
- Phase 1 was predominantly used to provide FTTC technologies. Phase 3 of the Programme prioritised very fast broadband speeds and resulted in a greater share of FTTP delivery.

Figure 4.2: Premises upgraded by Phase, rurality and by year



Source: C3 reports, Ipsos MORI analysis. Note that delivery has been assigned to the period covered by the relevant annual Connected Nations report and do not always cover a 12-month period.

4.2 Areas benefitting from the Superfast Broadband Programme

Table 4.1 provides an overview of the characteristics of the postcodes that have been targeted by the Superfast Broadband Programme. Postcodes benefitting from the Programme differed from other areas of the UK in several important respects:

- Availability & coverage:** Superfast broadband penetration in 2012 was lower in postcodes included in the build plans for the Programme than elsewhere in the UK. This is also reflected in measures of take-up, including the average and maximum speeds of connections and the number of superfast connections taken up by consumers located on the postcode.
- Network characteristics:** Areas in the build plans of Superfast Broadband Programme contracts were more likely to exhibit features that would increase the costs of bringing forward improved broadband infrastructure. Premises tended to be further from the telephone exchange serving the building. As the speed of broadband services provided using copper lines declines with distance, upgrading premises to superfast speeds involves greater costs by increasing the investment needed in fibre cables. The share of premises served by a line directly connected to the telephone exchange rather than passing through a cabinet was also higher. Upgrading these premises would require the installation of a new cabinet which would also increase the cost of improving broadband infrastructure.
- Demand density:** Population density was less than half the national average in the areas benefitting from the Programme. Local exchanges and cabinets also tended to serve smaller numbers of premises, and the unit cost of upgrading premises to superfast services was estimated by BDUK at more than £300 in 2013 (relative to £179 across the UK). However, areas benefitting from the Programme were broadly equivalent to the rest of the UK in terms of local unemployment and employment rates and weekly earnings.

Table 4.1 Characteristics of postcodes in Phase 1, 2, and 3 build plans

Characteristic	Phase 1	Phase 2	Phase 3	Rest of UK
Broadband availability and take-up in 2012				
% of postcodes with Next Generation Access, 2012	9.0	18.5	15.5	73.0
Average maximum download speed (Mbit / s) of connections, 2012	10.9	9.6	8.5	13.4
Average download speeds (Mbit / s) of connections, 2012	7.8	7.2	5.7	13.9
Network characteristics in 2013				
Length of line from exchange to premises (m) 2013	2,742	3,193	3,647	2,161
Share of premises with exchange only lines (%) 2013	20.8	17.0	22.0	4.5
Delivery points at serving exchange 2013	5,782	8,090	6,236	17,566
Delivery points at serving cabinet 2013	239	216	247	380
% of postcodes in Virgin Media footprint 2013	3.5	6.2	0.8	48.3
Number of residential delivery points on the postcode 2013	13.5	12.5	11.5	19.6
Number of non-residential delivery points on the postcode 2013	1.0	1.4	1.0	0.7
Estimated cost to upgrade serving cabinet (£) 2013	66,984	63,876	67,583	61,711
Estimate upgrade cost per premises upgraded (£) 2013	313	401	332	179
Area characteristics in 2013				
% of postcodes in rural areas 2013	74	67	80	14
Working age population (in Output Area), 2011	178	210	178	200
Population aged 65+ (in Output Area), 2011	57	60	58	50
Population density in OA (population per square km), 2011	1,421	1,065	666	4,403
Premises density in OA (premises per square km) 2013	939	689	425	2,564
Gross weekly earnings in LA (£), 2013	509	514	503	518
Employment rate in LA (%), 2013	74	73	75	71
Unemployment rate in LA (%), 2013	6.7	7.4	6.4	8.2

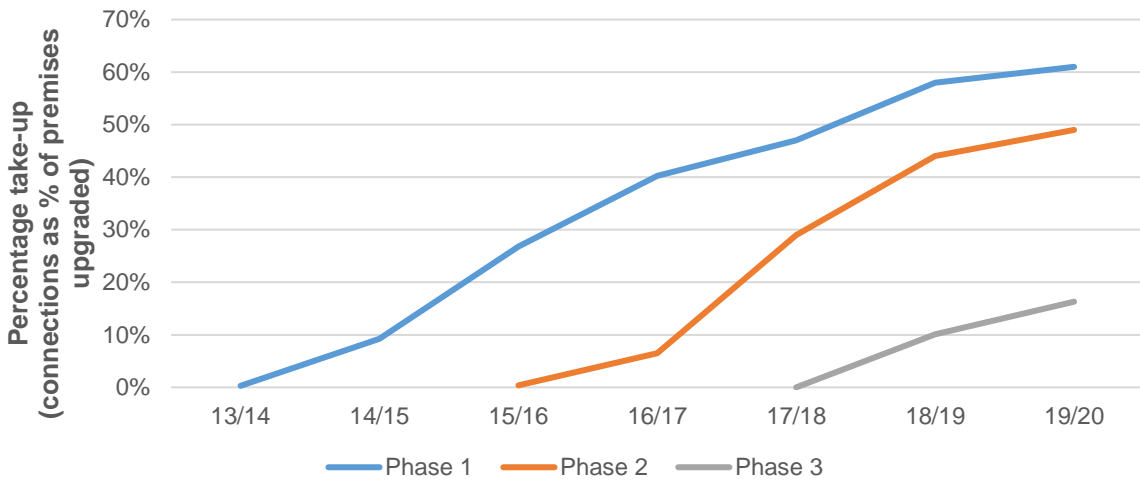
Source: Connected Nations (Ofcom), BDUK modelling, Census 2011 (ONS), Annual Survey of Hours and Earnings (ONS), Annual Population Survey (ONS).

4.3 Take-up

Take-up of superfast broadband services has risen steadily. As illustrated in Figure 4.2, take-up of superfast broadband services reached 60 percent for Phase 1 contracts in 2019 / 20. Take-up of superfast broadband services made available through Phases 2 and 3 grew in line with patterns observed for Phase 1 (reaching 50 percent and 17 percent for Phases 2 and 3 respectively).

Take-up has exceeded the expectations of network providers when they tendered for contracts, implying that they are likely to be more profitable than originally anticipated. In Phase 1, network providers expected take-up to peak at 21 percent. Expected levels of take-up rose in Phases 2 and 3 (to 35 and 52 percent respectively), although these expectations still appear pessimistic given experiences with Phase 1.

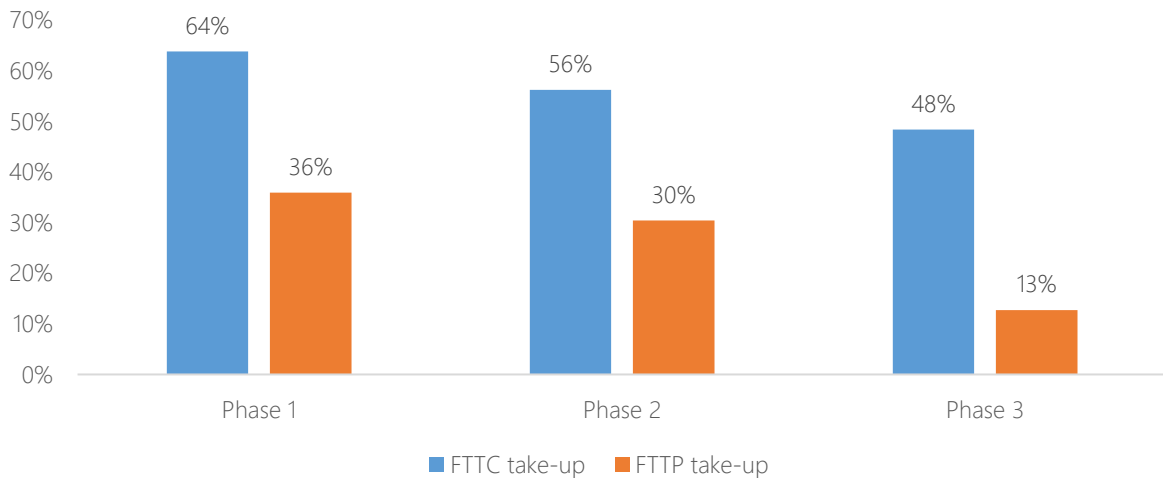
Figure 4.3: Take-up over time – number of connections as a percentage of premises upgraded, 2013 / 14 to 2019 / 20



Source: Programme data (C3 reports); Ipsos MORI analysis. Note that 2019 / 20 is an incomplete year.

The take-up, as of June 2020, is presented by Phase and type of connection in the figure below. This shows that the average take-up for Phase 1 contracts was higher for both FTTC and FTTP connections than take-up in Phases 2 and 3, as would be expected. The take-up for FTTC connections is higher than for FTTP connections in all phases.

Figure 4.4: BDUK reported take-up of superfast broadband connections by technology



Source: Cora Management Information, June 2020.

5. What are the outcomes of the scheme?

This section provides an assessment of the key outcomes and impacts achieved by the Superfast Broadband Programme by 2019. The findings here draw on an analysis of management data held by BDUK describing the delivery of the Programme, econometric analyses exploring the net impacts of the Programme on NGA and superfast broadband coverage, a survey of businesses, and qualitative findings from research undertaken with Local Bodies, telecommunication providers, public service providers, businesses and employees.

Key findings:

The Superfast Broadband Programme had a substantial effect in accelerating the roll-out of superfast broadband infrastructure between 2012 and 2019 and met its objectives to reduce the digital divide. It was estimated that between 39 percent and 57 percent of the premises upgraded would not have had access to superfast broadband services in the absence of the Programme in September 2019²³ (equivalent to between 1.6m and 2.3 premises). This has also translated into impacts on take-up of superfast broadband services.

The Programme also enabled a substantial share of the premises upgraded to receive improved broadband services earlier than they would have done in its absence. However, the Programme has also worked to delay the availability of superfast broadband services for around 10 percent of the premises benefitting from the Programme.

There are indications that the Programme has helped stimulate additional competition, or at least avoided the entrenchment of local monopolies. While most contracts were awarded to BT / OpenReach, it saw its market share for superfast connections decline in areas benefitting from the Programme between 2016 and 2020. Smaller suppliers awarded contracts have been able to expand their market share. Interviewees provided the view that open access provisions may also lead to more intense competition in the future.

The Programme has produced significant local economic impacts, including creating over 17,000 jobs and enabling an increase in the annual turnover of local businesses of £1.9bn. This was driven by improvements in the competitiveness of businesses already located in the Programme area and the relocation (or retention) of businesses to areas receiving improved broadband infrastructure. These economic impacts have benefitted workers by increasing wages and reducing unemployment. However, these local effects overstate the impact of the Programme at a national level due to displacement effects. At the national level, the Programme is estimated to have resulted in £1.1bn in productivity gains between 2012 and 2019.

There were also signals that improved broadband has both improved the efficiency of administrative tasks involved in the day-to-day delivery of public services and stimulated greater awareness and use of online or remote delivery modes. These have proved particularly important during the COVID-19 pandemic. However, effects on user satisfaction were not always positive and there was evidence that the Programme has led to migration to rural areas, placing pressure on the capacity of some public services.

²³ September 2019 has been used as a point of reference for the statistical analysis of connectivity outcomes due to time lags in the data availability. September 2019 was the most recent data available at the time the analysis took place.

There were mixed results in terms of how far the Programme improved public value outcomes for residents of the Programme area. The Programme led to an increase in house prices by between £1,700 and £3,500 on average and £0.7bn and £1.5bn in total. This suggests that buyers valued access to superfast broadband services. However, there was no robust evidence that the Programme increased subjective wellbeing. This could potentially be explained by migration induced by the Programme, which may have altered the composition of local populations or indirectly reduced the wellbeing of residents by placing excess pressure on the capacity of public services or disrupting settled patterns of community life.

5.1 Reducing the digital divide

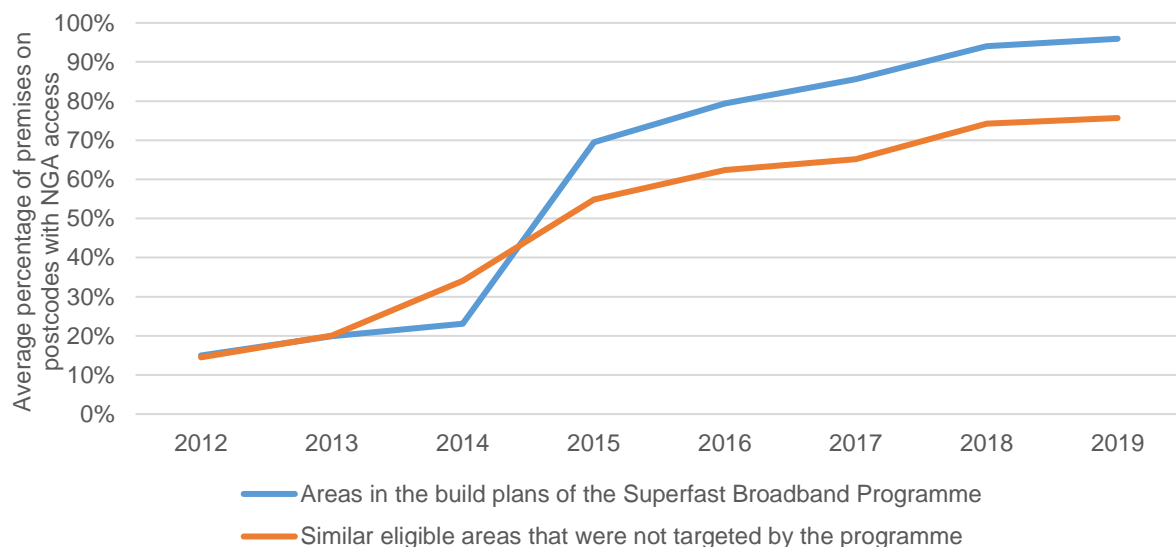
5.1.1 Impact on superfast broadband coverage

The availability of superfast services increased rapidly in areas benefitting from the Programme between 2012 and 2019 due to the public funding provided by the Programme:

- **NGA coverage:** The percentage of premises in the Programme area able to receive broadband through technologies that can deliver superfast speeds rose from around 15 to 95 percent between 2012 and 2019.
- **Superfast coverage:** The percentage of premises in the Programme area able to receive superfast speeds rose to over 80 percent in 2019 (from less than 15 percent in 2014).

An assessment of how far these results can be attributed directly to the Programme was made by comparing areas targeted by the Programme to similar areas that were eligible for investment but were not targeted by network providers. As shown in Figure 5.1, superfast broadband coverage rose substantially more rapidly in the Programme area than in these comparison areas over the period.

Figure 5.1: NGA coverage, postcodes targeted by the Programme and other eligible postcodes sharing similar characteristics, 2012 to 2019



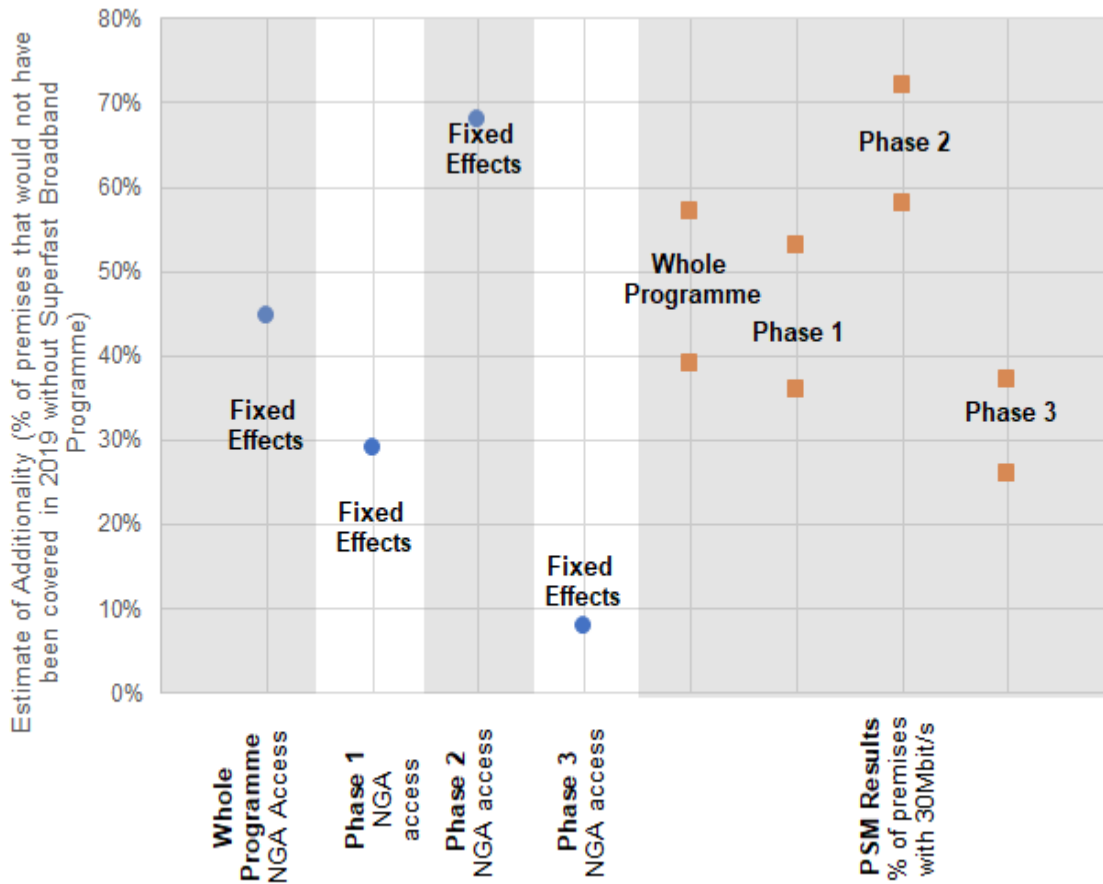
Source: Ipsos MORI analysis; BDUK C3 reports, SCTs & Ofcom Connected Nations

A range of statistical analyses were completed to estimate the impact of the Programme on both measures of broadband availability and take-up. These analyses showed:

- **Impacts on NGA and superfast coverage:** The Superfast Broadband Programme increased the share of premises in the Programme area able to obtain broadband services through NGA technologies by 24 percentage points and the share of premises able to obtain superfast services by 34 to 35 percentage points. The effect of the Programme on superfast availability was larger than for NGA availability, indicating that while some areas benefitting from the Programme may have received NGA coverage in the absence of the Programme, these technologies would not necessarily have delivered superfast speeds.
- **Take-up:** The Superfast Broadband Programme also had a significant effect on take-up of faster broadband services. It was estimated that the Programme increased the average download speeds of connections on postcodes benefitting from subsidised upgrades by 9.1 to 9.3 Mbps, and the maximum download speeds of connections by 9.4 to 11.8 Mbps.

Overall, it was estimated that between 39 percent and 57 percent of the premises upgraded would not have had access to superfast broadband services in the absence of the Programme in September 2019. This is equivalent to between 1.6m and 2.3 premises. The estimated share of premises that would not have been upgraded at the end of 2019 without the Programme varied across phases and by the measure of broadband availability used, as illustrated in Figure 5.2.

Figure 5.2: Estimated share of premises upgraded that would not have had NGA or superfast access without the Programme by September 2019

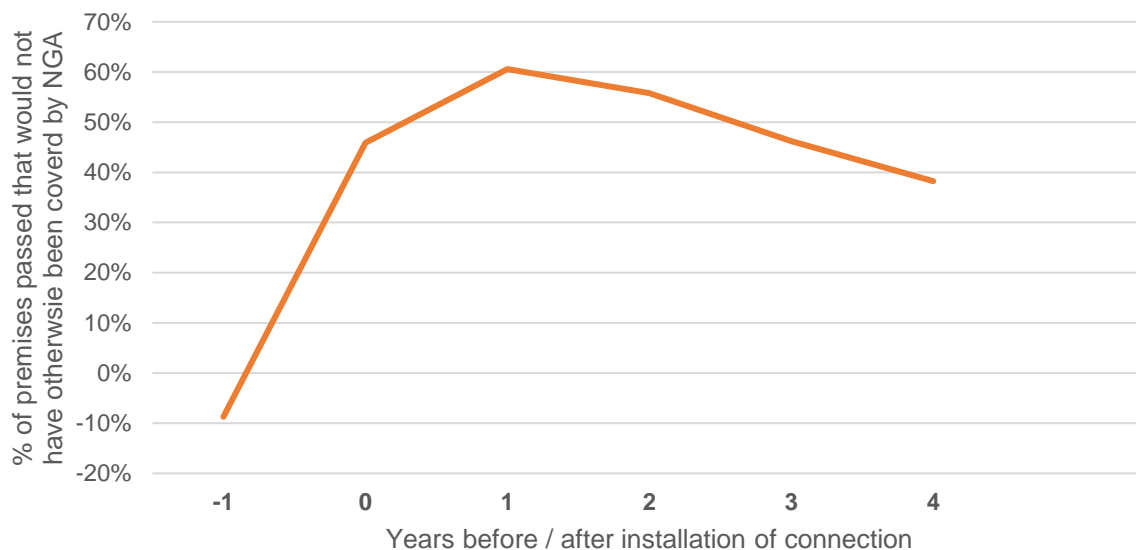


Source: Ipsos MORI analysis; BDUK C3 reports & Ofcom Connected Nations

5.1.2 Impacts over time

The impacts of the Programme varied over time. Figure 5.2 provides estimates of the share of premises that would not have been upgraded in the absence of the Programme, by the number of years elapsing since the upgrade was made. The results indicate that additionality peaks at 60 percent one year following the upgrade before decaying over time. This suggests that some areas benefitting from the Programme would have otherwise received improved broadband infrastructure at a later stage. There is also evidence that the Programme delayed the roll-out of superfast broadband to around 10 percent of premises that may have otherwise received coverage at an earlier date (an effect that is also visible in Figure 5.1 between 2012 and 2014). These are premises where the Programme delivered connectivity at a later date than unsubsidised network providers would have in the absence of the Programme, but the unsubsidised providers did not deliver these connections because of the planned roll out of the Programme.

Figure 5.3: Estimated additionality of NGA Coverage over time, Phase 1 to 3



Source: Ipsos MORI analysis; BDUK C3 reports & Ofcom Connected Nations

5.2 Stimulating the broadband market

The Superfast Broadband Programme was expected to stimulate competition in the broadband market. This has been explored using supplier level data on broadband coverage and take-up compiled by ThinkBroadband.

5.2.1 Effects on Programme beneficiaries

OpenReach (the primary beneficiary of contracts awarded through the Programme) saw its share of the overall UK broadband market fall from 43 percent to 40 percent between 2012 and 2020. However, its share of the NGA market rose from 24 percent to 37 percent over the same period. This expansion is larger if key ISPs using OpenReach infrastructure are included. Other network providers accounted for only a small share of the overall market. There appears to have been a decrease in the market share of Virgin Media in the total broadband market (not a Programme beneficiary), but this market share has not been taken by Programme beneficiaries, but by other network providers.

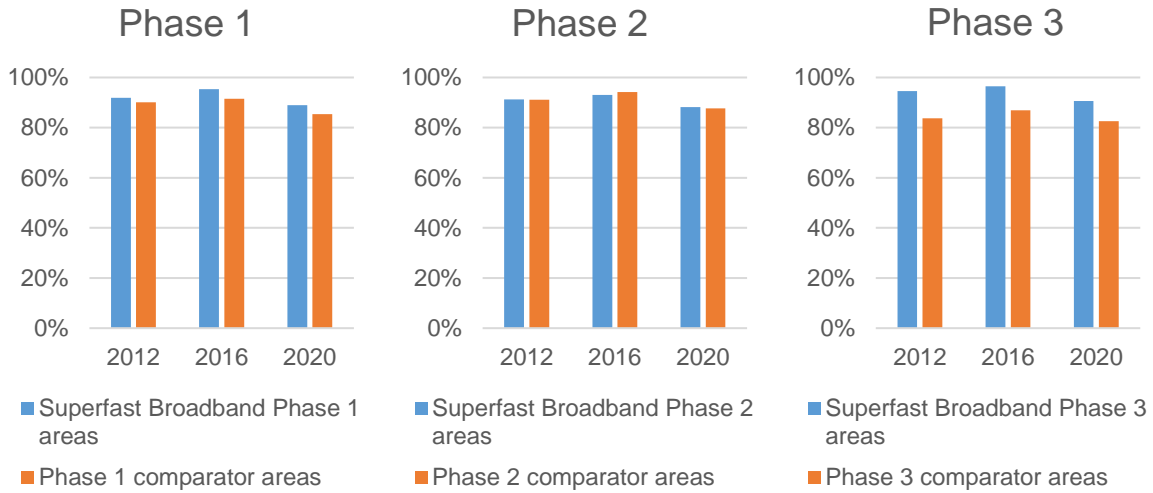
Table 5.1: Share of the UK broadband market, Superfast Broadband Programme beneficiaries

Network provider	Total broadband connections			NGA connections		
	2012	2016	2020	2012	2016	2020
OpenReach	42.8%	38.6%	39.6%	23.8%	35.5%	37.0%
OpenReach (plus Sky and TalkTalk)	71.1%	78.1%	75.2%	30.3%	60.5%	67.2%
Airband	0.0%	0.0%	0.1%	0.0%	0.1%	0.1%
Gigaclear	0.0%	0.1%	0.2%	0.0%	0.2%	0.3%
Callflow	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
UK Broadband / Relish	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Total Programme participants	71.1%	78.3%	75.5%	30.3%	60.8%	67.6%

Source: ThinkBroadband speed test data

The Superfast Broadband Programme does not appear to have had much effect on the market position of OpenReach. Its share of the NGA market changed broadly in line with changes observed in other areas eligible for the Programme, as illustrated in Figure 5.4.

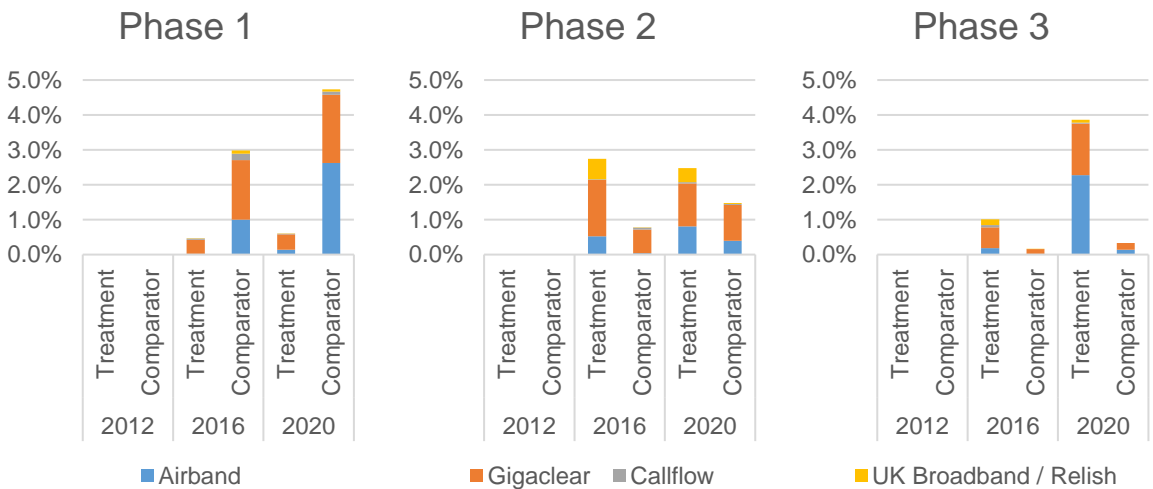
Figure 5.4 – NGA broadband market share for OpenReach (including Sky and TalkTalk) in Programme delivery areas and other areas eligible for the Programme



Source: ThinkBroadband speed test data

The market share of other network providers awarded contracts through the Superfast Broadband Programme is presented in Figure 5.5. These smaller providers saw larger growth in their market share between 2012 and 2020 relative to other areas eligible for the Programme in Phases 2 and 3. As these smaller providers were only awarded contracts in these two Phases, this indicates that the Programme may have helped smaller network providers expand their market share, making a contribution to greater competition.

Figure 5.5: NGA broadband market share for all other Superfast Broadband Programme beneficiaries in Superfast Broadband Programme delivery areas and other areas eligible for the Programme

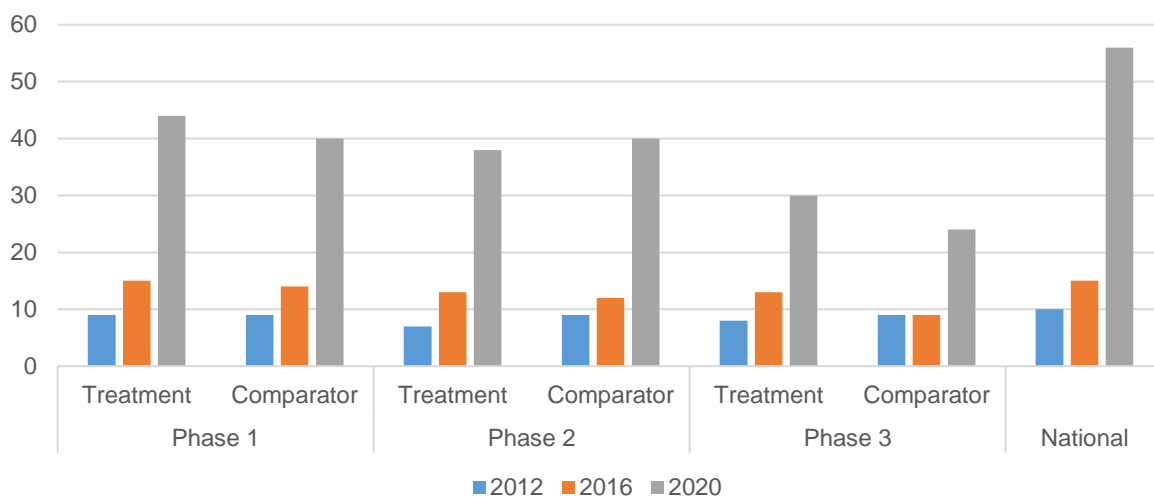


Source: ThinkBroadband speed test data

5.2.2 Overall number of ISPs

The number of network providers operating in the Superfast Broadband Programme contract areas increased between 2012 to 2020. This pattern is observed for all phases of the Superfast Broadband Programme, as well as other areas that were eligible for investment but were not targeted. No data was available on the level of the use of the infrastructure funded by the Programme under open access arrangements.

Figure 5.6: Total number of network providers in Superfast Broadband Programme treatment and comparator areas



Source: ThinkBroadband

5.3 Productivity growth and employment

The Superfast Broadband Programme was expected to produce local economic growth by helping firms improve their competitiveness and find new markets. A range of econometric analyses were completed to explore these impacts, using firm and worker level data drawn from a variety of ONS datasets. These analyses explored the effects of improved broadband infrastructure by comparing areas benefitting from the Programme in earlier years to those that benefitted later.

5.3.1 Local economic impacts

The results suggested that the Programme has produced a variety of important economic impacts at the local level:

- **Local employment impacts:** Subsidised coverage was estimated to have increased employment in the areas benefitting from the Programme by 0.6 percent, leading to the creation of approximately 17,600 local jobs by the end 2018.
- **Turnover:** Subsidised coverage also increased the turnover of firms located in the areas benefitting from the Programme by almost 1.0 percent by 2018, increasing the annual turnover of local businesses by approximately £1.9bn per annum.

- **Number of firms:** The evidence indicated that a share of these local economic impacts was driven by the relocation of firms to the Programme area. The evidence indicated that subsidised coverage increased the number of businesses located in the areas benefitting by around 0.5 percent.
- **Turnover per worker:** There were also some evidence of efficiency gains - turnover per worker of firms in the areas benefitting rose by 0.4 percent in response to subsidised coverage. This was not solely driven by more productive businesses moving into areas with improved broadband infrastructure. Firms that did not relocate over the period also saw their turnover per worker rise by 0.7 percent by 2018, indicating that subsidised coverage has also raised the efficiency of firms. However, the strength of these gains appeared to decay with time – while subsidised coverage had a stable effect on turnover, impacts on employment increased with time.
- **Wages:** The impacts of the Programme were also visible in wages. Employees working for firms located in the areas benefitting from subsidised coverage saw their hourly earnings increase by 0.7 percent in real terms in response to the upgrade (which did not vary significantly across occupational groups). This gives greater confidence that the Programme led to an increase in productivity.
- **Unemployment:** Local job creation also translated into reduced unemployment, with the number of unemployed claimants falling by 32 for every 10,000 premises upgraded.

5.3.2 National economic benefits

The findings above describe the effect of the Programme on the areas that benefitted from subsidised coverage. However, these results do not account for possible negative effects in areas that did not benefit from the Programme. For example, as the Programme encouraged firms to move to the areas benefitting from enhanced broadband coverage, there will have been offsetting loss of jobs in the areas from which those firms relocated. Allowing for these types of offsetting effects, at the national level, the Programme is estimated to have resulted in £1.1bn in productivity gains in total between 2012 and 2019.

5.3.3 COVID-19 impacts

Statistical models were utilised to explore the effect of the Superfast Broadband Programme coverage on claimant count during the COVID-19 pandemic. The results from these models suggest that the average claimant count in LSOAs / Data Zones where the Superfast Broadband Programme has been delivered is three claims lower than it would have been in the absence of the subsidised coverage. When this effect is grossed up to all LSOAs / Data Zones it suggests that over 30,000 individuals remained employed during the COVID-19 pandemic. However, the statistical models have low explanatory power and could not control for the connection speeds where individuals worked (as residential addresses may be in a different area to their workplaces), with workplace connection speed also likely to impact on employment status during the pandemic. Therefore, these findings should be treated with caution.

This evidence does indicate the provision of superfast broadband connectivity through the Superfast Broadband Programme may have supported resilience to unemployment.

5.4 Public sector efficiency

A mixed methods approach was used to explore the effects that the Superfast Broadband Programme has had on public sector efficiency. Where secondary data was available, econometric analysis was also undertaken to explore the effect of the Programme on objective measures of public sector service performance.

5.4.1 Effects on local authority services

Provision of services

The Superfast Broadband Programme was delivered during a time when local service transformation was becoming more of a priority for authorities, with more services being moved online in an effort to save cost and provide services in a more efficient manner. This process started before the initiation of the Superfast Broadband Programme but was viewed as having been accelerated by the Programme. This attributed to the broader availability of faster broadband connections for residents that were now able to access online services that might not have previously been accessible without the need to visit a public WiFi spot. The shift to digital service delivery was prominent in provision of refuse services, libraries services, delivery of administrative services and complaint and query handling.

Libraries were perhaps the public sector service most likely to benefit directly from connectivity delivered through the Superfast Broadband Programme, with many not having access to superfast connectivity before the Programme. Access to superfast broadband enabled some libraries to provide digital skills and inclusion activities in a more efficient manner, whilst others could begin to provide these services where they were unable to before. Amongst the activities provided by libraries were sessions with children on safe use of the internet, sessions focussed upon use of internet enabled devices such as tablets with families and sessions for elderly members of the community on accessing the internet safely.

“We can now run sessions with members of the local community, teaching them the basics of the internet, some IT skills and accessing content [as] well as other local services” – Library representative

Processing information

The delivery of other public services including applications and payments were also seen to have benefitted from the Programme in so far as more members of the public would be able to access them. In South Yorkshire, for example, the relative use of online tools for queries rose relative to phone services. Whilst it was not possible to say conclusively whether or not increased use of online services in any local authority would lead to reductions in face-to-face service costs, there was the suggestion that space could be freed up to provide other services in council buildings (although nothing specific was suggested).

Remote working

The COVID-19 pandemic highlighted a potentially large impact of superfast broadband connectivity on all councils, but the impact was most notable for the Isle of Wight in the form of access to remote working. Access to superfast broadband from homes of council workers was seen to be a key factor in maintaining council services. Representatives in the Isle of Wight described this as the main benefit of the Programme from their perspective. Beyond the pandemic, stakeholders across councils were also of the view that more frequent remote working would be considered the norm, and something enabled to some extent by superfast coverage to residential premises.

5.4.2 Impact on educational facilities

Administration

Consultations were undertaken with primary schools across three local authority areas to explore the impacts of the Superfast Broadband Programme on the provision of education and the finances of schools. For most schools, the largest benefit was in the form of improvements to the efficiency of day-to-day administrative processes and the use of online modes of communication with parents.

Remote learning

However, the COVID-19 pandemic highlighted a need for good home connectivity to support children's learning at home. At the time of interviewing, schools were largely open, however pupils and teachers were often required to self-isolate should they come into contact with someone who had tested positive with the virus. In addition, many schools had been providing some form of remote education during the UK's first national lockdown beginning in March 2020. For several of those engaged with in this research, a mix of remote and in person education was implemented at one stage with key worker children in schools and all others being taught remotely.

For many stakeholders, particularly the teachers, residential access to superfast broadband was essential to enable as close to normal an education as possible. Teachers felt that home broadband was generally important prior to the pandemic as a means of providing young children and their families access to educational resources to support in school learning and provide avenues for children's curiosity to explore. However, the pandemic had made home broadband essential, and many children would have fallen further back without it. It was argued that long episodes without education can stifle learning and remote learning was a means to continue these activities.

Although not related to the Superfast Broadband Programme, several stakeholders raised concerns over access to equipment required for remote learning such as laptops, tablets, or smartphones. Children from poorer backgrounds, whilst technically able to have a superfast broadband connection, may be in households that are not be able to afford a suitable fast connection or the tools mentioned above. In these cases, provision of further support was a key priority.

"It's all well and good having good broadband but there are several families that can't afford basic IT equipment. Without that a connection is useless." – Primary school teacher

Financial effects

Interviewees were also asked about the financial effects for the schools taking up a faster internet connection. In one case a school was able to run an online fundraiser to collect funds to provide IT equipment to those in need at the school early in 2020, which may have been more difficult without an online platform whilst school attendance was low. However, econometric analyses did not provide conclusive evidence regarding the impacts of the Programme on school ICT spending. Interviewees were also not able to identify specific examples where ICT spending had changed as a result of improved connectivity.

5.4.3 Impact on health and social care providers

Patient awareness and experience

Econometric analyses indicated that the Programme raised both awareness and usage of online services amongst patients registered with GP surgeries:

- **Awareness:** Awareness of the availability of online services to book appointments, order repeat prescriptions and review medical records online rose by 7, 5 and 6 percentage points respectively in response to the provision of subsidised coverage.
- **Usage:** Usage of these services increased between 2 and 4 percent. Implied take-up of opportunities to order repeat prescriptions was highest (at around 66 percent of those newly aware of the availability of these services).

Consultations with GPs (which took place between October 2020 and January 2021) suggested that moving as much activity as possible online produced a range of benefits, including more efficient practices, freeing up telephone lines for the most vulnerable patients, and reduced human error in administration. GPs consulted also suggested that patients had become more aware of the services provided digitally as time passed but also highlighted the promotion of online services undertaken by themselves and similar practices.

However, the impact of the Programme on patient satisfaction was mixed:

- **Time with GP:** Subsidised coverage appeared to increase the proportion of patients that were satisfied with the amount of time given to them for their last appointment by one to two percentage points.
- **Access and continuity of care:** However, subsidised coverage had a negative impact on measures of access and continuity of care. Subsidised coverage led to a reduction in the share of patients satisfied with the availability of appointments (by three to four percentage points) and the share of patients able to see their preferred GP most or all of the time (by eight percentage points).
- **Overall satisfaction:** Subsidised coverage also appeared to reduce the share of patients describing their experience as fairly or very good by two percentage points.

However, there was evidence that these impacts were driven by pressures on GP capacity rather than the digitalisation of services. Econometric analysis indicated that subsidised coverage increased the number of patients registered with GPs by three to six percent, while having no effect on the number of GPs employed. This was somewhat supported in interviews with GPs. After the bulk of their services were moved online in 2015 and 2016, the number of patients registered with them had continued to rise whilst cost pressures had kept the number of GPs employed at the practice stable. The findings also implied that the Programme has helped encourage migration to rural areas (as inferred by the effects on patient lists).

Use of remote consultations

These interviews also covered the role of broadband during the COVID-19 pandemic. Since the pandemic, the GPs interviewed described rapid rises in the use of telephone and video consultations as they sought to provide as many of their appointments as possible through these mediums. In general, telephone consultations were dominant, though superfast broadband connectivity was highlighted as being important for the increasing number of video consultations being undertaken. Video was more likely to be used where a visual inspection was required. In addition, images were often requested by GPs over email so that they could be reviewed by the GP before a telephone consultation.

Two GPs consulted were confident that a large proportion of their residents, particularly in the more rural areas, would not have been able to access their online services as easily without it in the pandemic. Again, a key issue raised was that the option of taking up a superfast

connection did not always mean this was done. For the GPs, the elderly patients were often reliant on in person appointments and telephone where necessary.

“I worry about those elderly folks in some of the more remote villages that don’t know how to use the internet, don’t know how to get broadband either if it’s available to them. They’re the ones that are potentially not booking appointments at the moment thinking they need to go in person and that it’s not safe to do so” – General Practitioner

5.5 Public value and wellbeing

Finally, the evaluation explored the effects of the Programme on the overall wellbeing of residents. This involved further statistical analyses exploring the effect on both house prices and subjective measures of wellbeing collected through national social surveys. In the former case, the underlying assumption is that if households place a value on superfast connectivity, this will be reflected in what they are willing to pay to obtain access to faster broadband. The key findings from the analysis described above were:

- **House prices:** The findings of the study suggested that the Programme led to an increase in house prices (of 0.6 to 1.2 percent, or £1,700 to £3,500), suggesting that buyers valued the technology. These estimates are in line with the results of a previous study estimating the per household benefit of upgrading rural areas of the UK to FTTC of £3,145 (based on an analysis of the impact of upgrading local exchanges to ADSL during the 2000 to 2010 period).²⁴ The total impact on house prices sold between 2012 and 2019 was estimated at between £0.7bn and £1.5bn.
- **Subjective wellbeing:** The findings provided mixed evidence as to how far there was an overall impact on the subjective wellbeing of residents. Modelling of the effect of the Programme on subjective wellbeing showed no significant effects on the overall population, although this varied across age groups. Those aged 65 and above experienced positive benefits, while there were neutral or negative effects on other age groups.

It should be noted that these analyses focused on changes in the wellbeing of those living in properties before and after the upgrade and could be distorted by migration patterns. There were signs from other analyses that the Programme stimulated migration to the areas benefitting from subsidised coverage. Migration may have altered the composition of local populations and could partly explain the mixed results on overall subjective wellbeing. Population growth may place pressure on public services and could offset positive wellbeing effects arising from consumption of faster broadband services.

More research will be completed as part of the broader evaluation Programme to address these gaps in understanding. This includes a face-to-face survey of households benefitting from subsidised coverage and analysis of the Oxford Internet Survey (OXIS) being undertaken by BDUK.

²⁴ Gabriel Ahlfeldt (2014) Speed 2.0 Evaluating Access to Universal Digital Highways

6. How has the behaviour of individuals / organisations changed for these outcomes to come about?

This section summarises the changes that have taken place for the outcomes and impacts described in Section 5 to be achieved. It also describes how and why these changes have taken place. The findings in this section draw on information collected through the business survey, qualitative research with businesses, employees, public service providers and telecommunication providers, as well as an assessment of Programme MI and secondary data sources. This section is structured around the key outcomes achieved.

Key findings:

The impacts of the Programme on the availability of superfast broadband services were enabled by the adoption of an Open Market Review (OMR) process that was broadly effective in revealing which premises would not be upgraded on a commercial basis. Analysis of the gap funding model, however, indicates that network providers consistently underestimated levels of take-up and the likely profitability of the investment. Given the large impacts of the Programme on deployment, this indicates that subsidies were critical in encouraging network providers to accelerate their investment plans, although it is likely that it would have been commercially viable to upgrade many premises eventually.

Around 50 percent of businesses in the Programme area have taken up faster connections since improved broadband networks have been available. The adoption of faster connections was reported to bring about a range of incremental efficiency gains, largely driven by the improvements to administrative processes. There was also evidence that the provision of enhanced connectivity had enabled firms to move to more flexible working practices, which have produced reported benefits for employees. These incremental gains are consistent with the estimated impacts of the Programme on productivity (presented in Section 5), which while large in total were relatively modest on a per firm basis.

Overall, the Superfast Broadband Programme was viewed by local authorities as a catalyst to help them advance their local digital plans by reducing pressure to facilitate improvements in broadband connectivity and enabling them to focus on other aspects of digital inclusion (such as digital skills). Schools engaged in the research also highlighted that improved access to online materials have helped improve pupil engagement, although they were less confident that this would necessarily translate into improved educational attainment. This evaluation has not involved a large amount of research with households and understanding how the Programme has improved quality of life and wellbeing remains an evidence gap.

6.1 Reducing the Digital Divide

Section 5 shows that the subsidies provided through the Superfast Broadband Programme had a significant impact on the availability of superfast broadband services in areas targeted by the contracts awarded. These impacts were enabled by a combination of:

- OMR and public consultation processes which were used to identify areas that would not receive superfast broadband coverage under commercial plans of network providers, so the Programme could be targeted at those areas most in need.

- The gap funding model that sought to make investments in these areas commercially viable by providing subsidies to network providers ensure that the expected profitability of the investments aligned with the expected costs of financing the project.

This section considers the role of these delivery mechanisms in altering the incentives faced by network providers to invest in superfast broadband services in rural areas. Questions in relation to the efficiency of these processes are explored in Section 7.

6.1.1 Open Market Review and public consultation process

The OMR and public consultation processes aim to reveal which properties are not expected to receive superfast broadband coverage under the commercial plans of network providers. For this process to function effectively, Local Bodies need to engage with all relevant network providers to request details of their plans. Plans provided by network providers should, as far as possible, provide an accurate reflection of their future intentions.

The findings set out in Section 5 indicate that 39 to 57 percent of the premises upgraded with funding from the Programme would not have otherwise received superfast broadband coverage by September 2019. This indicates that the OMR was broadly effective in identifying premises that would not have received superfast broadband coverage under commercial plans in the period in question. The findings of the evaluation suggest that this was enabled by:

- **Engagement with network providers:** Although Local Bodies reported some initial difficulties in engaging effectively with network providers at the start of the Programme, relationships have strengthened over time. Initial challenges were created by a lack of existing relationships with telecommunication providers in their area (and there were no issues where Local Bodies had strong links with local providers, highlighting the importance of having these relationships in place). All Local Bodies believed that they had improved their provider engagement over the duration of the Programme, with the development of links with providers central to this improvement.
- **Breadth of OMR responses:** Local Bodies (in most cases) reported that between two and six providers responded to each OMR requests. Local Bodies reported that they generally content with the number and coverage of those providers responding. There was also a general consensus that coverage of the OMR would be good enough even if only BT / OpenReach and Virgin Media responded due to the extent of their coverage overall, unless an area also included a relatively large regional provider. Smaller alt-nets were more likely to respond in Phases 2 and 3, predominantly in the areas they anticipated delivering in. Providers of wireless networks did not always respond though this was not generally considered a cause for concern to Local Bodies as their coverage was limited and often not able to provide superfast speeds.

However, the preceding sections indicate that the OMR and public consultation processes were not fully effective in identifying premises that would not benefit from commercial deployments (if they were, then additionality would be in the region of 100 percent of premises). Qualitative research with Local Bodies and network providers identified the following factors that may explain these findings:

- **Quality of data:** Local Bodies expressed some concerns with the quality of the information provided by providers as part of the OMR process. Responses provided by BT / OpenReach in Phase 1 reportedly caused issues where some areas where superfast was already available were marked as eligible for investment, while other

areas were wrongly excluded. Data at the premises (as opposed to the postcode) level was viewed as more accurate but with limited numbers of providers holding detailed data on their network at this level. Efforts to remove premises that were wrongly included in the build plans of superfast contracts were undertaken during project delivery, though this absorbed a large amount of resource. These issues were less prominent in Phases 2 and 3 as the data supplied improved ‘substantially’.

- **Investment cycles:** Both small and large network providers reported difficulty in providing data for the OMR. These difficulties arose because providers did not have concrete plans for future deployment for the next three years (to allow them to respond to customer demand) or their plans were not specified in sufficient detail to be included. One provider stated that they could only provide (or were only willing to provide) concrete roll-out plans for 12 months and not the 36 months requested. Their plans for months 13 to 36 were often rejected by Local Bodies because they were insufficiently definite. This meant that some ‘prospective’ plans were supplied to Local Bodies that were ultimately rejected. If these plans were brought forward, then some premises will have been marked as eligible for investment when in practice they should not have been.
- **Mismatch between length of contracts and OMR:** Another issue with the OMR process is that there was sometimes a mismatch between the time-period covered by the OMR (three years) and the time-period covered by the delivery contract (which could extend beyond the three-year period covered by the OMR). As commercial viability can change with time, the OMR could become outdated with network providers introducing new Programmes of commercial deployment on postcodes that were previously identified as eligible.
- **Static nature of the OMR:** The OMR produced a snapshot of future plans at a particular point in time. However, the plans of providers evolved with time. Wireless network providers were seen to be most readily able to change plans at relatively short notice and can encroach upon areas identified as eligible for the Programme. One Local Body proposed regular reviews of the landscape after the setting of the intervention area to keep abreast of changes in commercial plans. The static nature of the OMR also raised issues where regulatory changes occurred – such as changes in Physical Infrastructure Access (PIA) agreement with OpenReach, which reportedly made areas more distant from existing networks more commercially viable for providers.²⁵ This was not factored into their original OMR responses, which were no longer the best representation of their roll out plans.
- **Realism of plans:** Local Bodies also faced challenges in establishing the realism of the delivery plans put forward in the OMR. In addition, several Local Bodies outlined some suspicions of ‘gaming’ by providers leading to an overstatement of commercial plans to discourage competition and contributing to the issues above. These Local Bodies pointed to a number of areas where network providers reported plans to deliver improved broadband coverage but have been put under review as they have not yet received superfast broadband coverage.
- **Wireless:** Wireless broadband providers had further problems with the OMR process. Many had their responses rejected by Local Bodies (all wireless providers that were consulted had experienced having their responses rejected). The most common reason was that the Local Bodies did not recognise their technology as able to provide

²⁵ This relates to the Ofcom revision to Duct and Pole Access (DPA), which began in 2016 and was adopted in 2018 / 19.

superfast speeds (despite the wireless network providers claiming they provided substantial technical evidence to the contrary and extensive businesses case materials). Wireless providers felt that they had to provide more details (and incur a higher cost) to submit OMR responses than fixed broadband providers.

Despite concerns raised by the wireless providers, there are technical reasons why the Local Bodies took this approach. The placement of aerials, line of sight and number of premises on the network all affect the ability of wireless networks to deliver superfast speeds. There is also a lack of guarantees of the speed of service required by Ofcom on wireless networks.

6.1.2 Gap funding model

A gap funding model was used to incentivise network providers to invest in superfast broadband infrastructure in areas that would not have otherwise received improved broadband services. The Programme was underpinned by an assumption that there are some areas of the UK where investments in superfast broadband infrastructure will not generate sufficient profits to justify the costs of investments. The Programme sought to provide the minimum subsidy that would be needed to make these investments commercially viable. However, this involves some challenges as the public sector cannot perfectly observe the expected costs and revenues associated with potential investments in superfast coverage.

A set of analyses were completed to explore whether public subsidies were needed to incentivise network providers to extend superfast networks to the areas targeted by the Programme. This involved comparing the expected rates of return on the investments made to the costs of capital faced by the network provider. If the returns earned by the network provider exceed their cost of capital, then this would call into question the strength of the case for the provision of subsidies and / or the degree to which the public sector funding has provided the minimum level of subsidy needed for the project to proceed. The findings of these analyses showed:

- **Commercial viability at tendering stage:** Based on projections of costs and take-up provided by network providers at the tendering stage, the proposed network build was expected either to generate losses or rates of profitability that were substantially lower than the cost of capital faced by the network provider.
- **Commercial viability in light of actual costs and take-up:** As highlighted in Section 4, take-up of superfast services was substantially higher than expected, while costs were sometimes overestimated. These patterns were particularly prominent under Phase 1 of the contract. Updating this evidence based on observed costs and take-up suggests that:
 - **Phase 1:** Phase 1 contracts are now expected to be substantially more profitable than was expected at the tendering stage. Build costs were systematically overstated and take-up was systematically understated. On average, the portfolio of Phase 1 contracts are now projected to deliver an internal rate of return of below the Weighted Average Cost of Capital (WACC) without public subsidy. However, eight of 28 contracts analysed were expected to deliver a rate of return that exceeds the network provider's cost of capital. The network provider would arguably have had an incentive to proceed with these projects without subsidy.

- **Phase 2:** Phase 2 contracts are now expected to be loss making without subsidy on average (an internal rate of return of below zero on average). Three of 31 contracts analysed were expected to deliver rates of return without a public subsidy that exceeded the network provider's cost of capital and may have been commercially viable otherwise.
- **Phase 3:** The expected rates of return associated with Phase 3 projects without subsidy are not significantly greater than those expected at the tendering stage. In all cases, the rates of return associated with the projects were expected to be substantially lower than the cost of capital faced by the network and a subsidy would have been needed in all cases to create a sufficient economic incentive to deliver these contracts.

The findings imply that in some cases, network providers would not have required a subsidy to make the projects commercially viable. However, as highlighted in Section 5, the impacts of the Programme on superfast broadband availability have been significant. These results imply that the Programme has tackled important market failures that would have otherwise slowed the roll-out of the Superfast Broadband Programme, though many premises upgraded may have eventually received improved broadband services on a commercial basis.

6.2 Stimulating the Broadband Market

The Programme involved two direct mechanisms through which it could be expected to stimulate the broadband market. Most directly, the Programme can stimulate competition where contracts are awarded to smaller network providers. Additionally, the open access arrangements can also stimulate competition by allowing smaller network providers to make use of the infrastructure funded by the public sector.

6.2.1 Competition for Superfast Broadband Programme contracts

As noted in Section 4, most contracts were awarded to BT / OpenReach, although a broader range of smaller network providers were able to win contracts in Phases 2 and 3:

- In Phases 1 and 2, Local Bodies predominantly used the BDUK framework to procure the providers' services to deliver the infrastructure. This approach restricted the number of possible bidders to two (one of which did not submit any tenders).
- In Phase 3, procurements published through the OJEU were used by Local Bodies to target specific areas and / or clusters with the ability to target faster connection speeds, but the main benefits were expected to come from increased competition.

Data was not available on the number of bids received in response to the OJEU procurements to evaluate its effectiveness directly in generating larger numbers of bids. However, Local Bodies consulted highlighted a good degree of engagement from providers to Phase 3 procurement exercises with several bodies receiving five or six Expressions of Interest (EOIs). However, these translated into fewer responses to the full tender (between one and three). Nevertheless, there was a more even distribution of network providers awarded contracts, with BT / OpenReach being awarded just over two thirds of the contracts (69 percent), and Gigaclear being awarded a number of contracts (12 contracts, 23 percent).

Lotting²⁶ was also used in some areas to try to encourage further competition but views on its effectiveness were mixed with some areas forgoing this entirely given a lack of feasible geographic splits of the target areas. Where this approach was used, some Local Bodies thought it may have marginally increased the number of responses. In general, smaller providers engaged in the study highlighted a preference for smaller lots, though there was an acceptance that the lots needed to be of a suitable size to make them worthwhile bidding for. Additionally, the lots needed to be of a suitable size to ensure the management burden to Local Bodies and providers was appropriate (it is clearly more difficult to manage many small contracts than one large one). Smaller providers also stated that they would be more able to bid for contracts following the dividing up of some of the areas (into lots).

However, when the ITTs came out, there were still restrictions on which organisations could apply (turnover of applicants and other qualification criteria). This restricted the level of competition that was possible, but again providers generally understood that there needed to be some restrictions to provide reassurance that the publicly funded networks would be completed.

6.2.2 Open access arrangements

Interviews with network providers that were awarded contracts indicated that most of the Internet Service Providers (ISPs) offering services in the Superfast Broadband Programme delivery areas will be utilising the OpenReach network. Others suggested that, although there were wholesale access requirements in place on the networks they had built as part of the Programme, these had not been utilised by other ISPs. One of the main reasons given for this was that these beneficiaries do not have a large number of existing ISPs that utilise their networks (outside the ones constructed for the Superfast Broadband Programme) and therefore do not have an existing customer base. They anticipated that as their business matures, other service providers will start to use the networks built through the Programme.

6.3 Employment and productivity growth

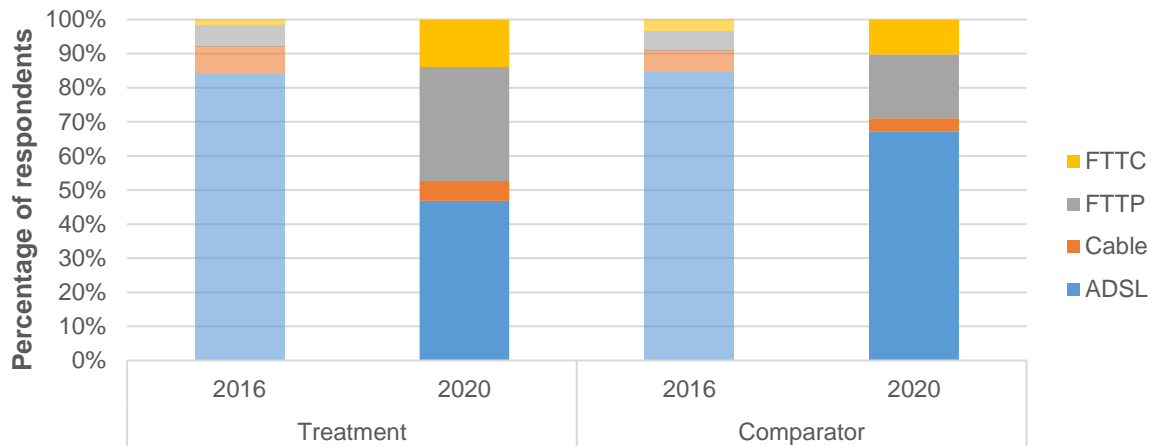
As highlighted in Section 5, the Superfast Broadband Programme had significant economic impacts at the local and the national level. The mechanisms by which these results were achieved was explored in a quantitative survey of 1,200 businesses and in qualitative interviews with 40 businesses. The survey incorporated samples of businesses located in areas that had benefitted from the Programmes, and businesses located in areas that had not yet benefitted from improved broadband infrastructure.

6.3.1 Take-up of superfast connections

The Superfast Broadband Programme enabled businesses to upgrade their internet connection. Nearly half of businesses in areas benefitting from the Programme reported using fibre connections compared to 30 percent in comparator areas. There was also an indication that the Superfast Broadband Programme enabled firms with 50 or more employees the ability to avoid the need to obtain dedicated leased lines to obtain higher capacity broadband services (43 percent of businesses in the comparator reported they used dedicated lines in comparison to 13 percent of businesses in the Programme area).

²⁶ Lotting is a process by which the Local Body divides their broadband project into multiple contracts (lots) rather than one single contract

Figure 6.1: Type of fixed line technology used, businesses located in the areas benefitting from the Programme and comparator areas, 2016 to 2020

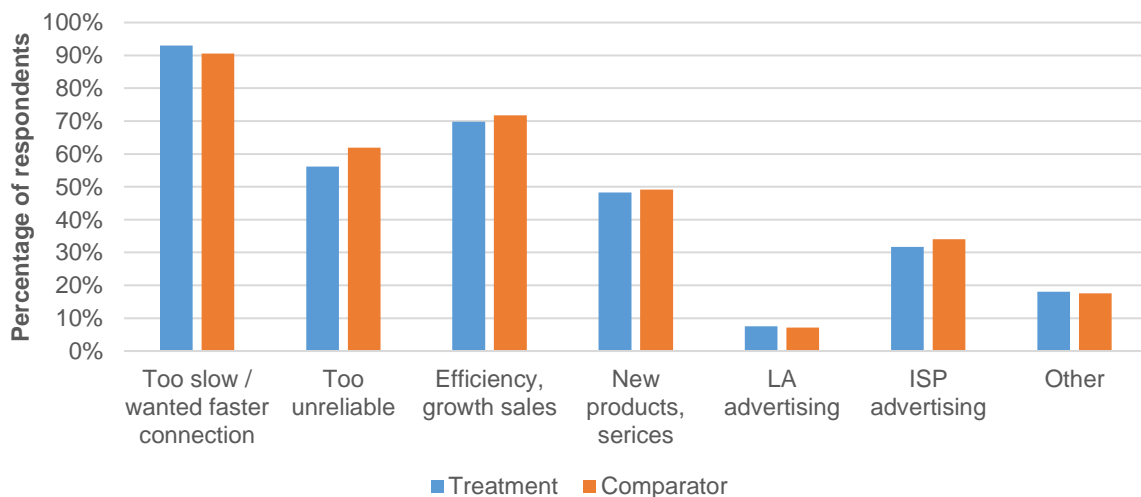


Source: Ipsos MORI survey of businesses, 2020. Base 1,200.

6.3.2 Motivations for upgrading

The main reasons businesses reported for wanting to upgrade their internet connection was to increase the speed of their connection or because they felt their existing connection was too slow. Similar proportions of businesses in the treatment and comparator areas reported this as the main reason for wanting an upgrade (around 90 percent). More than half of businesses responded that a reason for upgrading was that their existing connection was too unreliable.

Figure 6.2: Reasons for upgrading internet connections, businesses located in the areas benefitting from the Programme and comparator areas, 2016 to 2020



Source: Ipsos MORI survey of businesses, 2020. Base, businesses upgrading their internet connection between 2016 and 2020 (688). Respondents could select multiple reasons

The qualitative interviews highlighted the issues created by slow internet connections:

- The sharing of large files between workers in different locations was challenging as the files took a long time to share via email or upload to the cloud, meaning staff time was wasted. This was particularly true in sectors which required large files, such as publishing and design industries.

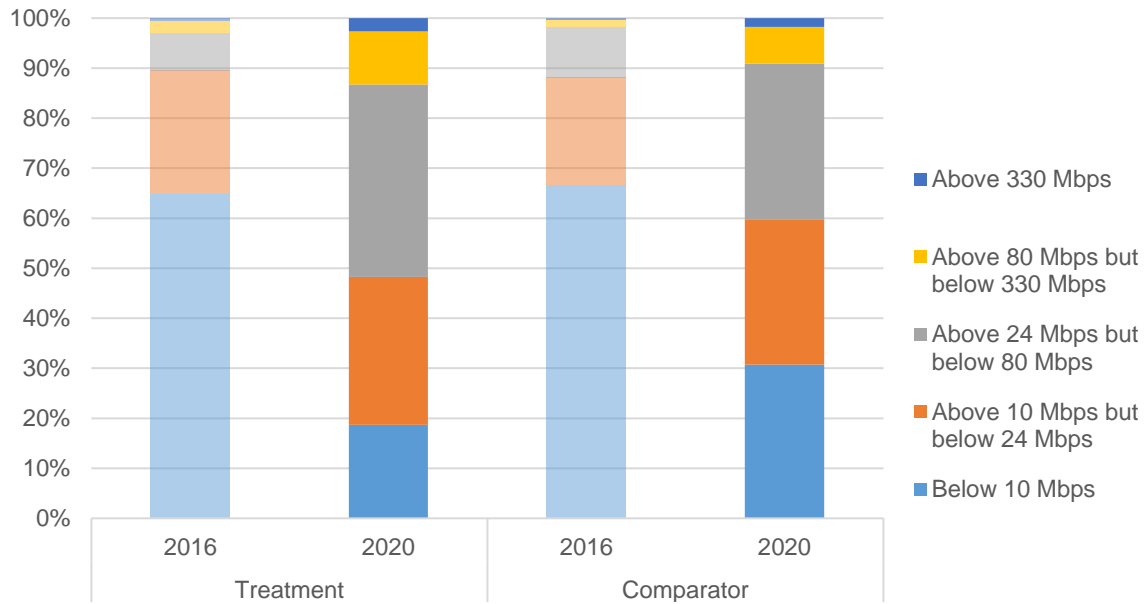
- The reliability and speed of transferring large files to customers / potential customers was also a challenge, particularly in industries where businesses were competing with businesses elsewhere in the UK with better internet connections. This could present challenges in securing new customers.
- The speed of the connection was also problematic for businesses in the hospitality and care sectors, as these businesses would have multiple individuals attempting to access the internet at the same time, which reduced the quality of their service.
- Reliability was also an important issue, particularly in more rural areas. For examples, if the internet connection was down, workers may have commuted a long distance to the office but could be unproductive.

There was no dominant reason why businesses chose not to upgrade their connection if it was possible to do so. The most frequent reasons provided were administrative or supply side difficulties in securing an upgrade (for example lack of trust of suppliers, or perceived lack of availability), the existing connection meeting the businesses needs and concerns about the price of faster connections. Of those that had not upgraded but were aware that upgrades were available, 37 percent reported that they were likely to upgrade their connection in the coming year. In qualitative interviews with businesses that had not upgraded their connection, the most common reason was that they did not think they required a faster internet connection (they were already satisfied with the speed and reliability they received).

6.3.3 Impacts on connection speeds and costs

Businesses in the Superfast Broadband Programme delivery areas reported an increase in connection speeds between 2016 and 2020. Forty-four percent of the treatment group reported having faster connections compared to 33 percent of the comparator group. The business services and primary / manufacturing sectors were most likely to report an increase in speed, in both the treatment and comparator groups. There were no major variations across businesses of different sizes.

Figure 6.3: Changes in connection speeds, businesses located in the areas benefiting from the Programme and comparator areas, 2016 to 2020



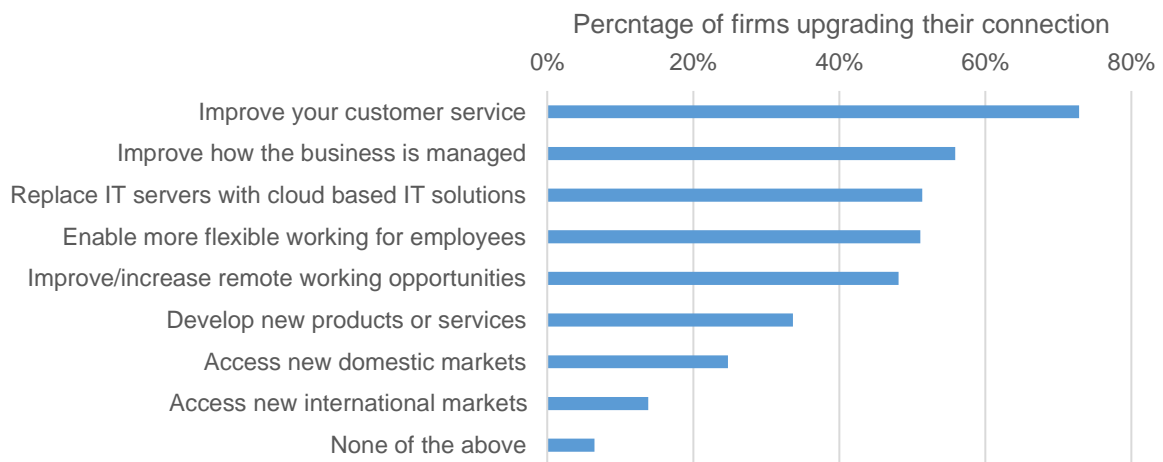
Source: Ipsos MORI survey of businesses, 2020. Base 1,200.

Where businesses were able to provide information about the monthly costs of their internet connection, over half (55 percent) reported that their costs had not changed between 2016 and 2020. Around a third reported their costs had increased (33 percent), with 11 percent reporting a reduction in cost. However, there was no difference between the proportion of businesses which reported changes in prices between the treatment and comparator group.

6.3.4 Benefits of improved connections

The most reported perceived impact of improved connections were enhanced customer services (72 percent), utilising the Internet of Things (55 percent), cloud-based computing (51 percent) and promoting flexible working (50 percent). Fewer businesses reported introducing new goods or services or opening up new markets. This suggests that the benefits of the subsidised coverage may have arisen primarily through enhanced operational efficiency.

Figure 6.4: Actions enabled by upgrading to superfast or ultrafast connectivity



Source: Business survey. Base: 296

Examples of the improvements in operational efficiency were explored in the qualitative interviews, and included:

- **Transferring documents:** Businesses described the difficulties they had transferring large documents between employees, customers and clients, with a lack of confidence that documents would be shared, and long upload times being required (both to upload files to a server, cloud computing or via email). One company stated that they used to have to build in “upload times” into their project timelines, to ensure that deadlines could be met. With the improved connections, the time required to share documents was reduced, meaning that staff did not have to spend as long facilitating the sharing of documents and freeing time to spend on other tasks.
- **Using online administrative systems:** Businesses reported a reluctance to use online systems with their previous internet connection, such as online accountancy, sales, or website management services. This was because of a lack of confidence that their connection speed (and reliability) would enable them to use these services. With the faster internet connections, some businesses have started to use these systems. Additionally, while many businesses reported using cloud computing with their previous internet connection, some switched from having servers on their premises (or rented elsewhere) to using cloud-based storage. The businesses that reported using cloud-based storage with their previous internet connection stated that it was inefficient but had improved since they upgraded their internet connection. Finally, a small number of businesses reported switching from an existing business line for their telephone system to having a phone system run through their internet connection. This tended to reduce their overhead costs (or at least be cost neutral). Businesses that had utilised an internet-based phone system reported that it would have been difficult to do this on their previous connection due to a lack of reliability in their connection (meaning that their phone system would also be unavailable).
- **Reduced travel times and expense:** Businesses reported that the improved speed and reliability meant that there was a reduction in travel times and expense. This was because their previous connections were too slow or unreliable to undertake specific tasks. For example, one business owner reported having to travel to public facilities in a city rather than using a connection where the business was based because it was too slow to undertake the tasks required. Other businesses reported that they would have to go to visit clients to resolve tasks that can now be resolved remotely (such as IT support) because of the poor connection speed they could access at their business address.

Although few businesses reported introducing completely new services, some businesses did state that they had introduced new ways of working or offers to customers. These included being able to video conference, either internally or externally with customers. Previously their poor internet connection speed prevented video conferencing. Some other businesses reported being able to offer remote IT support to customers, which meant that they spent fewer man hours resolving problems (as travel time was reduced) but also allowed them to support multiple clients at the same time, thus increasing their efficiency.

Businesses also reported that the improved connectivity had a positive impact on the volume of training they provide. This was because employees can access online training facilities or attend virtual conferences. The online training modules were reported to be less expensive than classroom-based learning (in some cases free with software packages the businesses had purchased) while maintaining a high level of quality. This, coupled with reduced travel costs for training and conferences (both in terms of travel cost and time – meaning workers

could be at their desk instead of travelling to and from training) meant training budgets could extend to include more training hours per year.

Employees reinforced some of the findings described above. Employees described an increase in efficiency as administrative parts of their job (such as processing payments) now took less time. The interviewees described this as making life easier or less frustrating and leading to an improvement in job satisfaction. One interviewee also reported that the use of video conferencing had increased at their firm during the COVID-19 lockdown, and this was beneficial to both them (in terms of being able to see colleagues) and the company (workers being able to complete tasks) – however they were unsure if the video conferencing would have been possible with their previous connection.

6.3.5 Changes in working practices

Firms benefitting from subsidised coverage that upgraded their connection were asked to report the degree to which the firm had introduced new types of working practices for their staff. As signalled above, introduction of new opportunities for remote working were most frequently reported by firms upgrading their connections. Clearly, this may have broader significance given the need for social distancing in responding to the challenges created by the COVID-19 pandemic and one area for future evaluation may be to examine the degree to which the Programme has supported the resilience of the local economies benefitting from the Programme. Use of online training and the introduction of new non-wage benefits using online services were less widely reported in the survey.

Qualitative interviews with employers found that most businesses had not changed their working practices as a result of the enhanced connectivity. Staff in most cases were already allowed to work remotely and flexibly (where possible). Most businesses reported that although they were now more efficient (as tasks took less time to complete), there was “always something else to do”, so there was no significant change in working hours – although a small number of businesses did state that it was likely that fewer staff were working overtime from home to finish tasks that had been delayed by poor internet connections. A small number of businesses did state that, although there had not been a decrease in working hours, the level of job satisfaction had probably increased, as staff were less frustrated with being delayed by the internet connection.

Employee interviews also found that the enhanced connectivity had a limited impact on work practices. Some of the employees were still based in their workplace with limited opportunity for flexible working, whereas others reported that flexible working was also available prior to the upgrade, although some stated that they did think that flexible working had become more widespread in the years since the connection upgrade.

There was also no evidence that the enhanced internet connection had led to a reduction in working hours – and in some cases the opposite was reported. As companies supported flexible working, and more workers were working flexibly, there had been an increase in working hours, as people worked out of office hours at home (in some instances to be in contact with colleagues in other countries). However, this increase in working hours was offset by other benefits they highlighted from working from home, such as a reduction in commuting time (although much of this was replaced with working) and the ability to take care of personal business during the workday. This was reported as leading to health and wellbeing benefits.

6.4 Public sector efficiency

6.4.1 Implementation of digital strategies

The local authorities engaged with in the interview process had digital strategies and plans in varying stages of delivery at the start of the delivery of the first Superfast Broadband Programme contract. However, towards the end of 2019 and into 2020 new plans were being developed and were in part informed by the Superfast Broadband Programme. Most notably, the South Yorkshire Digital Connectivity Strategy was produced by the Superfast South Yorkshire consortium in late 2019. The strategy focussed directly upon building on the foundations the Superfast Broadband Programme had provided. The plan aimed to extend superfast broadband coverage to all premises in the areas covered by the superfast contract. Alongside this, the plan set out ambitions to provide full fibre to business areas as well as provide the capability for 5G in the areas covered.

For other local authorities, digital inclusion strategies were produced that set out a variety of aims focussed upon increasing accessibility to digital tools and skills supported through access to reliable and fast broadband connections. Cornwall's digital inclusion strategy defined digital inclusion in terms of digital literacy and skills, accessibility and affordability as well as in terms of motivations for use, trust and confidence. The Superfast Broadband Programme was seen to primarily support the accessibility aspect through the provision of superfast connections. For the authority, the existence of the Superfast Broadband Programme meant they could begin to address other key elements, including skills and affordability through the provision of leadership in championing digital skills across the area, direct provision of public WIFI and equipment and through engagement and work with local partners.

“Superfast broadband has been the flag ship nationally for delivery of infrastructure to Cornwall and as such there is now a rich coverage of broadband within the area. This is something that underpins the challenge of ensuring that everyone has access to broadband and consideration is needed regarding how this is achieved” – Digital Inclusion Strategy for Cornwall and the Isles of Scilly 2019-2023

Similarly, the Isle of Wight Digital Island Strategy set out similar aims in terms of increasing the availability of digital skills but placed a much larger emphasis on local authority public service transformation. Superfast broadband was viewed as key to underpinning the intended transformation given the need for access being available to the public to use online services. A shift to online delivery leaving behind many members of the local public without suitable connections to access public information and services would not lead to any cost savings as intended but may instead increase costs.

Overall, the Superfast Broadband Programme was viewed as a catalyst in the delivery of digital plans for local authorities, removing some of the burden on them to build digital connectivity. The access to superfast broadband for the general public and less so access for the public sector service providers could be seen to be the key component driving the Superfast Broadband Programme's relevance to advancing local digital plans.

6.4.2 Impacts on educational facilities

In terms of teaching, those interviewed did not highlight any particular changes to the way children were taught at the schools as a result of having increased broadband speeds. Instead, the main benefit in terms of teaching was said to come from the increased reliability provided by the connection with more children able to access online resources at the same time and without as much of a delay as was previously the case. This enabled teachers to cover more

in their lesson which has potential implications for pupil achievement (discussed further below). In addition, teachers reported an increase in engagement from children with online learning resources. Anecdotally, children generally obtained more enjoyment from online resources relative to the resources accessed before the school's connection was improved. It was hoped by teachers that this would lead to an increase in their attainment. Related to this, attendance was mentioned but not considered a factor likely to be impacted by the improved broadband connection.

"I would say there has been a marked increase in engagement with online resources by the kids in my classes. Although, I don't think it will necessarily mean they will do better in their reading, writing and maths test. They still need supervision and person to person teaching" – Primary school teacher

Online tools need to be utilised in support of traditional classroom methods in the view of several teachers consulted. Therefore, the extent to which improved internet connections would be solely responsible for measurable increases in attainment was questioned.

6.5 Public value

As stated in Section 2, due to the COVID-19 pandemic it has not been possible to undertake the planned large-scale research into the public value effects of the Superfast Broadband Programme. A previous study, completed in 2018, did explore some of these issues. These were explored in a large-scale postal survey (1,314 responses) and depth qualitative interviews with households. This study found that there were limited differences between households in upgraded and non-upgraded areas. Comparisons between upgraded and non-upgraded areas suggested that the patterns of internet usage did not vary across groups. Respondents adopting superfast services stated more extensive usage of social networks with 45 percent of adopters using social networks several times or more a day compared to 36 percent of participants with slower speeds.

Small differences were evident in the importance placed on the internet for the activities explored in the evaluation such as communicating with friends and family and accessing entertainment content for which respondents in upgraded areas considered internet access more important:

- **Communication:** Comparisons of the methods participants used to keep in touch with friends and family from the survey were not very different in areas that were upgraded to those non-upgraded. There was, however, a difference in the use of messaging platforms, with internet-based messaging services such as WhatsApp and Facebook Messenger used significantly more widely by participants in upgraded areas. Participants in both samples were equally likely to have accounts on a wide range of social networks, however, participants in upgraded areas were significantly more likely to say that they use social networks several times a day or more often than those located in non-upgraded areas (four in ten of the former and one third of the latter). Participants in upgraded areas were also more likely to state that the internet is essential for keeping in touch.
- **Accessing content:** Evidence from the previous study suggested that internet usage for accessing entertainment content was similar across upgraded and non-upgraded areas. However, differences emerged between those in non-upgraded and upgraded areas in how essential the internet is for accessing entertainment content. Participants in upgraded areas were significantly more likely to consider the internet essential than those in non-upgraded areas (15 percent to 10 percent).

- **Managing everyday life:** The quantitative survey did not provide evidence of any differences in the use of broadband in terms of managing respondents' day-to-day lives through tasks such as paying bills, banking, buying groceries and non-food items. These were, however, cited frequently in qualitative interviews as an area where internet access has made a significant difference. Many described making use of online banking, online accounts for utilities, as well as online shopping. Participants that had adopted superfast services were also more likely to agree with the statement "I manage as much I can of my day-to-day life online".

There have been changes in digital usage since this research was undertaken (some of this due to the COVID-19 pandemic). Therefore, it will be beneficial to undertake the planned large-scale research into the public value effects of the Superfast Broadband Programme, which will take place in late 2021.

7. How effective and efficient has the Programme been?

This section presents an assessment of how the Superfast Broadband Programme has been implemented, drawing on key information collected for the process evaluation. The findings presented here also draw on information collected from an analysis on Programme MI and secondary data sources, and primary research with Local Bodies, telecommunication providers and validation interviews with BDUK.

Key findings

The Superfast Broadband Programme was delivered using a match funding model in which Local Bodies were required to find complementary resources from other Programmes or budgets. Local Bodies did not report difficulties in obtaining these resources in earlier phases. However, increased dependence on match funding in Phase 3 (compared to Phase 2) may have led to some schemes being scaled back owing to resource constraints.

There was a high level of engagement with the Open Market Review (OMR) process. Local Bodies were able to secure responses from most relevant network providers. However, there were some issues with the quality and accuracy of data provided and challenges in assessing the realism of plans put forward (with some suspicions that some network providers were overstating their ambitions to prevent the emergence of subsidised competition). Additionally, the investment cycles of many network providers were determined over relatively short time horizons (12 to 24 months) which did not match the three-year period covered by the OMR. The snapshot provided by the OMR also became out of date as network provider's plans evolved in response to changes in demand and regulatory innovation.

There was no evidence that utilising an alternative tendering and / or contracting approach to that recommended by BDUK had beneficial outcomes for Local Bodies (in terms of the value for money achieved or project delivery). However, dividing contracts into smaller lots in Phase 3 did appear to improve value for money and increase competition at the margins.

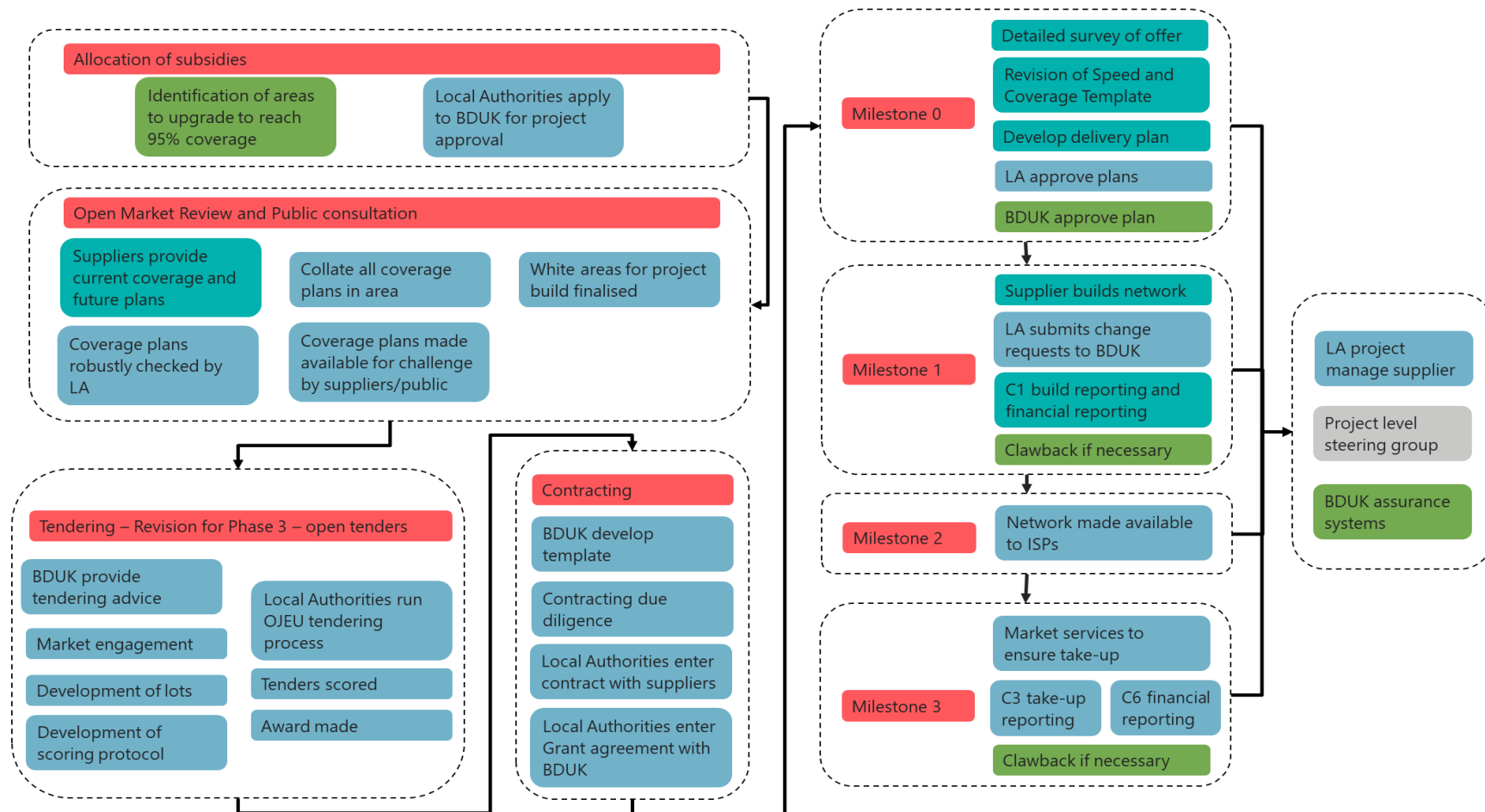
Most Local Bodies used similar project management approaches, with day-to-day project managers overseen by steering groups / committees and where required support was provided by BDUK. A small number of projects described working with the Programme beneficiary as being a partnership rather than a client-contractor relationship. These bodies felt they got more out of the provider on the delivery of the project with barriers addressed through close partnership working.

The delivery of Phase 3 contracts has been delayed. Reasons for this included the capacity of Programme beneficiaries to deliver their contracts, the duration of time required to resolve change requests and the enforcement of 'milestone zero' within contracts. BDUK has been working to develop new approaches to ensure change requests are resolved in a timely manner and this should help to resolve this issue, but Local Bodies also need to ensure that their processes allow for a rapid response to change requests and escalate difficult change requests to BDUK expediently.

7.1 Processes used to deliver the Superfast Broadband Programme

The figure below presents the processes that are in place for the delivery of the Superfast Broadband Programme. An assessment of these processes is provided throughout this section.

Figure 7.1: Map of processes used to deliver the Superfast Broadband Programme



7.2 Project funding

7.2.1 Match funding

Superfast Broadband Programme gap funding was disbursed as matched funding with Local Body funding matched by BDUK. Local Bodies were able to supplement funding for their projects by applying to other grant Programmes or through other public funding sources. Local Bodies made use of several other funding sources including Local Enterprise Partnership, Local Growth Deal or in some cases district council funding. Grant funding was also available from a variety of EU Programmes, including the European Regional Development Fund (ERDF) and European Agricultural and Rural Development Fund (EARDF).

Whilst in general Local Bodies did not encounter many barriers to raising match funding for early phases, challenges were encountered in some localities when it came to securing Phase 3 match funding. In many cases, the extent of coverage to be provided in Phase 3 was limited when compared to ambitions, due to the amount of Local Body match funding that could be secured. This was seen to be a result of wider resource constraints faced by Local Bodies, and not a result of a lack of commitment, with those seeking funding from district councils for Phase 3 particularly unable to raise as much as sought.

In addition to those sources noted above, gainshare and clawback funding were utilised to top-up funding for Phase 3 contracts or to extend Phase 2 contracts. This process was seen to be an efficient mechanism to deliver publicly funded projects by most interviewees and the option to utilise this funding in this manner was appreciated, potentially avoiding some issues in raising funding in later phases.

7.2.2 Business case development

Local Bodies were also required to submit business cases to justify the use of public funds for local projects. In general, Local Body interviewees explained that business cases, and those for Phase 1 in particular, were produced with the main aim of attaining as much coverage as possible from a limited budget and with limited tailored evidence required to substantiate the anticipated benefits of the project. Several interviewees stated that they used evidence produced at the national level where possible.

Most Local Bodies explained that the business case focussed on extending availability to residents as a key benefit. Business cases also emphasised the potential impact of projects on the strength of the local economies, including GVA and employment. These were particularly relevant where LEP or ERDF funding was sought. Only in a very small number of cases were disbenefits considered, and not included in the business case, but a handful of interviewees were aware of the potential for some of these to arise, such as a potential for emissions to increase as people work from home and consume utilities. Business cases for Phase 3 contracts, where required²⁷, were developed by updating the existing business cases, rather than developing a new business case.

The development of business cases was in almost all cases done in conjunction with economic development colleagues and drew upon the wide range of stakeholders internally, with business cases having to be approved by senior staff at the Local Body. In a small number of cases, this posed a challenge, particularly where Local Bodies were seen to be either particularly risk averse or required a more in-depth description of the expected benefits which delayed some early projects. Overall though, connectivity was a priority for Local Bodies and

²⁷ A small number of "Phase 3" contracts were effectively "Phase 1 bolt on" contracts with no additional public funding (they just used gainshare and supplier funding), therefore did not need a new business case.

the Superfast Broadband Programme was seen to provide a helpful mechanism to achieve local aims.

Where funding came from multiple sources, Local Bodies were required to produce multiple business cases. For example, ERDF and EAFRD funding also came with business case requirements, albeit different requirements to those for the Local Body business case. These funding sources also came with associated emphasis on certain benefits. ERDF application involved a focus on the benefits to the local economy leading to Local Bodies emphasising and substantiating the potential business implications most prominently, whereas EAFRD application emphasised wider benefits but specifically those relating to rurality, and social care as described by one Local Body. Interviewees did not highlight any particular difficulties in applying for these funding sources (although they required more information than needed to secure BDUK funding) and the resource required was deemed to be reasonable.

7.2.3 Impact of match funding requirements on projects

Other funding sources also had implications for the direction of projects more generally. For LEP and ERDF funding, interviewees described projects being targeted more at business in general in an effort to realise those benefits as outlined in their business cases with ERDF funding in particular only being paid for eligible business premises. Both DEFRA and EAFRD funding also led to some projects being targeted more towards very rural areas through their emphasis on rural businesses.

7.3 Open Market Review and Public Consultation

7.3.1 Supplier engagement

As highlighted in Section 6, interviews with Local Bodies described some initial difficulties in engaging effectively with providers at the start of the Programme (the beginning of Phase 1). Contact with providers was predominantly made via email at the time of the OMR process with subsequent telephone calls or chases in some places. Some Local Bodies stated that they would have liked access to a central list of contacts prior to their OMR process. However, Local Bodies were generally content with the number and coverage of those providers responding. Local Bodies did not identify any issues with providers being able to respond within the allotted timeframes.

Local Bodies described a degree of variation in the responses received from providers in terms of detail, with smaller providers viewed by one Local Body to be 'overwhelmed with what was being asked of them'. Local Bodies reported that smaller providers were in many cases not able to provide the postcode level data required in early phase OMRs and subsequent premise level data in later phases and instead submitted higher level plans. Local Body interviewees suggested that the certainty of these plans was variable and, in some cases, very ambitious.

Consultations with network providers highlighted noticeable differences in perspective across smaller and larger providers. Smaller providers often reported they were not engaged by the Local Bodies in the earlier phases of the Programme and had to pursue the Local Bodies themselves after finding out about the Programme through the press or from BDUK (even if they were already working with the same Local Bodies on different projects). Smaller providers found out about the OMR process by proactively contacting Local Bodies. The largest providers reported that the Local Bodies contacted them about the OMR and to ask for a response, in line with the description of the Local Bodies and were often chased for a response. As the Programme progressed into Phase 3, network providers reported that the level of engagement from Local Bodies has improved.

As a result of this, and the responses some of the smaller providers received from Local Bodies, there was a general view that the Local Bodies were not interested in receiving a response from smaller providers. Two providers stated that the Local Bodies did not want to receive a response from them as it would jeopardise the size of the project they were able to deliver (as it would reduce the white postcodes).

Network providers were split on the duration of time required to complete an OMR response. Some small providers claimed that it was very time consuming and potentially detrimental to their other business activities (taking several members of staff numerous days to complete). However, others felt it was a straightforward exercise to run off the required data, particularly for their current infrastructure. Most felt that this was easier in later stages, when organisations had got used to completing the responses, and many had introduced new software that made it easier to complete (as mentioned above).

7.3.2 Robustness of information provided

As highlighted in Section 6, Local Body interviewees expressed some concerns with the accuracy of the information provided by providers as part of the OMR process. Alongside data inaccuracies, there were also challenges in recognising what were realistic and unrealistic expected delivery plans outlined in provider responses:

- Local Bodies described the support provided by BDUK to fill in the gaps in their capabilities who had little experience of this sort of activity and was received positively.
- A small number of Local Bodies would have liked more power to disregard some claimed expansion in network coverage where they felt the provided plans were unrealistic.
- In addition, several Local Bodies outlined suspicions of 'gaming' by providers leading to an overstatement of commercial plans in an attempt to discourage competition thus contributing to the issues above. Local Bodies highlighted areas where providers claimed they were / had rolled out Superfast coverage to in their OMR response, which still do not have superfast broadband coverage.

7.3.3 Public consultation

Many Local Bodies and providers highlighted that the public consultation process was mis-named, as it was not intended to be a consultation for the public. It was intended to be a process through which providers and Local Bodies could review the plans to make sure they considered their submissions were accurately represented and they could assess where the local project could operate.

Most network providers interviewed stated that they viewed the combined OMR responses that were presented as part of the public consultation exercise. However, few reported that they responded to this to the Local Bodies. This was because they saw no need to respond if the combined OMR responses accurately reflected their responses. This is not to say that the public consultation exercise was not useful to some providers. One provider stated that, by observing the areas that were categorised as white and knowing the Programme would look to cover the maximum number of properties, they could identify where the Programme was likely to build (and chose to build their own networks elsewhere to avoid competition).

In many areas, members of the public did respond to the consultation exercise. This was generally to air frustrations they had at their area not being included as an eligible area. However, in a small number of cases, public engagement led to the reclassification of areas.

7.4 Tendering and contracting

7.4.1 Procurement models

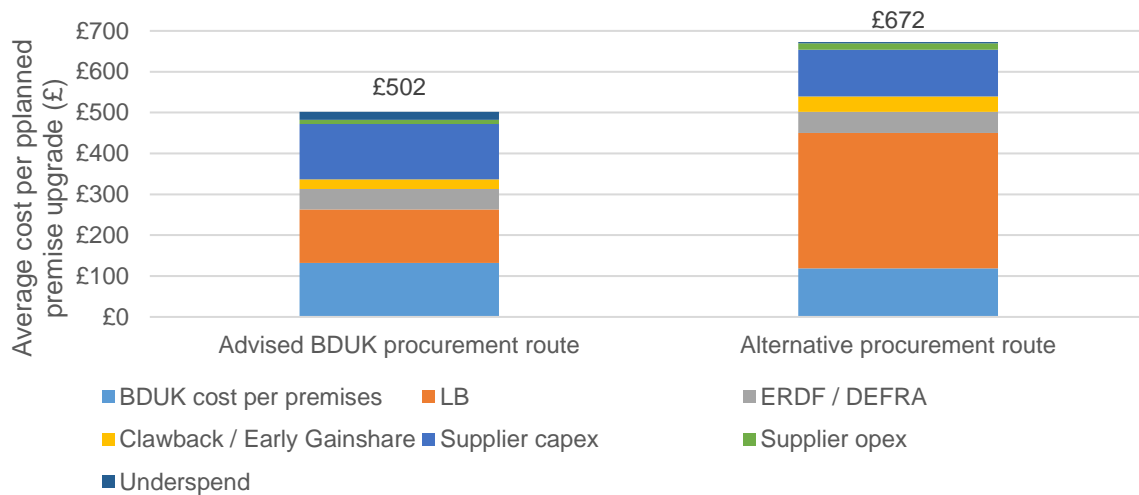
For Phases 1 and 2 of the Programme, Local Bodies predominantly used the BDUK framework to procure the providers services to deliver the infrastructure. This approach in practice restricted the number of possible bidders. In the small number of cases not using the framework for Phases 1 and 2, either a competitive dialogue or the OJEU process was used, with some of these occurrences before the standard framework came into being. These procurement exercises would have been with either one provider or would have received a small number of responses (two to three).

Local Bodies highlighted some benefits of the framework in that it had been developed specifically for this Programme and was in line with State aid requirements. Most bodies stated that they did not possess the skills or resource locally to be able to design and apply such frameworks effectively, with many new to this type of procurement.

A total of three Local Bodies described a competitive dialogue process for their Phase 1 procurement. There were mixed views on the effectiveness of this approach. One was able to 'whittle' their options down to a single provider through competitive dialogue following an initial PQQ Stage that eliminated unviable providers. Another Local Body reduced eight initial bidders to three refined solutions and two final bids. This Local Body found the process worked effectively, with them iterating plans successfully with providers. However, one found there were not enough alternative providers willing to work with the body to generate a realistic second or third option. They found that this required a lot of energy in terms of engagement to produce a similar result to what they could have achieved through an open tender.

When comparing the relative value for money offered by different procurement routes, the Management Information suggests that all contracts tendered through competitive dialogue were won by the same provider, and that the average cost per premises upgraded was higher than through the BDUK Framework or an OJEU process. This could be due to the specific areas that the small number of contracts awarded by competitive dialogue cover (more large, rural and dispersed areas). However, this evidence does not suggest that utilising an approach other than that advised by BDUK provided better value for money for Local Bodies.

Figure 7.2: Average cost per planned premise upgraded to by procurement route

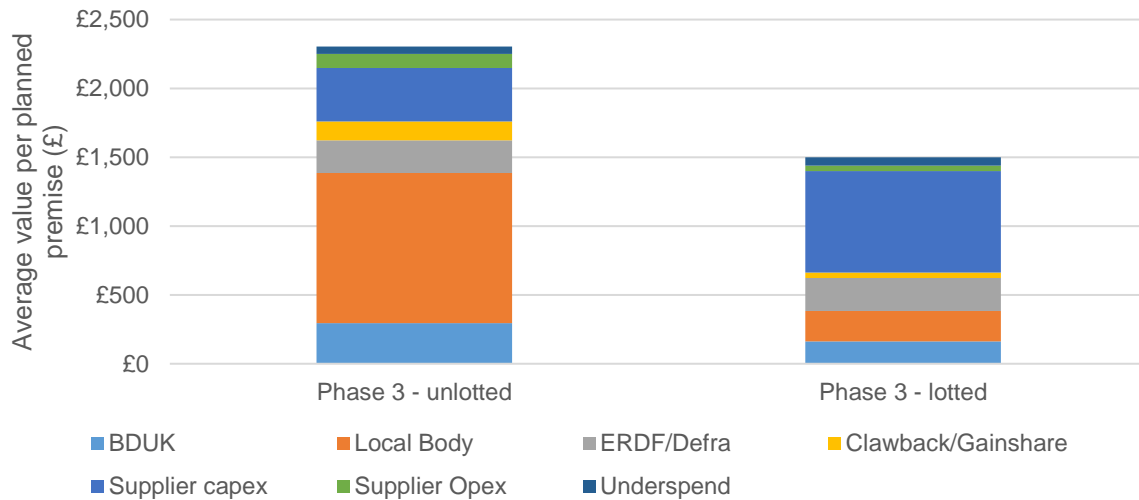


Source: Cora Management Information, June 2020; LB = Local Body

In Phase 3, OJEU procurements were used by Local Bodies to meet State aid requirements. The main benefits were expected to come from increased competition. As noted in Section 6, Lotting was used in some areas to try to encourage further competition but views on its effectiveness were mixed with some areas forgoing this entirely given a lack of feasible geographic splits of the target areas. Where lotting was used, some Local Bodies think it may have marginally increased the number of responses.

Activities to engage providers were more notable for Phase 3 procurements with Local Bodies describing provider days before and after tender and consultation with providers before to refine the tender. The approach to lotting was also taken in conjunction with provider consultation in one area. The conclusion they reached following provider engagement was that the lots should be around 18,000 premises in size and geographically conjoined. Another Local Body used market engagement before the public consultation to explore options for lotting but based upon feedback did not apply a lotting approach to the procurement.

Another potential benefit of the increased competition from lotting contracts was thought to be an increase in the value for money the contracts would offer Local Bodies. An examination of the Management Information shows that in Phase 3 of the Programme, Local Bodies which used a lotting approach to contracts had a lower average cost per planned premises upgraded, and a higher proportion of the value of the contract being provided by the provider than in unlotting contracts. Part of this could be due to differences in the geographies of lotted and unlotting contract areas (as described above), but it does suggest that lotting contracts has had a positive impact on the value for money Local Bodies were able to receive for their contracts (see Figure 7.2). This finding was also described in the interviews with the smaller Superfast Broadband Programme beneficiaries, who indicated that they were willing to submit bids that had large levels of self-funding.

Figure 7.3: Average cost per planned premise to be delivered to, lotted and unlotted contract areas

Source: Cora Management Information, June 2020

Local Body interviewees highlighted a good degree of engagement from providers in Phase 3 procurement exercises with several bodies receiving five or six EOIs. However, these ultimately translated into much fewer responses, between one and three, to the full tender.

These findings are consistent with the responses to the provider interviews. Providers described a much higher degree of engagement with Local Bodies before and during the Phase 3 procurement process. All the providers spoken to described being invited to and participating in provider engagement days with Local Bodies.

The providers did make suggestions for the size of lots. In general, smaller providers would prefer smaller lots, however there was an acceptance that the lots needed to be a suitable size to make them worthwhile bidding for, and for the management burden to Local Bodies and providers to be acceptable (it is clearly more difficult to manage a large number of small contracts than one large one).

The smaller providers stated that they would be more able to bid for contracts following dividing up of some of the areas (into lots). This was because they would not have the resources or capacity to deliver contracts across the whole Local Body area, and therefore would not have put in a bid for the contract. Therefore, in this respect the lotting approach did increase competition, as it encouraged more providers to put in bids for contracts.

However, when the ITTs were published, there were still restrictions on which organisations could apply (turnover of applicants and other qualification criteria). This restricted the level of competition possible, but again providers were generally understanding that restrictions were needed to provide reassurance that the publicly funded networks would be completed.

7.4.2 Tendering

Providers considered that for the OJEU tendering processes they were involved with, the information provided by the Local Bodies was very clear. The documents set out exactly what was required and how the tenders would be scored. The providers reported that, although the tenders were substantial documents which required a lot of inputs, there was sufficient time allowed between the issuing of the ITT and the submissions deadline.

Network providers stated that it was time consuming to complete the tender documentation. The cost of putting these together was in the tens of thousands of pounds in terms of opportunity cost (staff time that could have been spent on other work). One network provider engaged a sub-contractor to write the bid, at a large cost to the company. However, they felt that this was appropriate, as the contracts were often multi-million pound contracts.

However, some network providers were unhappy with the clarity of the scoring applied to their bid. One provider queried the decision made (after the provider was excluded from the process) as one of their files did not upload correctly. Others were unhappy with how different Local Bodies interpreted the scoring criteria, suggesting that “*(the Local Body) knew who they wanted to award contracts to and made up the scoring to arrange this*”. An example of this was one company submitting similar responses to the same questions in two Local Body areas, and seeing their scores differ by 120 percent.²⁸ Multiple providers stated they had issues uploading documents from Mac computers, which caused difficulty in getting tenders submitted.

7.4.3 Contracting

In terms of the use of the BDUK contract structure, nineteen Local Bodies stated that they used the BDUK contract structure, for at least one phase, with minor amendments. Where amendments were made, these were described as being to ensure the contract reflected the Local Body needs, for example tagging of postcodes to local authorities and reflecting the priorities of the Local Body. Local Body interviewees who made use of the BDUK templates were positive in describing it, stating that a major benefit was that it was State aid compliant, so they did not have to use resources ensuring their own contract complied with State aid decisions – meaning that using this was cost-effective for Local Bodies while still offering a degree of flexibility. This was welcomed by a number of Local Bodies, who also praised the support of BDUK in implementing the contracting process. The Local Bodies that stated they did not use the BDUK template had used their own because their original project predated the template and they continued to use their own contract.

Whilst Local Bodies overall viewed the support provide by BDUK throughout tendering and contracting positively, there was a view that the dissemination of guidance documentation could be tweaked. Interviewees described some difficulties being able to quickly access the information they needed due to the amount of information available, and they mentioned some instances in which guidance and templates had been updated but which were not clear leading to some wasted effort on the part of the Local Body. Documentation was described as being made available online by BDUK with version control an issue as guidance gets updated.

Local Bodies did not highlight any particular issues with getting contracts signed in a timely manner, particularly where the BDUK framework was used and the provider was au fait with the information required and the clauses included within the contract.

The Programme beneficiaries were generally satisfied with the contracting process, although they stated they had no power over the contracting terms as they were stated in the tender documents (in Phase 3). However, providers did have the opportunity to contribute to what was included in the contract through provider engagement held by BDUK. This led to changes in the contracts compared to the contracts used in Phases 1 and 2. These included the way in which milestones were enforced, such as Milestone 0 (validation of build plan). In Phase 3,

²⁸ It should be noted that all award decisions were reviewed by the National Competency Centre and no evidence of collusion or improper awarding processes were highlighted.

this milestone was more strictly enforced with providers requiring a complete validated build plan before any physical work on the contract could begin (previously they reported being able to start physical work and amend the build plan on an ongoing basis).

One provider stated that the enforcement of Milestone zero²⁹ in the contract had caused delivery issues, mainly the ability to complete build within the allotted contract length. This is because the validation of the build plan often took a long time, and in that period no actual building work could take place. They reported that the approval of the build plans was outside their control but impacted on their ability to fulfil the contracts. Another issue with the contract was that they took longer to get signed than stated in the tender documents. However, this was a minor issue as it did not impact upon their ability to deliver the contracts to time.

Programme beneficiaries were satisfied with the clawback mechanisms in the contract and appreciated why there was a need for the mechanism. There was only one minor criticism of the mechanism, which was the duration for delayed projects. The clawback mechanism runs for seven years from the end of the project – but for projects with large delays to the end point of the project this meant the clawback period ran for longer than anticipated. This would mean the financial modelling which underpinned the initial bid for the contract was inaccurate.

The Management Information analysis presented in Section 4 of the report shows that the clawback mechanisms have contributed to the funding of Phase 3 projects, representing five percent of the cost of Phase 3 delivery. This is lower than in Phase 2 of the Programme, but this would be expected, as Phase 2 contracts were more accurately budgeted given improvements in knowledge around take-up and improvements in the robustness of the data used in the application and OMR processes.

7.5 Project delivery

7.5.1 Local Body project management

Local Bodies all maintained similar regular assurance activities throughout the lifetime of contracts with interviewees describing regular meetings including the beneficiary. These included quarterly delivery boards and, in some cases, weekly contact to aid implementation. More regular informal calls were described by local leads, particularly in cases where delivery was delayed or at risk. In general, Local Bodies managed projects with one or two key colleagues acting as project managers, from IT and / or economic development backgrounds. Steering groups / committees were organised in all cases with these including the Local Body leads, provider representatives and often councillors. These were described as more strategic group meetings which would involve the elected members and more senior members of staff who needed updating on progress and issues. Implementation meetings were more frequent and used to address delivery concerns and remedial plans, with one example of these occurring more frequently when Phase 2 contracts for a Local Body entered default. These would typically involve the Local Body leads, provider and BDUK. One Local Body described the addition of other departments such as planning and highways in relevant implementation meetings to unblock or assess issues related to those departments.

Ongoing contract management by Local Bodies also included assurance activities. These involved the checking of provider invoices and the delivery of work, through site visits or audits of provider information. This was often delivered by a small internal team but in a very few cases was contracted out to external consultants at cost to the Local Body.

²⁹ Milestone zero involves the selected provider undertaking a detailed survey of the proposed build, to ensure that the postcodes do not have any superfast coverage and that the build can be completed for the value specified in the contract.

Three Local Bodies described their relationship with providers (particularly BT / OpenReach) more as a partnership rather than a client-contractor relationship. These Local Bodies felt they got more out of the provider on the delivery of the project with barriers addressed through close partnership working. In one case, this was seen to have led to more premises being delivered than originally set out.

The beneficiaries generally confirmed this approach to project management. One beneficiary would nominate a delivery manager, a contract manager and a finance manager for each project, and a regional director to oversee a wide range of projects. The delivery manager would be responsible for working closely with the Local Bodies. Most delivery managers would be responsible for up to three local projects. The delivery managers would have at least one meeting in person with the Local Body project manager, and ongoing contact with them. The contract and financial managers were less involved on a day-to-day basis but became involved with specific issues in the project and invoicing / payment issues. For other, smaller beneficiaries, there would be a general / project manager, responsible for all aspects of the project. These project managers would receive support from other departments in the organisation.

Capacity

Local Bodies described limited local resource from which to draw on for the management of contracts internally. This led to some activities being contracted to external consultants. As mentioned earlier, the management of contracts involved colleagues from multiple departments within the Local Body, most notably economic development, IT and legal / finance. Activities for the Superfast Broadband Programme were on top of their day-to-day responsibilities, but most Local Bodies felt that they were able to balance resource requirements to a satisfactory degree.

Interviews with Local Bodies also suggested there were some issues with a lack of capacity amongst beneficiaries throughout the Programme. Civil engineering capacity was seen to be limited with the contracts stretching sub-contractors delivering the infrastructure on the ground. Interviewees saw this to be the result of the scale of delivery nationally. In some cases, alt-nets were not considered to have had the resource to expand in contract areas as quickly as anticipated and lacked the organisation to effectively apply for wayleaves etc, leading to delays with the contracts. Some frustrations were also apparent on the part of Local Bodies in relation to the amount of time planning of changes could take amongst providers with a perceived lack of planning resource.

Some of the criticism described above was acknowledged by the providers who delivered contracts. One beneficiary stated that they had issues with their subcontractors, in terms of them having the capacity to deliver the work specified in the contracts, the quality of the work provided and their ability to manage the contracts. One of the reasons behind this issue was that the beneficiary had to start working with new subcontractors as a result of winning the contracts. As they did not have existing relationships and a large supply of future work after the contract, these new subcontractors did not provide the service needed to deliver the Superfast Broadband Programme contracts. However, there were failings at the beneficiary to properly manage the relationships, ensure that there was sufficient resource to deliver contracts and quality assure the work delivered. As a result of these problems the beneficiary has changed their internal processes and is more confident of successful delivery in the future.

Another large beneficiary of Superfast Broadband Programme contracts stated that there had not been difficulties with build capacity for the Programme. Where there have been delays, these have been due to contractual issues (for example delays associated with milestone

zero) and change requests (for example having to rescope project delivery). They did not recognise the planning issues raised by the Local Bodies.

Most of the beneficiaries consulted indicated that the project had not had an impact on their ability to deliver commercial contracts, or other BDUK contracts. This was the case for both providers who delivered Superfast Broadband Programme contracts and those that did not. Large providers explained that they used Tier One (large) subcontractors, which were able to absorb any additional capacity. But also that the Superfast Broadband Programme timings tied in with other types of delivery finishing, so there was capacity within their supply chain. Smaller providers described how they used smaller, often local subcontractors with a different workforce to the Tier One subcontractors, and therefore they did not feel any effect of the Programme on labour supply for their commercial deployment. However, as mentioned above, one provider did report capacity issues due to working with new providers to meet the demand the Superfast Broadband Programme had created.

The skills needed in the workforce as a result of the change in focus to faster speeds in Phase 3 was also explored. However, all providers stated that there was no difference in the skills required by the workforce to deliver networks capable of delivering faster speeds – therefore the change in focus of the Superfast Broadband Programme had no adverse labour supply issues.

7.5.2 BDUK Programme management

Local Bodies were positive when discussing their relationships with BDUK, although some Local Bodies felt the level of support from BDUK had reduced in recent years. However, this was intended by BDUK, who wanted to make Local Bodies take more responsibility for the local connectivity projects they were delivering. Overall, Local Bodies were happy with the degree of support provided and that provided through their designated contact. BDUK were seen in one case to have "functioned well to offer advice, and guidance, and support to the [Local Body] in something that obviously the [Local Body] can only really have a limited level of understanding of how these processes work". This idea of the Local Body and BDUK acting as partners with the latter providing support and assurance was prevalent across Local Bodies.

BDUK support was described by Local Bodies to have been provided through a combination of participation of contract leads in regular implementation meetings and through the provision of guidance and templates. Support was more intense when issues arose, for example when contracts go into default with regular attendance at meetings designed to understand and resolve delivery constraints.

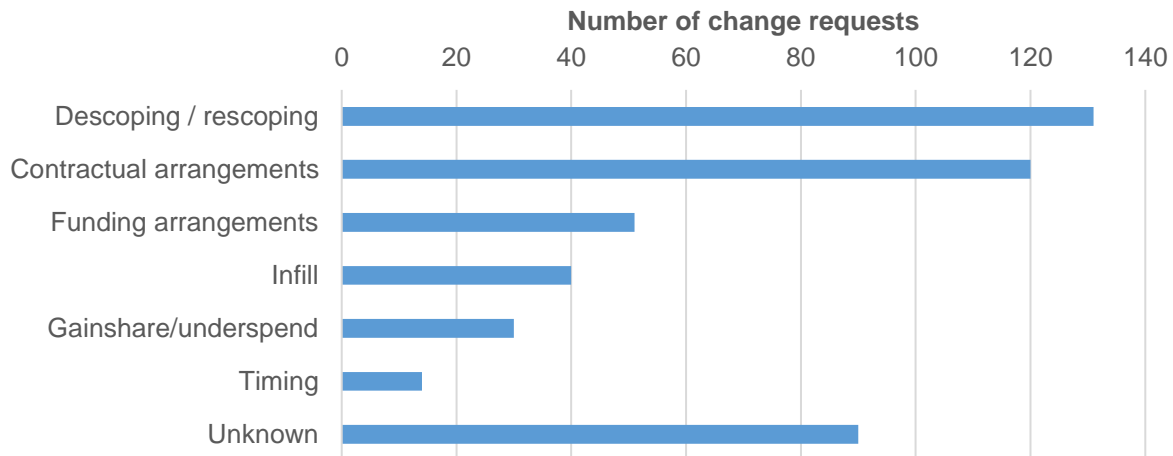
Some Local Bodies reported that change requests and associated assurance activities took longer than necessary, in part driven by providers but also seen to be in part due to delays within BDUK. During the delivery of Phase 3 contracts, BDUK has been working to enhance the management of change requests and has introduced a new system to expediate the approval of change requests (introduced in 2018).

Change requests

A summary of change requests was made available to the research team and has been analysed. These were taken from the Change Request pipeline. The pipeline is a summary of change requests submitted to BDUK. 476 change requests were submitted to BDUK. Nearly all Local Bodies were recorded as having submitted at least one change request to BDUK (ranging from two to 19). However, this understates the number of changes, as some requests

included multiple changes rolled into a single request. Additionally, not all change requests are submitted to BDUK for approval. The most common reason for a change request was for descoping and / or rescoping, followed by contractual issues (such as moving premises between Phases of contract, re-drafting contractual documents such as Project Financial Monitoring or terms and conditions, milestones etc.).

Figure 7.4: Reasons for change requests³⁰



Source: BDUK management data.

Change requests were viewed by Local Bodies as being resource intensive to manage overall with the responsibility on the Local Body to manage these with assurance provided by BDUK. Local Bodies described many occasions where change requests were approved with these driven by a multitude of factors including the descoping of areas wrongly included or other delivery constraints such as delays to delivery of the infrastructure (see below). In general, these were described as being processes that take months to finally approve. In one case, change requests were seen to remain in discussion for up to three years with a reluctance on the part of the provider to approve those that were not entirely understood by the Local Body. BDUK was seen to be supportive in this context and important in escalating the issue at the national level with the provider.

All of the providers that delivered contracts highlighted challenges faced during delivery, and all the providers stated that there were challenges around the timing of delivery due to contractual issues and the time it took to resolve change requests. Unlike the Local Bodies, the providers were more likely to state that it took Local Bodies and BDUK a long time to agree and sign off change requests, which was the main cause of a lot of the delays in the projects. However, two providers did acknowledge that it could be time consuming for providers to fully research and develop change requests, if it involved a lot of survey work or a lot of rescoping. This could take months to develop – however they also pointed out that it would be at least an equal amount of time to get the change requests signed off.

³⁰ Descoping / rescoping were Change Requests which involved taking premises out of build plans or adding new premises into build plans; Contractual arrangements were change requests querying the contract being used; Funding arrangements were change requests about the level of funding; Infill were change requests about connectivity delivered between white postcodes; Gainshare / underspend were change requests about the use of gainshare or previous underspend funding, and Timing were change requests about the timeline of delivery.

7.6 Take-up

As described in Section 4.4, the management information suggests that take-up of superfast broadband connections is higher than anticipated, particularly for Phase 1 and Phase 2 contracts. This is mainly because Programme beneficiaries underestimated the demand for superfast broadband connections. However, findings from the qualitative interviews suggests that both Local Bodies and Programme beneficiaries have undertaken work to boost take-up.

Most Local Bodies interviewed were undertaking or had undertaken some form of demand stimulation exercises or activities. For most, this took the form of an advertising campaign to stimulate awareness. Some areas went further and were planning activities with local charities and associations to coincide with completion of work by the provider in particular areas. For those bodies with more intensive marketing, e.g. a full-time marketing officer, this was seen to be at risk as was being funded locally but was keenly recognised as having been important in accelerating initial take-up. The level of take-up realised on these contracts, and most others, was much higher than originally anticipated but it is difficult to say how far this resulted from Local Body or provider promotion activity.

Superfast Broadband Programme beneficiaries reported engaging in marketing activity to promote take-up – this included direct marketing to households in areas that had been upgraded, advertising on cabinets and community engagement and information exercises throughout the course of delivery. It is not possible to examine differences in take-up by marketing channel, but one provider did notice some interesting patterns in take-up in different project areas. These particularly related to the provider performance during the build phase – where the provider had struggled to deliver the network build in a high quality or timely manner (for example long delays in digging up roads, damage to grass verges, not delivering build on time), or not being able to deliver the network at the time originally advertised (due to not having sufficient backhaul) take-up was lower than anticipated. The provider has found that this is due to the poor reputation of the company in these areas – households are unwilling to use what they see as an unreliable provider for their broadband connection.

Network providers and ISPs which were not directly involved in the Programme did not report any changes in their marketing approach or undertaking of any targeted marketing in the areas that had been upgraded through the Programme. They described undertaking standard marketing activities to advertise services when OpenReach upgraded a network that they already used to provide services. However, the ISPs are competing with other providers who are able to offer exactly the same connection speed, meaning additional advertising for increases in speed is not an effective point of differentiation between providers.

Providers that reported that they had been overbuilt by the Superfast Broadband Programme also reported that they did not engage in targeted marketing as a result of the overbuild. For some, it meant no advertising in the area at all (due to not utilising the network – see below), whereas for others it meant simply continuing their existing marketing strategy. The approach to marketing in areas that had been overbuilt depended on the providers views on take-up and churn of current and potential customers.

Take-up among providers that were not delivering the contracts was also explored. This provided some interesting views about how the Programme has and could potentially impact upon the market. In general, providers tried to avoid building in areas that the Superfast Broadband Programme was operating in. However, in some cases, this was not possible (see OMR discussion). Where this was the case, many alt-net providers felt they could not compete with the publicly funded provider. This was both on cost, and particularly for wireless providers on perceived quality from the consumer. This could mean that providers would lose close to 100 percent of their market share in these areas. This has led to inefficiencies in some areas,

where wireless networks have been built (using public funding) but never switched on, as following the wireless build FTTC networks funded by the Programme have been built. The wireless provider did not think it would be cost-effective to run the wireless network. Other wireless networks have indicated that hypothetically the same would happen to their business, and so deliberately avoided areas that the Superfast Broadband Programme could potentially deliver in.

However, other (wired) alt-nets were more bullish about their ability to compete with the publicly funded networks. These were generally alt-nets that built FTTP networks in hard-to-reach areas. They felt that the quality of the service they provide, in many cases the fact that they were the first provider to deliver there (which involved a large degree of community engagement) had meant there was a lot of customer loyalty and would mean that the impact on their take-up would be minimal – and in the small number of areas where there is overbuild (for example due to gaining access to remote villages) this is backed up by the number of households that remained with the original provider.

7.6.1 Take-up of wholesale services

The alt-nets that delivered Superfast Broadband Programme contracts said that they are currently the only providers using their network – and other ISPs have not used the networks yet. These networks are FTTP or wireless networks. They do not expect other providers to attempt to use these networks until there is sufficient demand for FTTP connections. For OpenReach networks, ISPs can utilise the networks through OpenReach wholesale products.

One provider mentioned a regulatory pricing issue which may prevent smaller internet service providers from using the networks built for the Superfast Broadband Programme – particularly on OpenReach networks. There is a pricing differential for the use of cabinets in different locations (urban areas are Category B and rural locations are Category A) – and where the project has been delivered to many of the cabinets would be expected to be Category A. Access to these Category A cabinets was described as prohibitively expensive by one provider, which would mean that there would be limited competition in the areas that the Superfast Broadband Programme has built in (as ISPs struggle to form a reasonable business case to access these cabinets due to the product pricing). However, this is a regulatory issue for which Ofcom are responsible.

This view was reinforced by an ISP which does not own their own network. They stated that if wholesale prices are considered too high (meaning that they cannot sell their product while maintaining a sufficient retail margin) they would not deliver services to an area. For this ISP to utilise the wholesale access for the networks upgraded through the Superfast Broadband Programme would require a large amount of investment on the part of the ISP (to access networks / cabinets and establish handover infrastructure). Therefore, the ISP would require a large number of customers in the upgraded areas to sign up to their service to make offering the service in these areas economically feasible. This, coupled with the lower population density in upgraded areas (compared to in towns and cities where the ISP operates), and higher wholesale access prices can make offering services in these areas unattractive to ISPs.

8. Was the investment cost effective?

This section of the report examines the cost of the Superfast Broadband Programme and attempts to compare this to the cost of other publicly funded broadband interventions to assess whether the Programme was delivered in a cost-effective manner. It additionally summarises the results of the analyses exploring the economic and social impacts of the Programme and provides an overall cost-benefit analysis of the Superfast Broadband Programme.

Key findings:

Contracts have been designed in such a way that Programme beneficiaries are required to return resources to the public sector if build costs are overstated or if take-up proves higher than expected. The protections put in place by BDUK are likely to prove highly effective in protecting the public sector from the risk that it provided more than the minimum subsidy needed for projects to go forward. As costs and take-up expectations were systematically lower than observed, the public sector cost of the Programme is expected to fall from £1.7bn to £0.8bn.

These mechanisms have substantially improved the value for money obtained from the Programme. At the point of contracting, the expected public sector costs per premises upgraded was £342. However, after allowing for clawback, this is expected to fall to £140 per premises upgraded. Even after accounting for the likelihood that a share of the premises upgraded would have received improved broadband connectivity anyway, a net cost per additional premises upgraded of £250 is expected. While there are few available evaluations of comparator Programmes, the Superfast Broadband Programme appears to be one of the most efficient Programmes supporting broadband deployment in the EU.

It should be noted that the learning beneficiaries have generated over the course of the Programme mean that the amount of money returned to the public sector through clawback is likely to be lower for Phase 3 contracts than for Phase 1 and 2 contracts.

The benefits of the Programme are also expected to significantly exceed its costs. The estimated Benefit to Cost Ratio (BCR) was between £2.70 and £3.80 per £1 of net public sector spending based on its impacts between 2012 and 2019. Allowing for future benefits to 2030, the BCR is expected to rise to between £3.6 and £5.1 per £1 of net public sector spending.

8.1 Effectiveness of clawback mechanisms

Section 6 highlighted that Programme beneficiaries systematically underestimated take-up during the tendering process and many projects have proven more profitable than originally expected. Some projects would likely have been commercially viable without a public subsidy. This risk was anticipated in the design of contracts, which included provisions to clawback any underspend in the delivery of the project and a share of any excess revenues arising from higher-than-expected take-up. Additional modelling work was completed to explore the effectiveness of these mechanisms in containing any excess profits that may otherwise have been earned by network providers.

8.1.1 Effectiveness of clawback mechanisms

An assessment of the effectiveness of clawback mechanisms was undertaken by exploring the anticipated levels of funding that would likely be returned to the public sector, given actual delivery costs and levels of take-up. These analyses indicated that:

- The projects funded are on average expected to deliver rates of profitability that exceed network providers' costs of capital once subsidies are accounted for. This would imply that the public funding awarded through the Programme would enable network providers to earn excess profits on their investments.
- However, the protections put in place by BDUK to protect the public sector from the risk that it provided more than the minimum subsidy needed are likely to prove effective. After clawback of subsidy, the average internal rates of return associated with Phases 1, 2 and 3 contracts are expected to fall.
- Many contracts awarded under Phase 1 are expected to deliver rates of return that exceeded the network provider's Weighted Average Cost of Capital (WACC), even after the application of clawback. These schemes were largely commercially viable without a subsidy and the clawback mechanisms are expected to return almost all subsidy to the public sector.
- Few contracts awarded under Phases 2 or 3 are expected to deliver a rate of return that exceeds the network providers' cost of capital once clawback is accounted for.

8.1.2 Impacts on costs

The clawback mechanisms are expected to substantially reduce the cost of the Programme to the public sector. The gross value of public funding associated with the 144 contracts signed across Phase 1, 2 and 3 was £1.9bn (in nominal terms). The value of clawback will not be known until the contracts have been fully wound down seven years post completion. However, the modelling was used to develop estimates of the lifetime net public costs:

- **Underspending:** Forecast public spending before clawback is expected to fall from £1.9bn to £1.5bn in nominal terms (£1.7bn in 2019 prices). This difference is largely driven by underspending on Phase 1 contracts. The gross value of the public spending associated with contracts at the point they were awarded was £1.2bn. However, final claims were only made for £689m of public funding.
- **Clawback:** Network providers are also expected to return £147m to the public sector (in 2019 prices) because delivery costs were overstated. Network providers are also expected to return a further £714m (in 2019 prices) to the public sector due to higher-than-expected take-up. This was largely driven by Phase 1 contracts.
- **Net public spending:** After accounting for clawback, it was estimated that the net cost of the contracts to the public sector will fall to £807m (in 2019 prices).

The modelling may have also understated the levels of clawback that may ultimately be received by the public sector. In some cases, the modelling was based BDUK's forecasts which assumed lower levels of take-up in the long-term than might be expected based on how actual take-up has grown with time. For Phase 3 contracts (where delivery was at very early stages), no adjustment was possible for future potential implementation and take-up clawback.

Table 8.1: Expected net public sector costs (£m, 2019 prices)

Phase	Number of contracts	Forecast public funding (£m)		Forecast implementation clawback (£m)		Forecast take-up clawback (£m)		Net cost to the public sector (£m)	
		Undisc.	PV	Undisc	PV	Undisc	PV	Undisc	PV
Phase 1	45	1004.7	931.7	-114.1	-93.3	-548.2	-408.6	342.4	429.8
Phase 2	48	476.1	395.8	-11.1	-8.4	-160.7	-113.1	304.3	274.3
Phase 3	51	187.3	148.5	-21.8	-17.2	-5.0	-3.2	160.5	128.1
Total	144	1,668.1	1,476.1	-147.0	-119.0	-713.9	-524.9	807.2	832.2

Source: Ipsos MORI analysis; CORA; BDUK; Undisc. Is undiscounted value, PV is discounted (Present Value), all monetary values in 2019 prices.

This analysis focuses on delivery of the Programme to March 2019. While Phase 1 and 2 of the Programme were largely complete at this stage, Phase 3 contracts were at relatively early stages of delivery (around 79,100 premises had been upgraded under Phase 3 contracts (around 17 percent of the 322,242 contracted). This was factored into the analysis by adjusting down the net costs of Phase 3 in proportion to the share of contracted delivery completed by this stage. This gave a total cost for the Programme of £727m. This does not include administrative costs incurred by BDUK and the Local Bodies in their management of the Programme because these costs were not monitored on a systematic basis.

Table 8.2: Expected net public sector costs (£m, 2019 prices) of delivery to March 2019

Contract phase	Net cost to the public sector, net of clawback (£m present value)	% of contracted premises delivered	Costs included in the analysis
Phase 1	429.8	~100	429.8
Phase 2	280.7	~100	274.3
Phase 3	128.1	17	22.6
Overall	838.6		726.7

Source: Ipsos MORI analysis; CORA; BDUK, all monetary values in 2019 prices.

8.2 Cost per premises upgraded

The cost effectiveness of the Programme can be understood in terms of the public cost per premises upgraded.

8.2.1 Initial expected public sector cost per covered premises

A total of £1.9bn of public sector funding was committed across Phase 1, 2 and 3 contracts with a total of 5.5 million contracted premises passed. This equates to an ex-ante gross public sector cost per premises passed of £342. There was a large degree of variation across the various phases. Phase 1 had the lowest cost per premises passed of £266. Phase 3 had the highest public sector cost per premises at over £1,216. This is driven by the higher share of FTTP build expected in Phase 3 delivery which was expected to come at a higher cost and be more expensive to serve.

Table 8.3: Contracted cost per premises passed by Phase

Phase	Contracted public sector cost ³¹ (£m)	Contracted premises passed	Gross public subsidy per gross premises passed (£)
Phase 1	1,169.1	4,388,618	266
Phase 2	332.6	830,654	400
Phase 3	391.9	322,242	1,216
Overall	1,893.6	5,541,514	342

Source: Ipsos MORI analysis; CORA; BDUK, all monetary values in 2019 prices.

8.2.2 Current expected (actual) public sector cost per covered premises

³¹ In nominal terms, not in present value terms. Taken from CORA management extract

The table below provides estimates of the expected public cost per premises upgraded by March 2019 before and after clawback. Based on delivery and costs incurred by March 2019, unit costs per premises upgraded were expected to fall from £342 to £280 due to underspending on contracts in Phase 1.³² After accounting for actual and potential clawback, the unit cost per premises upgraded would be expected to fall further to £140.

Some of those premises passed to date would have received coverage in the absence of the Superfast Broadband Programme. The table below provides unit costs per additional premises upgraded. This applies estimated additionality at the end of the third year following delivery (to align with the period covered by the OMR process) of 56 percent. This would imply that 3.0m of the 5.3m premises upgraded would not have otherwise received coverage after three years. The unit cost per additional premises upgraded was estimated at £460 before clawback and £250 after clawback.

Table 8.4: Expected gross cost per premises and additional premises upgraded, before and after clawback

	Expected public sector cost by March 2019 (£m)	Premises passed by March 2019	Expected gross public subsidy per gross covered premises (£)	Additional covered premises by March 2019	Expected Gross public subsidy per additional covered premises (£)
Before clawback	1,353	5,268,398	260	2,950,303	460
After clawback	727	5,268,398	140	2,950,303	250

Source: Ipsos MORI analysis; UK Broadband Performance Indicator; BDUK. 2019 prices. Note that cost-effectiveness estimates differ slightly from those presented in the State aid evaluation report. Estimates of overall delivery in the table above are based on the published UK Broadband Performance Indicator and are not broken down by Phase. The focus of the State aid evaluation report was on Phase 3 of the Programme and estimates of unit costs were based on delivery estimates from the C3 reports which implied slightly higher levels of delivery. All monetary values in 2019 prices.

³² Note that expected Phase 3 costs were scaled down to 17 percent of the total to reflect the amount of delivery by March 2019.

8.2.3 Benchmarking

An attempt was made to compare the unit cost per premises upgraded with comparable interventions, though there are few studies that have sought to examine the cost-effectiveness of broadband Programmes in the EU. This may in part be because of a relative lack of public Programmes on the same scale as the Superfast Broadband Programme. However, there are some examples where the expected unit cost of premises passed has been estimated. It should be noted that these are projected public sector costs per gross premises passed, rather than observed costs. The estimated costs are:^{33,34}

- In Austria, the cost per premises passed was approximately £1,900 and £3,600 across two projects.
- In Germany, projects estimated the average of cost per premises passed was between £1,100 and £9,300.
- In Finland, the projected cost per premises passed was estimated to be between £1,300 and £5,800 across three projects.
- In Hungary there are multiple projects, and the average cost per premises passed was estimated to be between £200 and £660
- In Ireland, the estimated cost per premises passed was £4,900.
- In Italy, several projects estimated that the cost per premises passed was between £230 and £330.
- In Portugal, there are several projects and the estimated cost per premises passed was estimated to be between £220 to £810.

These show that in most countries, the average cost per premises upgraded is higher than the cost observed in the Superfast Broadband Programme. This could be due to the approach taken by the Superfast Broadband Programme or the physical factors which affect unit costs – however this could not be assessed from the study reviewed.

A recent study evaluating parts of the Superconnected Cities Programme (SCCP)³⁵ in the UK included a cost-benefit analysis of the Connection Voucher Scheme. This made vouchers up to a value of £3,000 available to small to medium sized businesses (SMEs) to put towards upgrading their internet connection. To be granted, the connection would need to provide at least superfast speeds but was technology agnostic. The study found the average cost of subsidised connections through this Programme was £1,400, although this also varied substantially by technology type (ranging from £1,100 for FTTC connections to £2,800 for Fixed Wireless / Microwave connections). The cost per installation was estimated at £1,400, though each installation led to a further 4.7 additional connections per postcode. This equated to an estimated cost per additional connection of £290. However, this is not directly comparable to the figures above as it focuses on the cost of connections rather than the cost of coverage.

8.3 Cost-Benefit Analysis

A cost-benefit analysis of the Programme was completed in line with the guidance set out in the HM Treasury Green Book. The findings of the analysis are summarised here, and full details are provided in the State aid evaluation report.

³³ European Commission (2020) The role of State aid for the rapid deployment of broadband networks in the EU. Available at: <https://ec.europa.eu/competition/publications/reports/kd0420461enn.pdf>

³⁴ Values converted from € to £ using exchange rates from xe.com

³⁵ Description of project available at: <https://www.gov.uk/government/news/superconnected-cities-scheme-helps-14000-small-businesses>

8.3.1 Productivity gains

It was estimated that the Programme led to an additional £1.1bn in productivity gains by the end of 2018 / 19. This was projected to rise to between £1.6bn and £1.8bn by 2029 / 30.

Table 8.5 – Additional GVA resulting from productivity gains (£m, 2019 prices)

Period	Undiscounted (£m)	Discounted (£m)
Productivity gains 2011 / 12 to 2018 / 19 (£m)	1243.1 – 1245.1	1,078.8 – 1,080.4
Productivity gains 2011 / 12 to 2029 / 30 (£m)	1972.9 – 2275.0	1,609.9 – 1,810.8

Source: Ipsos MORI analysis.

8.3.2 Unemployment impacts

In addition, the Programme was estimated to have resulted in a further £125m in GVA gains by 2019 as result of reducing long-term unemployment. These impacts were projected to rise to between £237m to £306m by 2029 / 30.

Table 8.6 – Additional GVA resulting from reductions in long-term unemployment (£m, 2019 prices)

Period	Undiscounted (£m)	Discounted (£m)
GVA from the reduction in long-term unemployment 2011 / 12 to 2018 / 19 (£m)	144.5 – 144.9	124.9 – 125.2
GVA from the reduction in long-term unemployment 2011 / 12 to 2029 / 30 (£m)	303.5 – 409.9	237.1 – 305.9

Source: Ipsos MORI analysis.

8.3.3 Social benefits

The social benefits of the Programme were valued using the house price gains estimated through the econometric analysis. This 'revealed preference' is considered more robust than the available alternatives as it is based on observed market prices. The present value of social benefits was estimated at between £741m to £1.5bn).

Table 8.7: Land value uplift arising from impacts on house prices (£m, 2019 prices)

Period	Low house price premium	High price premium
Land value uplift (£m, present value)	741.9	1,536.8

Source: Ipsos MORI analysis; CORA; BDUK

8.3.4 Benefit to cost ratios

Drawing on the results above, low and high estimates of the Benefit to Cost Ratio (BCR) associated with the Programme are developed using the estimates of the net cost of the Programme set out in subsection 8.1. This gives a range for the BCR as follows:

- **Benefits from 2012 to 2019:** The short-term BCR (based on benefits to date) is estimated at between £2.7 and £3.8 per £1 of net lifetime public sector costs. This exceeds the hurdle rate of return normally applied in the appraisal of public sector Programmes (of £2 per £1 of net public sector costs) and suggests that the Programme has already delivered a strong rate of return.

- **Benefits from 2012 to 2030:** In the long run (allowing for future economic benefits), the BCR is estimated to rise to £3.6 to £5.1 per £1 of net public sector spending.
- **Sensitivity:** It should also be noted that investment in the Programme can also be justified on the long-term economic benefits alone. Excluding the social benefits inferred from house prices (which are less certain), the BCR is estimated to range from £2.5 to £2.8.

It is important to note that the modelling of the future benefits do not attempt to incorporate the possible effects of COVID-19 or the departure of the UK from the European Union (as the magnitude and direction of these effects are largely unknown at this stage). These events may have a transformative effect on the UK economy and projections of the future benefits of the Programme should therefore be treated as indicative.

Table 8.8: Benefit to Cost Ratios, 2012 to 2019 and 2012 to 2030

	2012 to 2019		2012 to 2030	
	High additionality / house price effects	Low additionality / house price effects	Low additionality / house price effects	High additionality / house price effects
Benefits				
Productivity gains (£m)	1,079	1,080	1,610	1,811
Long-term unemployment (£m)	125	125	237	306
House prices (£m)	742	1,537	742	1,537
Total	1,946	2,742	2,589	3,697
Costs				
Lifetime cost	727	727	727	727
Benefit to cost ratio	2.7	3.8	3.6	5.1

Source: Ipsos MORI analysis; All benefits included are direct benefits of the Superfast Broadband Programme

9. What can be learned to improve future policy design and implementation?

The research undertaken for the evaluation of the Superfast Broadband Programme indicates that the Programme has been successful in achieving its stated outcomes and has been delivered in a cost-effective manner. There are areas of key learning from this Programme which can inform other publicly funded Programmes, and some areas where this Programme could be improved further. This final section sets out the key lessons from the evaluation for future Programme design and implementation.

9.1 Role of subsidies

The central finding of the evaluation is that the faster broader connectivity is socially beneficial. However, there are important market failures that slow down the deployment of those networks even where the investments would be commercially viable. Subsidising network deployment has proven an effective means of accelerating these investments and has significant economic and social benefits that substantially exceed the costs involved.

Alternative delivery models are unlikely to have produced outcomes on a similar scale or offered equivalent value for money. Demand driven mechanisms, including voucher Programmes, have not been able to deliver improved connectivity as efficiently and it is unlikely that they could be used to deliver results of equivalent scale. The Superfast Broadband Programme has also achieved delivered connections at a lower unit cost than most other schemes aiming to support the deployment of faster broadband networks in the EU.

The design of the Superfast Broadband Programme has meant resources have been focused on areas that were the easiest to reach. This has meant that a reasonable share of the premises upgraded would have eventually received broadband coverage at a later stage. Focusing on the hardest to reach premises would have been an alternative approach that could have maximised levels of additionality. However, it is important to note that a large share of the social and economic benefits have been driven by the acceleration of broadband deployment plans and may not have been realised using such an approach.

9.2 Open Market Review process

The OMR process is an important element of the design of the Programme which has helped direct resources to areas that were unlikely to receive improved broadband infrastructure without public subsidies. This should form part of any future subsidy Programme and relationships formed between Local Bodies and network providers will be beneficial in implementing these processes.

However, the evaluation indicates that static snapshots of commercial delivery plans offered by the process can become outdated as network providers respond to changes in demand or regulatory innovation. Additionally, network providers cannot always provide concrete investment plans over long-time horizons.

There may be opportunities to maximise the value for money for the Programme by using the results of the OMR more flexibly in defining areas eligible for subsidies and in structuring project delivery. This could involve attaching probabilities to more speculative future plans revealed by the process and allowing for this when sequencing the delivery of contracts (e.g. by going to areas that may be addressed by speculative plans of other network providers last, giving a greater chance for them to be descope if necessary). Smaller projects of shorter

duration should also minimise the risk that the Open Market Review gets 'overtaken' by external events.

9.3 Clawback mechanisms

The clawback mechanisms employed in the delivery of the Programme are likely to prove effective in protecting the public sector from the risk that subsidies result in network providers earning excess profits (and have been a key contributor to the strong value for money offered by the Programme). However, it is also important to note that clawback payments are recovered over a period of seven years and the public sector will incur opportunity costs by tying up resources in the Programme in the meantime. These opportunity costs will be larger where network providers use the gap funding model to 'de-risk' investments by systematically understating costs and take-up levels.

BDUK may wish to consider whether seeking to contain these opportunity costs in future procurements could be justified. The evidence in this analysis indicates that increased levels of competition in Phase 3 have limited the extent to which network providers can transfer risk to the public sector (as transferring the risk will result in a less competitive tender). Other options could include using the information on the tail end of the distribution of observed take-up rates across Phase 1, 2 and 3 contracts to set a maximum level of subsidy to be offered as part of a given procurement. This may still allow network providers to understate profitability by adjusting revenues via price schedules (though if BDUK are able to monitor revenues earned on connections as well as volumes of customers, this may limit the scope for providers to behave in this way).

9.4 Capacity of the market

The findings of the evaluation suggested that the delivery of Phase 3 contracts has partly been delayed by insufficient capacity amongst network providers to deliver at the scales required by the contracts awarded. This is clearly a risk for any future Programme and will need to be considered carefully.

9.5 Population migration

The findings of the evaluation also highlight that improved broadband infrastructure in rural areas can encourage migration of population and stimulate rural population growth. This process has the potential to produce negative social outcomes by placing additional pressures on public services or disrupting settled patterns of community life. These issues need to be understood in more detail. However, given the centrality of broadband to the government's infrastructure investment plans, broader thought could be given to the implications that may arise from greater decentralisation of population (e.g. in terms of pressure to develop land). Accommodating rural population growth stimulated by improvements in rural broadband connectivity could require actions to be taken by other government departments.

9.6 Key implementation lessons

In addition to the key lessons learned about the design and the impact of the Superfast Broadband Programme, there are some additional lessons that can be drawn from the implementation of the Programme. These implementation lessons are discussed below.

The sources of match funding had an impact upon where the local Superfast Broadband Project was targeted. Where match-funding was sourced from DEFRA or EAFRD, the focus of the project was more likely to be on more rural areas, and where LEP or ERDF match funding was used the project area had to be more focussed on covering businesses. For future publicly funded Programmes, the appropriateness of potential match funding sources should be considered alongside their availability.

Local Bodies described not having produced new business cases for each phase of the Superfast Broadband Programme. This means that the business cases used for the Superfast Broadband Programme may be outdated, in terms of the benefits the business cases claim will be achieved and the scale of these benefits. Additionally, the business cases used did not include any potential disbenefits of enhanced connectivity. For future publicly funded Programmes, new businesses cases should be developed with revised benefits and disbenefits included in the case. The evidence presented in this evaluation should provide some of the evidence required to develop new business cases.

Enhanced communication between Local Bodies and network providers will help to prevent some of the issues faced by Local Bodies within the OMR process, such as rejecting submissions or damaging relationships with network providers. This can be achieved by ensuring that the Local Body engages with providers prior to the OMR process and fully explains the eligibility criteria, and ensures that all providers feel able to provide a response. Additionally, where the Local Body feels they need to reject a submission or part of a submission, communication is required to fully explain the reasons for this to the network provider. This will help to promote positive relationships between Local Bodies and network providers.

There was no evidence that utilising an alternative tendering and / or contracting approach to the one recommended by BDUK had beneficial outcomes for Local Bodies (in terms of the value for money achieved for the project or project delivery). It was reported that the alternative approaches to tendering were more resource intensive than the recommended approach. Therefore, in future publicly funded Programmes Local Bodies should follow the approach recommended by BDUK, and lotting of contracts should be utilised where possible in order to improve cost effectiveness.

There were some reported issues with the timeliness with which change requests were processed. BDUK has been working to develop new approaches to ensure they have processes in place to resolve change requests in a timely manner and this should help to resolve this issue. However, Local Bodies also need to ensure that they have internal processes in place to allow for a rapid response to smaller change requests, and to escalate more difficult change requests to BDUK expediently. This could include mimicking the BDUK system on a smaller scale – logging the change request and date received and ensuring it is addressed within a certain timeframe. This would contribute towards the local contracts being completed to schedule.

The qualitative evidence collected suggests that Local Body and Programme beneficiary activities to promote take-up of superfast broadband connections do lead to an increase in take-up. It is recommended that Local Bodies and Programme beneficiaries undertaking some form of promotion activity in the areas where publicly funded networks are being built to increase take-up in the area and maximise the wider outcomes presented in this report.



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