



Celebrating 25 years of UK internet

Prepared by:

Point Topic Ltd.
Innovation Warehouse
1 East Poultry
London EC1A 9PT

Adroit Economics
31 Finchley Road Hale
Altrincham, Cheshire WA15 9RE

Date: September 2020

Table of Contents

1. INTRODUCTION FROM ISPA	3
2. GENERATIONS OF CHANGE – ROCK WALLS TO DIGITAL WORLDS	5
3. TWENTY-FIVE YEARS OF PROGRESS.....	6
Network Coverage.....	6
Broadband Speeds	7
Subscriber Numbers	9
Cost	11
4. OVERVIEW OF THE ISP SECTOR	13
Infrastructure Providers	13
Service Providers in the Consumer Market.....	14
Service Providers in the Business Market	15
Industry Jobs and Training.....	16
Investment in the Sector	18
Innovation in Ownership Models	20
5. THE BEGINNINGS OF ISPA	21
Founding Principles – What Makes ISPA Unique	22
The ISPAs – Creating the Industry’s Oscars	26
6. CAMPAIGNING AND ADVOCACY FOR THE INDUSTRY	28
The Internet Watch Foundation – an Industry First	31
7. TIMELINES – 1995 TO 2020	32
Policy and Regulation – Setting the Framework	33
ISPA Impact – Campaigning and Advocacy Issues	34
Technology – The Bandwidth Milestones	36
Market and Services – Key Inter-related Offerings	37
8. CHANGING ROLE OF THE ISP	38
From Narrowband to Broadband	38
IPTV Turns ISPs into Entertainers	39
Broadband as Part of a Bundled Offering	40
Security and IT Support	40
A Permanent Revolution	41
Convergence Continues to be Rallying Cry.....	42
The Vital Role of R&D.....	42
9. TRADE AND THE ECONOMY	43
Significance of Increasing Fast Broadband and Business Benefits.....	43
Regional Disparities in Speed Availabilities Widens.....	45
Speed Disparities within the Devolved Nations	46
Faster Speeds for Business and GVA Potential.....	48
Increase in Residential Speeds and Their Impact	49

1. Introduction

As ISPA approached its twenty fifth anniversary, we decided to celebrate this landmark by looking back at the journey the UK's internet has made over the last quarter-century and chart how it became so fundamental to our everyday lives. Little did we know that global events this year would bring into stark focus our reliance on the internet and connectivity, and we are proud of the role our members have played in the UK's response to the pandemic and the role they will play in our recovery.

The UK is a leading digital economy, the twenty-five year+ journey UK ISPs have been on to help this happen has been immense. When ISPA formed in November 1995, John Major was Prime Minister, Blackburn Rovers were Premier League champions and Blur and Oasis were battling it out for the number 1 spot in the charts. A nascent internet industry was starting to enter the public consciousness through the world of dial-up and home PCs, taking the Internet from a largely hobbyist activity to what it has become today. In 1995, only a quarter of households had a PC as Windows 95 launched, yet today nine out of ten of us are online, the average UK household has ten internet-connected devices and one-third of new relationships started on the internet.

Key facts and figures from the research demonstrate the scale of the development, one characterised by rising speeds, reduced costs and increased take up:

- Consumers today can access the internet 200,000 times faster than in the 1990s
- Average downstream bandwidth available to the UK consumer has increased from 5.3Mbps at the end of 2004 to well over **200Mbps** downstream across the UK in 2020
- Median upstream bandwidth has also grown from 0.3Mbps in 2010 to **29Mbps** in 2020
- Bandwidth has increased by 50% (Compound Annual Growth Rate) consistently since 1995
- The total number of broadband subscribers in the UK has doubled since 2007 from 14 million to over **27.2 million** in 2020
- Today you can get a gigabit connection for as little as £30/month and on average across the UK it's £60/month – 6p a megabit
- There were under **50,000 websites in 1995**, today the number is 1.8bn and rising

The growth and development of the UK Internet has not been without its challenges. The last 25 years has seen the dot-com bubble, recession, the rise and consolidation of cable networks, a maturing of the regulatory regime, and huge disruption to many traditional industries, but it has also massive innovation in technology and services as the internet continued its unstoppable rise.

ISPA's 25th anniversary comes at a time when UK ISP sector is currently at a particularly exciting moment. Our members are embarking on a massive infrastructure upgrade, rolling out the next generation of technology and services through gigabit capable broadband, all while preparing to switch off analogue phone lines through the PSTN switch off, and as we enter a new chapter of internet regulation. This infrastructure revolution is happening on a national, regional and local level led by a variety of providers, from large established names to newer independent networks. Industry's plans will be complemented with funding from Government, as it aims to meet its

manifesto commitment of nationwide gigabit broadband by 2025. This huge engineering and technology project will be an essential part of the UK's recovery post-Covid-19.

As we look towards what the next 25 years may hold, some of the immediate questions include: what more can be done by Government to remove barriers to rollout? Is the country prepared to pay more for faster broadband? How many competing networks and ISPs can the market handle? What new technical innovations will ISPs be empowering? Will the economy become wholly digital? How do we ensure we continue to help the digitally excluded?

But for now, this research report and accompanying series of interviews takes us back to the early years through to the present and shows how the UK ISP industry has transformed our lives.

2. Generations of change – rock walls to digital worlds

Communications networks have been at the heart of human society since the start.

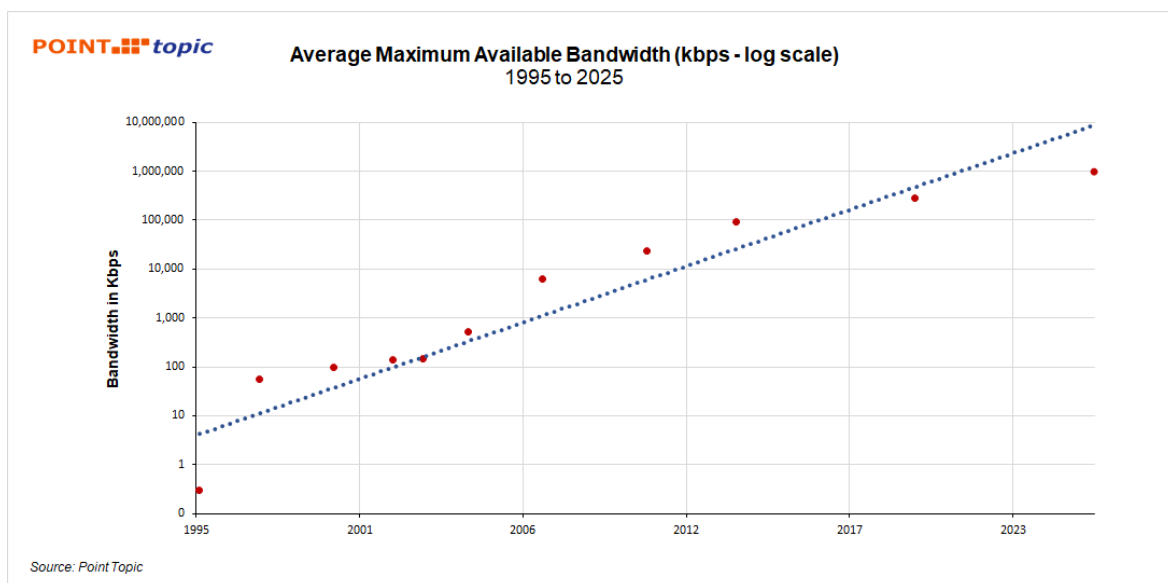
It has been a story of ever-increasing bandwidth. From cave paintings experienced by a select few, through oral histories, writing, printing and libraries and widespread literacy, bringing us to the current generation and our first steps into a digital future.

This change has been accelerating. As the power of networks enables multi-sector exposure to expertise and the interactive development of new ideas and technologies, we are seeing unprecedented levels of invention taking us on some unexpected and often wonderful paths.

The internet we know today has been around in a variety of flavours since the 1950s and by the early 1990s was emerging from the world of defence, research and academia. Today the innovators and builders of the communications infrastructure we all rely on now, and the services provided over it, are represented in the UK by ISPA – the Internet Service Providers’ Association – and this report forms part of the celebration of twenty five years since its inception and the role the association and its members have played in the generation of change.

What we see on our screens is only the surface of the systems, relationships and agreements that form the physical and more intangible networks at the heart of the modern internet. Today’s global communication system is the largest and most complex continuous structure ever built. Its importance and the central role that digital communications play in our lives is only increasing. Networks make it possible for us to do so many things and support us in times of stress, as has been all too apparent in recent months, and they continue to deliver the growing bandwidth that we need.

Figure 1: Bandwidth over time in the UK, 1995 to 2025



3. Twenty-five years of progress

Huge advances have been made in the spread and capacity of communications networks over the past 25 years. We have gathered a number of metrics that illustrate the phenomenal rise of the internet in the UK, namely the expansion of networks, bandwidth availability and how it has increased over time, subscriber numbers and household penetration of broadband, which indicate the rising use of internet services by the UK population, as well as cost per megabit.

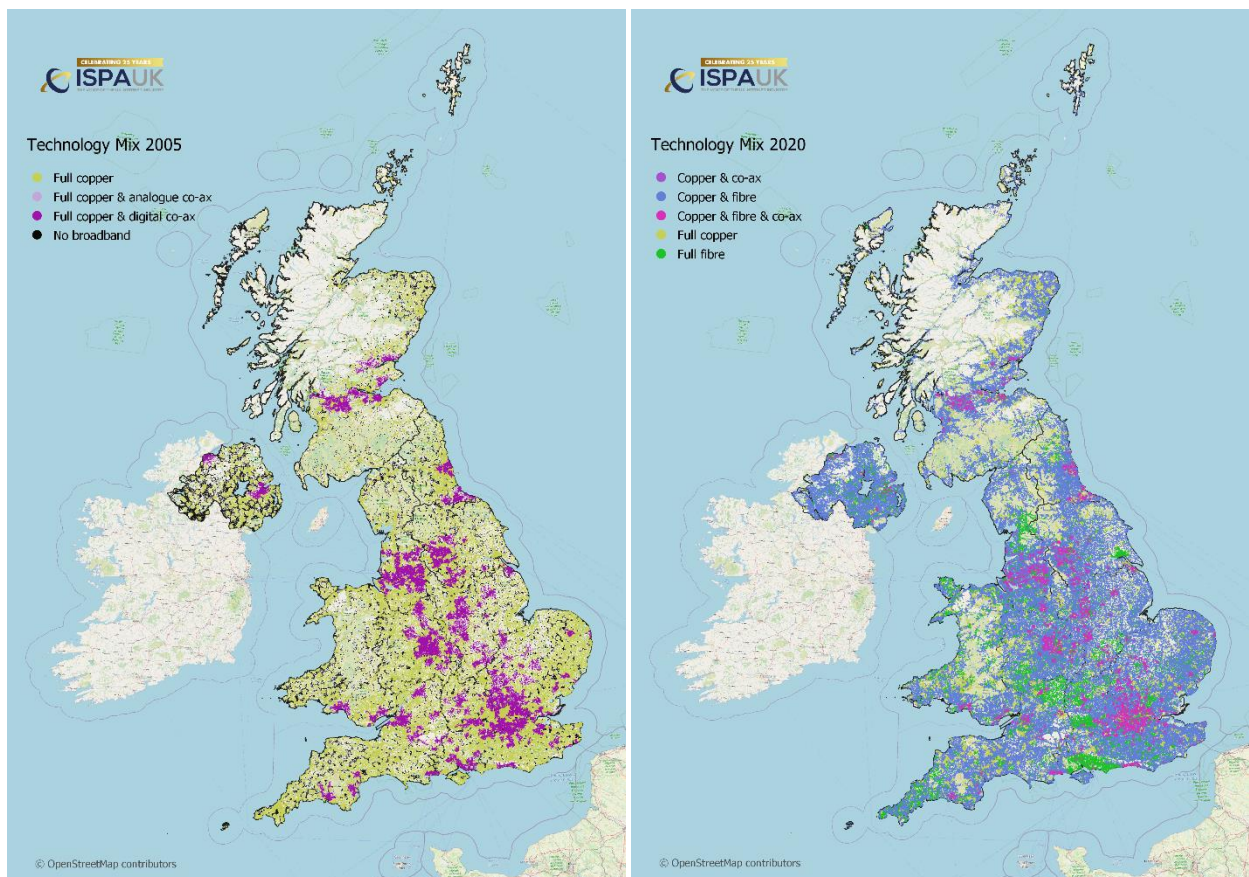
From a handful of networks to multiple choices

Network coverage comprised BT and KCOM as the incumbent operators in 1995 along with a patchwork of cable TV providers. This was infrastructure built for telephone calls and not data. Pipex, the UK's first commercial internet service provider and established in 1990, had been providing dial-up internet access from March 1992. Academic networks such as JANET and private business networks were also in use.

Cable franchises issued since the 1980s had resulted in the deployment of regional networks, of coaxial cabling, built to provide TV services. Permission to operate broadband services was granted from 1985 newly formed Cable Authority. By 1995 consolidation of cable operators had begun with NTL buying up several companies in different parts of the country.

In 2020 there are fixed broadband infrastructure in place from dozens if not 100s of operators including Virgin Media with its predominantly cable network, and around 40 independent network operators as shown in Figure 4. In addition, there are well over 100 fixed wireless access networks located around the country on a local or regional basis.

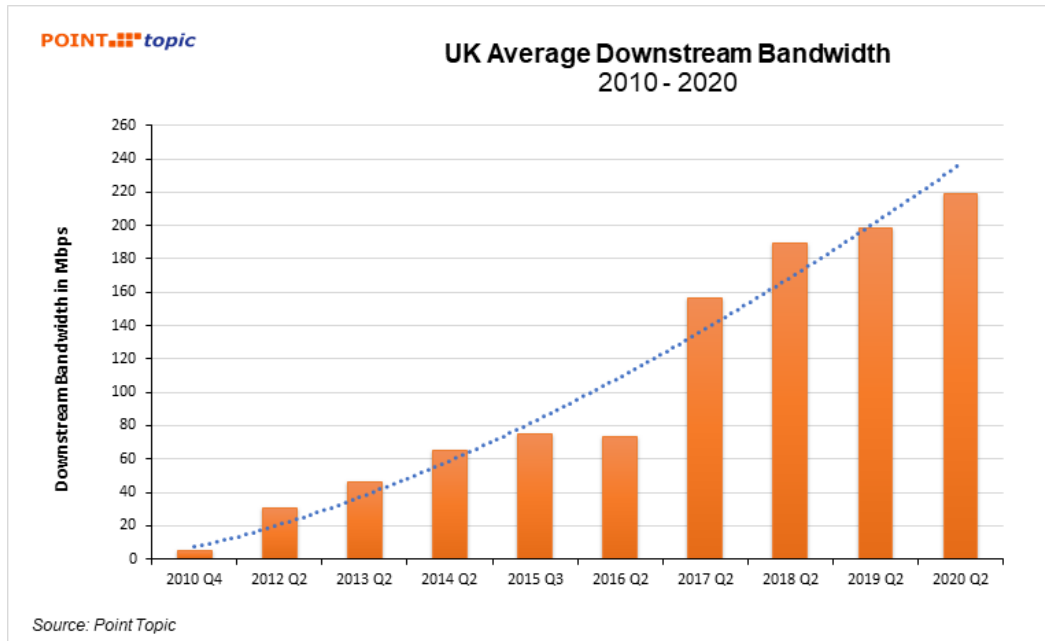
Figure 2: UK network coverage 2005 and 2020



Broadband speeds increase over time

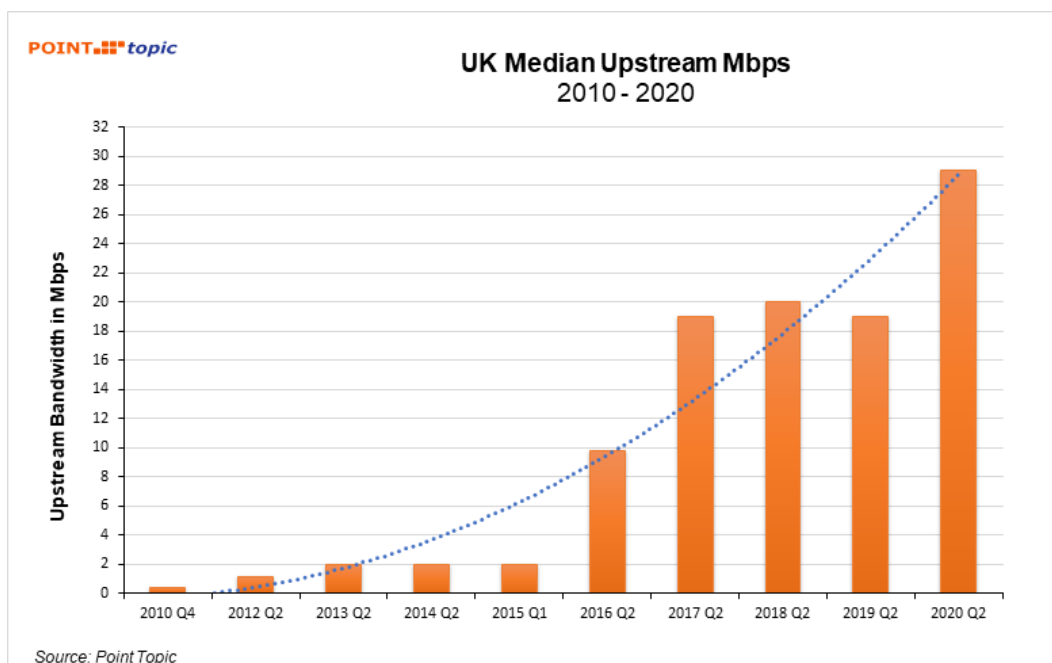
Bandwidth availability in the UK has increased steadily over the past 25 years. Figure 3 illustrates average downstream bandwidth increases over time going from 5.3Mbps at the end of 2004 to well over 200Mbps downstream on average across the UK, in 2020.

Figure 3: Average downstream bandwidth in UK, 2010 to 2020



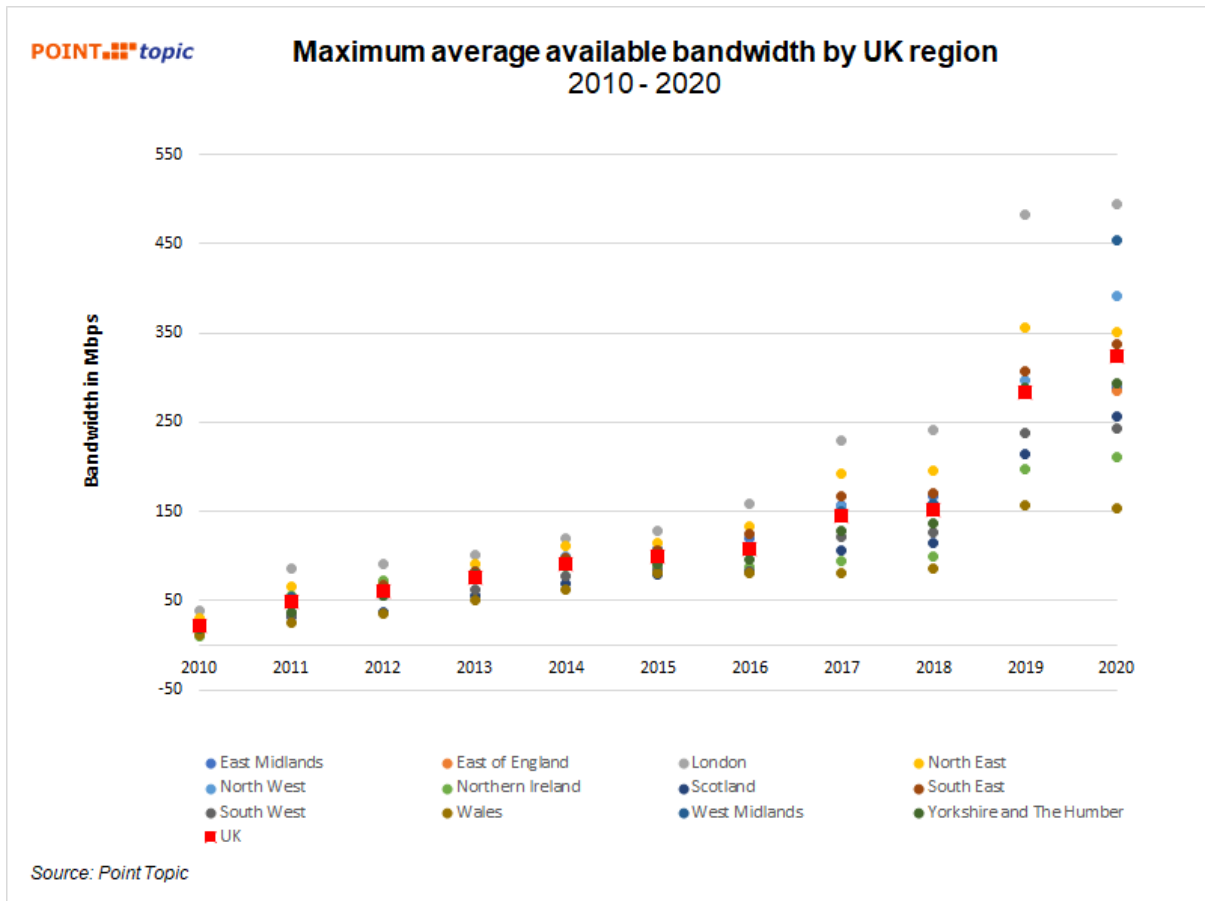
Median upstream bandwidth has also grown from 0.3Mbps in 2010 to 29Mbps in 2020, illustrated in Figure 4.

Figure 4: Median upstream bandwidth in the UK, 2010 to 2020



Looking at the UK by region, we can see the increase in available bandwidth over the years. Figure 5 illustrates the rise from 2010 to 2020. London experienced more than a hundred-fold increase in downstream bandwidth available with a rise from 39Mbps in 2011 to almost 500Mbps in 2020.

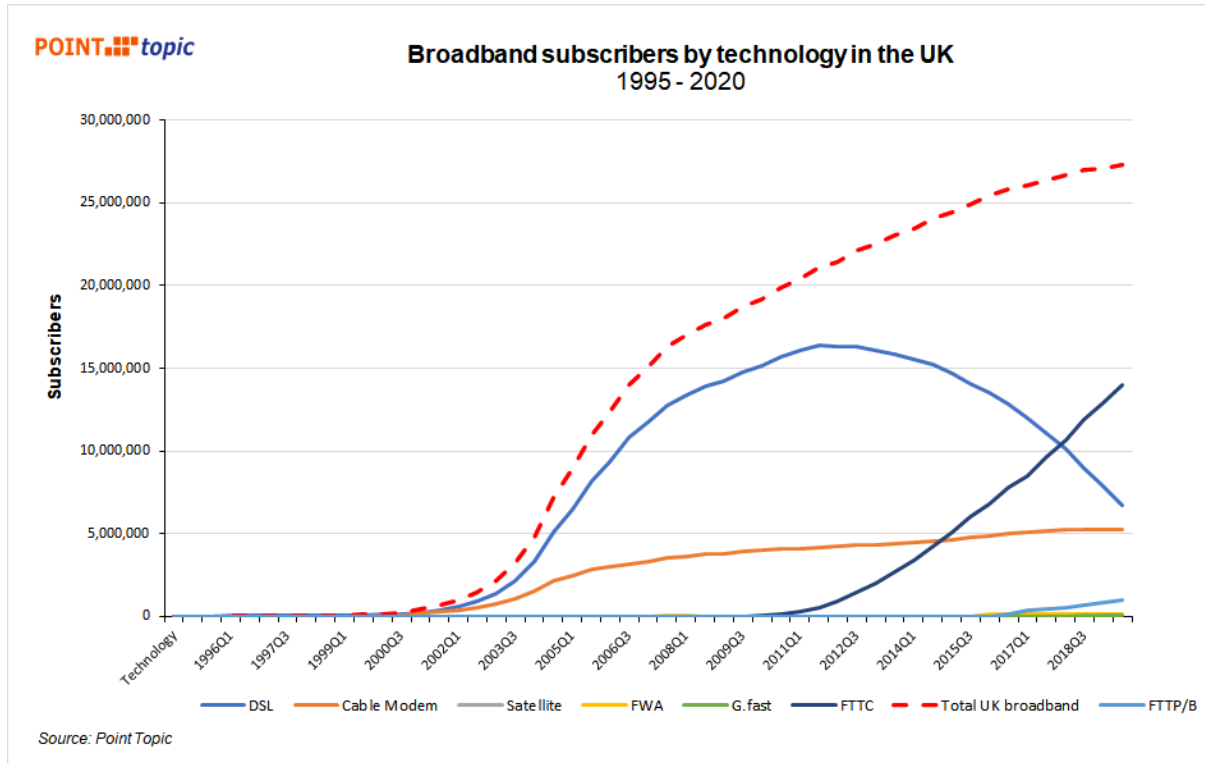
Figure 5: Maximum bandwidth by UK region



Subscriber numbers show rising take up

Broadband lines illustrate the rising take up of internet services in the UK. Figure 6 shows how total broadband customers increased from 14 million in 2007 to over 27.2 million in 2020.

Figure 6: Broadband lines in the UK by technology, 1995 to 2020

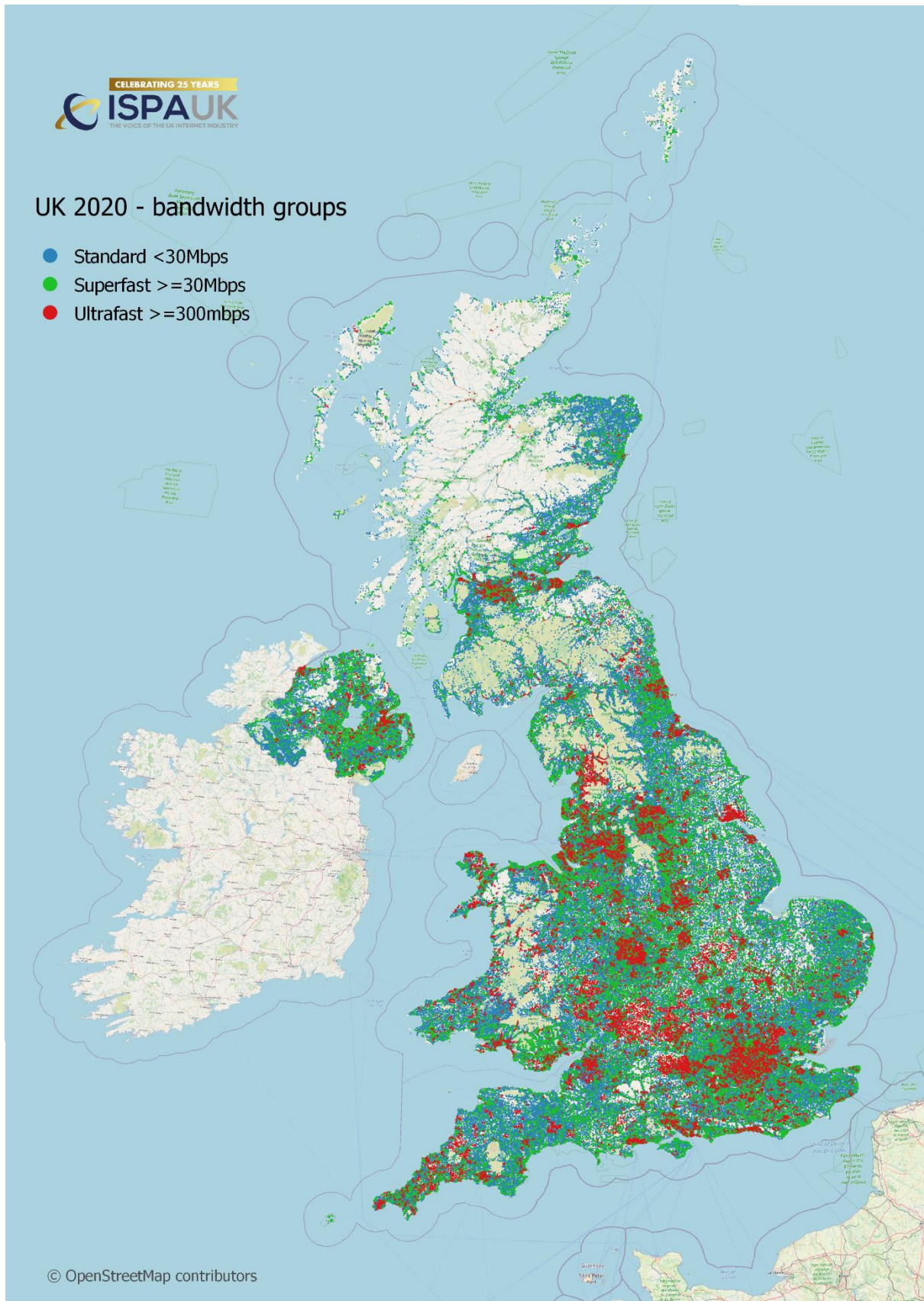


The past 10 years have seen the rise of superfast and ultrafast services, driven by ADSL2+ and Docsis 3.1 technologies. Figure 9 illustrates lines by technology with digital subscriber line (DSL) beginning its decline from 2013 as it is replaced by fibre-to-the-cabinet (FTTC) and now increasingly fibre-to-the-premises (FTTP/H) or fibre-to-the-building (FTTB).

Fibre-to-the-cabinet, fibre-to-the-building and fibre-to-the-premises entered the market in 2011, with lines increasing to nearly 15.09 million in 2020. Meanwhile digital subscriber line technology has seen major decline in recent years, peaking at 16.37 million in 2012, beginning to decline from 2014 to represent 6.73 million broadband lines in 2020. Cable modems have seen a moderate increase over the years to reach 5.28 million in 2020.

Superfast (30Mbps+) and ultrafast (100Mbps+) line numbers jumped over the 20 million mark increasing by an estimated 791,700 in the first three months of 2020 to 20.325 million. This includes lines provided by independent network operators and KCOM, the incumbent in Kingston upon Hull. These lines now represent 74.5 per cent of the UK's total broadband market.

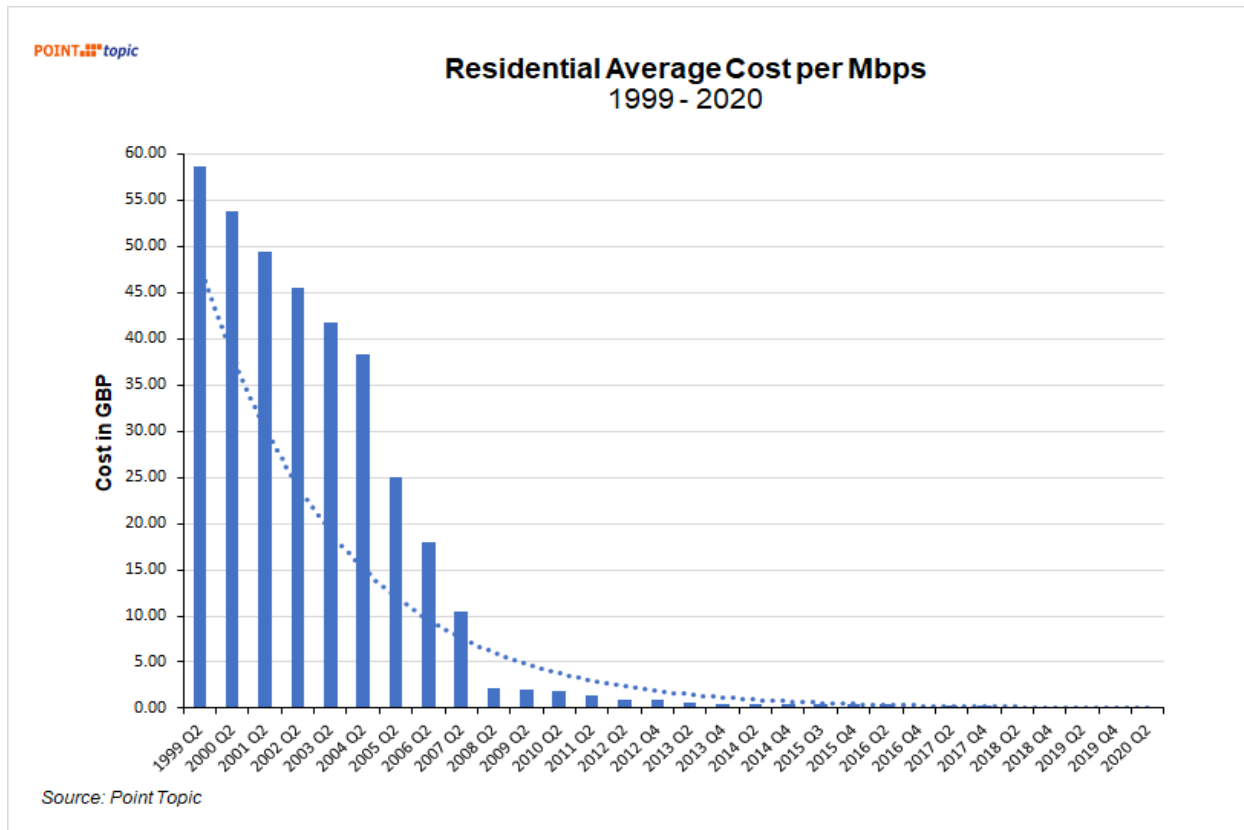
Figure 7: Downstream bandwidth in the UK, 2020



The cost of internet service reduces over time

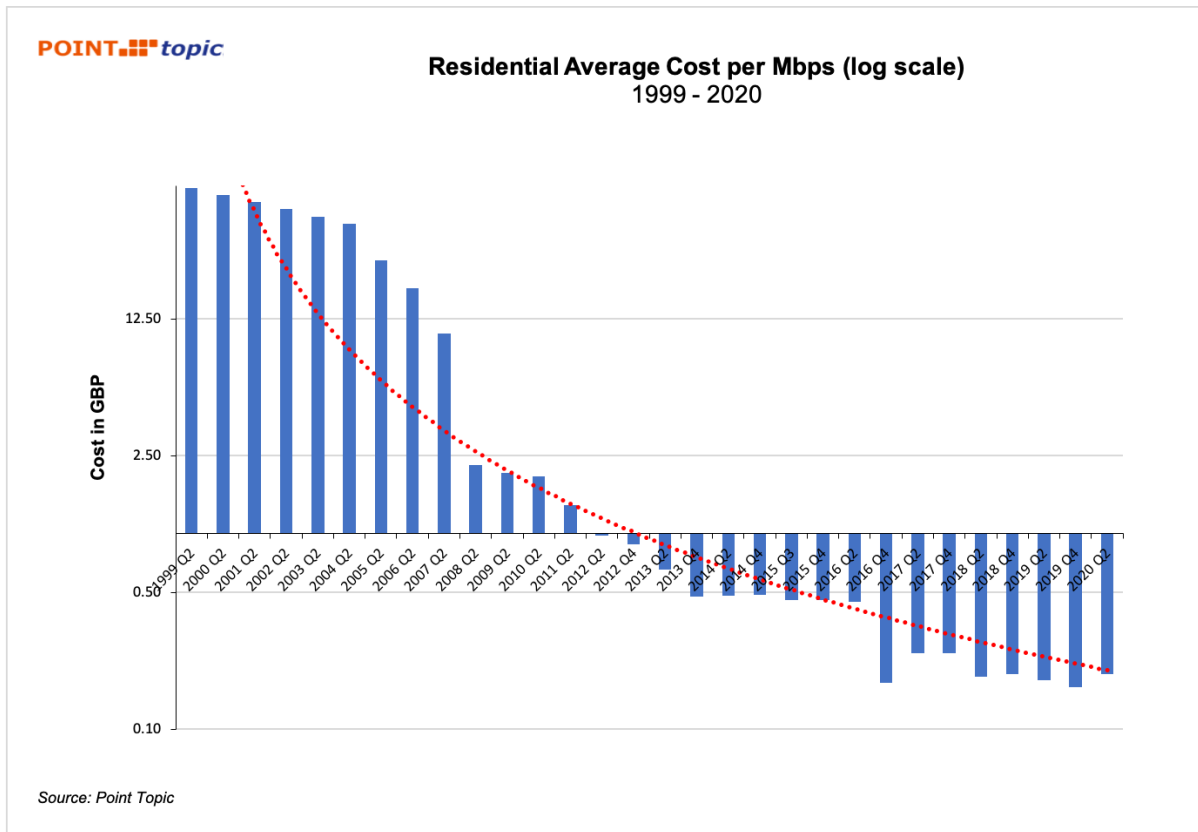
Finally looking at average tariff levels for internet access services offers an indication of affordability, a prime factor in take up rates, as shown in Figure 7, 7a and 7b.

Figure 8a: Average cost per megabit for residential tariffs in the UK, 1999 to 2020



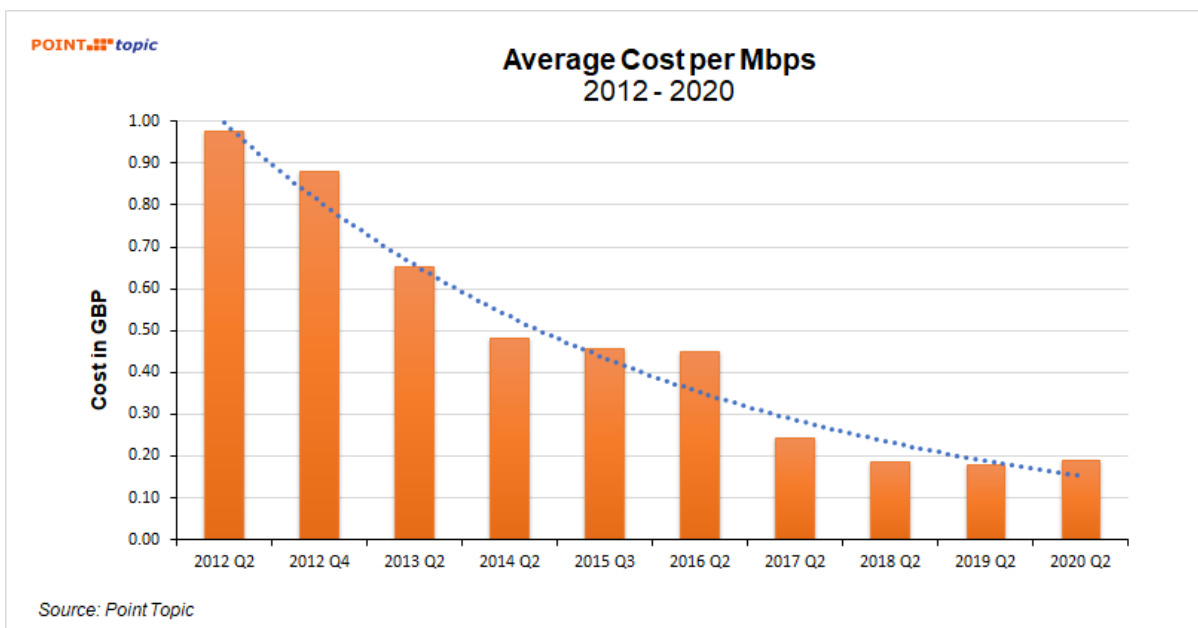
It can be difficult to effectively represent data when the disparities are so large over time. The log scale approach in the first chart in the report can help.

Figure 8b: Average cost per megabit for residential tariffs in the UK, 1999 to 2020 (log scale)



Recent trends are similar although as we can see from the more current data that there is a limit, at least with the bandwidths and technologies we have available today.

Figure 8c: Average cost per megabit for residential tariffs in the UK, 2012 to 2020



4. Overview of the ISP sector

Today the UK has a vibrant market for internet service provision both at the network and the service level. There are over 650 service providers using the Openreach wholesale network, around 50 independent network operators building their own FTTP and FTTB networks to offer services direct and increasingly on a wholesale basis, and approximately 120 fixed wireless access (FWA) players ranging from small community operators to large commercial ISPs.

One of the most direct effects of the sector has been on the UK's economy. Jobs, incomes and new industries have all arrived, and many have flourished as the internet becomes increasingly integrated into our daily lives. The disruptive effects are perhaps even more dramatic with the decline of CDs and DVDs, MP3 players, audio cassettes and VHS tapes, all becoming museum pieces after just a relatively brief appearance in our lives.

Infrastructure providers

BT Group as UK's largest infrastructure player

BT Group's Openreach is the country's largest infrastructure provider in terms of geographic reach. Its superfast network covers 28.42 million homes and business, representing coverage well over 95 per cent of its total network. At the end of March 2020 Openreach had passed over 28.4 million premises with superfast and ultrafast FTTx technology. Gfast technology covered 2.8 million premises and FTTP covered 2.5 million premises, taking its combined ultrafast footprint to over 5.38 by end-March 2020. On 7 May 2020 BT Group announced a rapid acceleration of its FTTP build with a target of 20 million premises passed by the mid- to late-2020s, including a significant build in rural areas. After passing 1.3 million premises last year, it is aiming at over two million in 2020/21, and envisages a maximum build rate of three million premises per year.

Virgin Media as traditional challenger

Cable operator Virgin Media's UK network coverage stood at 14,981,500 at the end of March 2020 on which it had nearly 5.28 million connections. It started upgrading this network to Docsis 3.1 in 2019 to provide gigabit services, and by March 2020 announced this was available 13 per cent of its footprint. The operator is due to extend this upgrade to its entire network by the end of 2021. Meanwhile its Project Lightning network expansion project had reached 2.2 million premises passed by the end of March 2020, using FTTP's RFOG technology rather than Docsis in parts.

Hull's incumbent operator expands

In March 2019 KCOM, the incumbent operator in Kingston upon Hull, announced the completion of its £85 million fibre deployment covering 96 per cent of its addressable area of 200,000 premises. The incumbent in Kingston upon Hull has used predominantly FTTP technology with the remaining four per cent due to use FTTC. In January 2020 KCOM announced plans to invest approximately £100 million in expanding its ultrafast full fibre broadband to thousands of properties across East Yorkshire and North Lincolnshire.

Rise of independent network operators

At the start of 2020, the UK's independent network operators had passed more than 1.2 million premises between them with their fixed broadband infrastructure. An increase of 52 per cent year-on-year. The vast majority uses ultrafast FTTP/H and FTTB technology. Live connections for independent operators stood at an estimated 366,000 at the end of December 2019, up 23 per cent on the previous year. As a sector, independent network operators are aiming to pass 15.7 million premises by end-2025 with fixed ultrafast infrastructure. The following is a selection of independent network operators and the progress they continue to make:

- CityFibre's acquisition of FibreNation has increased its full fibre rollout ambition from five million to up to eight million premises. TalkTalk joins Vodafone as a major wholesale customer, and in March 2020 CityFibre named a further 36 towns and cities where it plans to construct FTTP network.
- Hyperoptic services are now available in over 43 towns and cities and its network passes over 400,000 homes and businesses. It has ambitious growth targets of passing two million homes by 2021 and five million homes by 2024.
- In early April 2020 rural specialist Gigaclear had nearly 110,000 premises ready for service, and the company plans to connect over 300,000 properties within the next three years through a combination of both subsidised BDUK rural broadband programme funds and its own commercial investment. It has announced plans to reach over 350,000 homes and businesses by 2021.

Importance of the WISP community

It is estimated that the total number of premises passed in the UK by WISPs between 2.15 to 2.33 million, and that current around 100,000 premises are connected with speeds ranging from basic broadband at 10Mbps to multi-gigabit commercial services.

Service providers in the consumer market

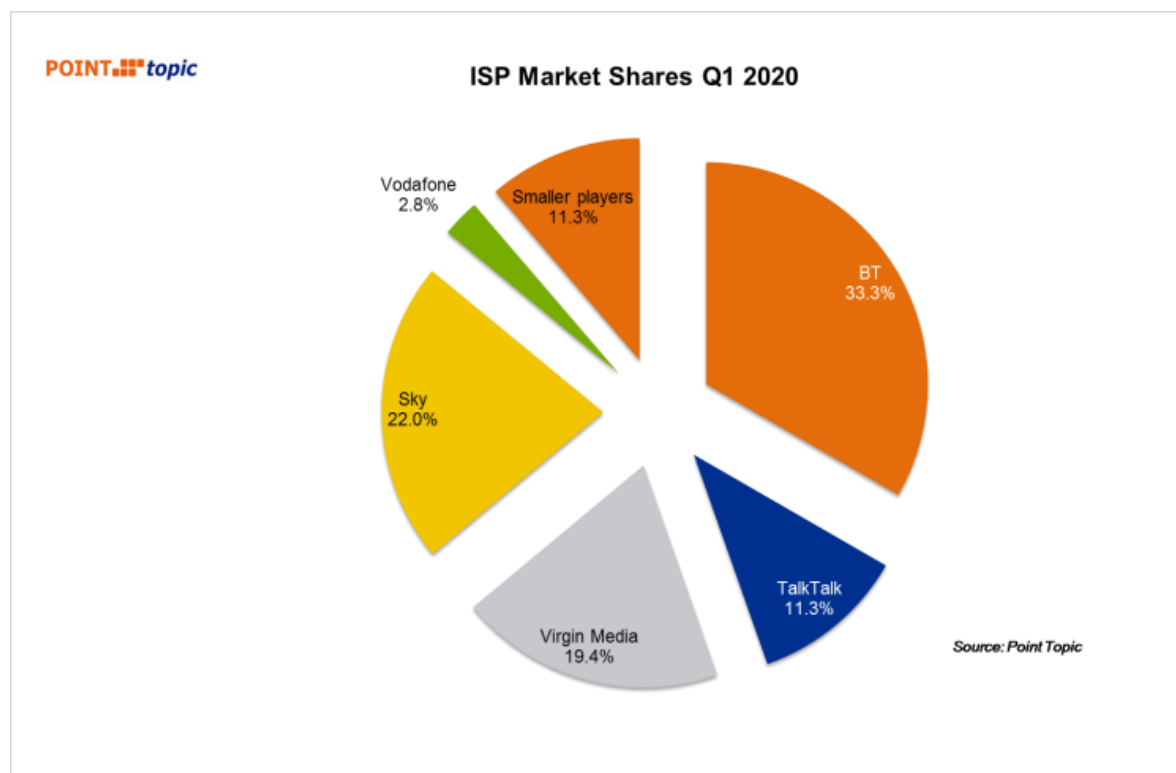
Big brands hold sway in the residential sector

The consumer market is dominated by big brands including BT, Virgin Media, Sky Broadband and TalkTalk. Vodafone is growing its relatively young fixed broadband base. BT's three consumer brands – BT, EE and Plusnet – lead the sector in terms of market share with an estimated 33.3 per cent of the UK broadband market at the end of March 2020. Sky Broadband is the next largest service provider with a 22 per cent share of the sector, followed by Virgin Media with 19.4 per cent, and then TalkTalk with 11.3 per cent. Combined the UK's smaller service providers have an estimated 11.2 per cent of the market, while Vodafone has 2.8 per cent, as shown in Figure 8. This figure is only likely to grow as more and more vertically integrated alternative networks enter the market.

Around half of broadband connections on Openreach's FTTx network are now supplied by providers other than those within BT Group – namely BT, EE and Plusnet. Resale high speed lines on the Openreach network provided by players other than BT are estimated to be 7.2 million at the end of

March 2020, representing over 49 per cent of the total 14.624 million superfast and ultrafast Openreach connections.

Figure 9: Market share of UK service providers, Q1 2020



Service providers in the business market

Large range of ISPs and resellers

The business sector is a far more fragmented market with a vibrant range of ISPs and resellers. While it is difficult to put a precise figure on the number of service providers. One approach is to count the number offering the Gigabit Broadband Voucher Scheme to business customers which in early 2020 came to over 470 suppliers.

The two big network owners, BT Group and Virgin Media, continue to compete on speed but are moving into increasingly sophisticated products and services which link to digital working and transformation programmes. Hosted voice and cloud are becoming “normal” products for these companies, and the goal posts are being moved towards business applications, and even artificial intelligence.

Virgin Media Business has a history of attacking the start-up and entrepreneur market in its marketing, primarily through its Voom campaign which includes its annual Voom Pitch competition supplemented by its Voom Tour. Recent years have seen growth both in customer numbers and revenues from the SOHO and SME sector.

Having built its brand and reputation on being a value for money provider with a disruptive approach to the market, TalkTalk Business has been promoting experience and longevity (including its days as Opal Telecom).

Other players such as Daisy SMB and Zen Internet have traditionally positioned themselves as advanced IT connectivity providers. Both have moved to more advanced offerings. Zen Internet continues to see strong growth in cloud services and VoIP; Daisy is using Microsoft Azure.

At the lower price end of the market, Unicom and XLN Telecom, both had ambitions to expand their range of services. XLN Telecom has delivered on this by adding energy to its portfolio, while Unicom has added water supply in Scotland with plans to do the same in England, as well as insurance through a sister company to its product range.

All these operators continue to make the UK a leading and advanced digital economy and enable an ecosystem of talent and development that help the UK maintain its position as a digital global leader. The investment in and realisation of their networks has contributed thousands of jobs and billions of pounds to the UK.

Industry jobs and training

Higher growth for the number of telecoms-related companies

There were 6,000 enterprises in the UK telecoms sector by 2009. This grew to 7,700 in 2014, up by 28.3 per cent. By comparison, the number of enterprises in general across the UK economy grew by just 10 per cent over the same period. Telecoms accounted for 0.4 per cent of the total number of firms in the UK in 2014. Of those 7,700 firms, 89.1 per cent were micro businesses with fewer than 10 employees, and 99.3 per cent were SMEs with fewer than 250 employees.

Telecom jobs increase over time

Telecoms sector employees totalled 176,000 in 2016, up from 174,000 in 2011, an increase of 1.6 per cent. The workforce is relatively decentralised from London, with just over 19 per cent of those employed in telecoms being based in the capital. There are clusters of jobs in the North West, where 8,000 people are employed in telecoms, and the South West, where there are 17,000¹. [Update with latest figures].

The sector employs personnel in variety of roles, from research and development, engineering and civils work, through service design, project management, marketing and communications, to accounting, legal, and regulatory work, and increasingly data analytics.

Training in the sector by operators and colleges

City & Guilds run an internationally recognised Telecommunications Systems set of qualifications, and several players provide their own training, graduate and apprenticeship programmes. This

¹ <https://www.parliament.uk/documents/commons-committees/Exiting-the-European-Union/17-19/Sectoral%20Analyses/37-Telecommunications-Report.pdf>

includes long established companies such as BT Group through Openreach, which has been ramping up its training programmes. For example, Openreach announced on 16 September 2019 that it is investing £1.7 million in a new fibre training centre in Bolton. The facility is part of a wider plan to educate the next generation of digital engineers for the North West and beyond. Around 2,500 new and existing Openreach engineers are expected to train at the centre during the coming year.

Training is also being carried out by the generation of newer operators such as Zzoomm which has a partnership with Hexatronic for the supply of parts along with an engineering support and training packages, and CityFibre, which teamed up with Kirkstall Forge, Leeds College, and O'Connor Utilities (OCU) in December 2019 to support young apprentices through a 12-week fibre installation training scheme.

Growing role for service providers in digital skills

ISPs are also active in the area of digital skills training. Hyperoptic for instance, launched its first Digital Skills Academy for local people in Southwark in June 2019. The initiative enables volunteer champions to be given free training and support to help develop the digital skills of other residents in the borough. Meanwhile Community Fibre delivers digital skills training to residents of the housing associations it works with.

Investment into the sector

ISPs including BT Group, Virgin Media, KCOM, CityFibre, Hyperoptic and Gigaclear have already invested heavily in upgrading and deploying new infrastructure. Unlike some other sectors, broadband is primarily funded by the private sector. Tens of billions of pounds have already been announced with the promise of more to come.

BT and Virgin Media invest countrywide

In May 2020 BT Group announced it had set a new target to invest around £12 billion to build full fibre broadband for 20 million premises across the UK, including rural areas, by the mid- to late-2020s. Virgin Media with the backing of Liberty Global, says its Project Lightning is the single biggest private investment in the UK and Ireland's digital infrastructure in more than a decade at £3 billion although as the shift to infrastructure competition and consumers are demanding more bandwidth there is plenty more money in today's market.

Growing investment from the independent sector

Interest and commitment remain strong in the independent network sector, with financial-related announcements totalling £936 million during 2019 and early 2020. This is in addition to an estimated £5.7 billion of private investment-related announcements already made in relation to the sector, bringing the total to £6.6 billion.

CityFibre joined Sky and TalkTalk in a co-investment model in York, and more recently purchased FibreNation for £200 million from TalkTalk. In 2018 it announced a £2.5 billion investment programme to connect five million homes to full fibre. In March 2020 CityFibre said it would be increasing its coverage to nearly eight million premises, supported by an investment project of up to £4 billion.

And new infrastructure players, many of whom are vertically integrated, continue to enter the UK internet sector with full fibre provision. These include Zzoomm, Lightning Fibre, tooB, VXFiber and British Fibre Networks. Established independent network operators including Hyperoptic, Community Fibre, ITS Technology, Broadband for the Rural North (B4RN), and Nextgenaccess continue to raise funds and expand their footprints.

Government steps in to invest and stimulate investment

There have been other forms of investment coming into the sector. The UK Government has provided multiple forms of public funding since 2010, as shown in Figure 9.

Figure 10: UK Government broadband funding announcements

Date announced	Announcement details
20 October 2010	Government Spending Review announces £530 million in BDUK funding. The UK Government launched the Broadband Delivery UK (BDUK) programme – £1.7 billion in public funding to complement private sector investment in the deployment of superfast broadband services with the aim to reach 95 per cent of premises by the end of 2017.
10 March 2011	Rural Community Broadband Fund worth up to £20 million, designed to allow rural communities to apply for help with small scale broadband projects. Delivered as part of the Rural Development Programme for England, it is jointly funded by DEFRA and BDUK.
3 October 2011	Mobile Infrastructure Project (MIP) with funding of £150 million to improve the quality of mobile services for the 5-10% of consumers and businesses in areas of the country where existing mobile coverage is poor or non-existent.
29 November 2011	£5 billion of spending on infrastructure projects such as roads, railways and broadband networks.
20 December 2011	Urban Broadband Fund for ‘super-connected’ cities provides £100 million in funding for creating up to 10 ‘super-connected’ cities with 80 to 100Mbps broadband and city-wide high-speed mobile connectivity.
21 March 2012	An extra £50 million comes into the Urban Broadband Fund to bring ultra-fast broadband to more UK cities.
8 August 2012	The £300 million Additional Funding Allocation comes closer as the BBC Trust signs an agreement with DCMS to pay £150 million of licence fee income a year for two years to fund broadband rollout to rural areas.
18 March 2015	The digital communications infrastructure strategy allows access to funding from a number of pots via the NIC and SIP. Projects like LFFN are funded as well with over £100 million across all projects.
1 October 2019	£5 billion to deploy gigabit-capable broadband to the most remote 20 per cent of locations by 2025 according to an “outside-in” approach.

Funding from European Union sources

The UK’s smaller fixed network providers have successfully sought investment from the European Union. In January 2016, Gigaclear secured £18 million committed debt facility from the European Investment Bank’s (EIB’s) InnovFin – EU Finance for Innovators’ MidCap Growth Finance scheme to support rollout of their fibre network and on 19 July 2016, Hyperoptic announced a £21 million investment from the EIB in their fibre network.

This is in addition to match funding by local authorities in the BDUK programme, and goes back to the early days of broadband, when the ERDF helped fund the Superfast Cornwall project supporting various rural broadband rollout schemes.

Variety of investment models

Investment in the sector has seen a range of different models used. CityFibre's innovative anchor tenancy model has been central to the operator's expansion. CityFibre builds, owns and operates an open-access fibre network without requiring ownership participation by the incumbent or service providers. Instead long-term commitments are obtained through contractual arrangements with CityFibre and its customers, or anchor tenants. These in turn trigger the release of funds by institutional investors.

The Enterprise Investment Scheme (EIS) was important for several community-based projects. Broadway Partners for example, launched its Rural Broadband EIS Fund in December 2012, established in partnership with Enterprise Private Equity, to provide investors with the chance to access a spread of tax efficient investments in businesses providing superfast broadband services to rural communities, principally via fibre optic cabling.

Crowdfunding has been an additional part of fundraising. FundTheGap, an online equity fundraising platform for UK start-ups and smaller businesses enabled investors to support a local business or someone they know. B4RN was successful in raising more than 100 per cent of its £3 million bond offer through crowdfunding promoted by Triodos Bank. The final figure was £3.3 million.

Innovation in ownership models

The UK market has also seen innovation in ownership models, some more successful than others. The majority of operators are commercial entities, both publicly and privately owned such as BT Group and CityFibre respectively.

Some UK community groups flourish

There are community groups, often owned by the residents they were set up to serve with Broadband for the Rural North (B4RN) being the most well-known. It is notable that B4RN and Balquhider Broadband both feature in the European Commission's Broadband Handbook showcasing the success factors and good practices for rural policy makers and broadband project managers who wish to roll out high-speed networks in rural or remote territories.

Cooperative models have also appeared where partners leverage the assets they have and produce a shared outcome that delivers services.

Local authority-owned initiatives

There have also been local authority-owned infrastructure initiatives. Digital Region in South Yorkshire was set up to serve 546,000 homes and 40,000 businesses but unfortunately closed in 2014. In addition, NYNet serve the public sector in North Yorkshire, while Shetland Telecom was established by the Shetland Islands Council to provide a wholesale fibre optic network across the Islands. More recently Colchester City Council's commercial arm owns a full fibre network in the city centre and is building a new dark fibre network.

5. The beginnings of ISPA

ISPA itself began as a concept in August 1995 and was discussed by a handful of industry executives who had met for a purchasing consortium meeting. Following a small gathering at a coffee shop in the Pantiles in Tunbridge Wells, ISPA was created with founding members and a Chair.

These founding members came from a handful of what were commonly referred to at the time as “information superhighway companies” and had the aim of establishing a “voice” for the fledging business of commercial internet service provision. Run by individuals who were entrepreneurial pioneers and often immersed in the deep end of technology, the founders went on to set up a Secretariat based in Gayfere Street in Westminster run by Nick Lansman, the founder of public affairs consultancy, Political Intelligence, that continues to support ISPA to this day.

An Extraordinary General Meeting was held at Sun Computers in London in November 1995 with some 26 companies represented, and 34 people in attendance. Of the companies present, 24 agreed to become founder members of the association. On 6 February 1996, ISPA was incorporated and the Memorandum and Articles of Association clearly defined ISPA’s aims and objectives with a Code of Practice that set the precedent for a self-regulatory approach to the sector.

There was already a process of discussion as to what the internet could be used for and a growing concern about regulation, and that the internet would be treated in the same way as telecoms or be set within some rigid framework that would stifle innovation. There was a growing need to educate Parliamentarians and policy makers, to explain the sector and its various components, and to promote and defend the interests of emerging players in this market.

“We were lots of small players relative to BT, IBM, Mercury and the like, and we needed to combine our voices to get a fair crack of the whip... As smaller operators we weren’t going to be heard but as a group we stood a chance.” – Peter Dawe OBE, ISPA founding member, and founder of Pipex, the Internet Watch Foundation and LINX

“There was a lot of bad press about the internet at the time and there was really no voice of response, so at the end of that purchasing consortium meeting we raised the question that we needed some way of coming back on this.” – Shez Hamill, ISPA co-founder and first ISPA Chair until December 1997

Founding principles – what makes ISPA unique

ISPA adopts a collegial approach

The founding member organisations were surprisingly dispersed with only four companies operating out of London as shown in Figure 2. The organisation grew quickly and by September 1996 ISPA had 60 members made up of access providers, internet cafes and other enterprises associated with the internet. Today ISPA has over 200 members, covering the full breadth of the market.

But a couple of key players were missing – BT and Demon, which as incumbent operator and leading internet service provider, were clear gaps. Both were persuaded to join, with BT becoming instrumental in drawing up ISPA’s Code of Practice. This heralded a key strength of ISPA – the ability to bring organisations together that may not agree on everything, in order to work on the issues, they did agree on.

“I really liked the collegial way of working. We were all competitors, all with very different approaches – AOL was big and American, Demon was smaller and more libertarian than AOL – but it was very collegial and good at putting heads together in a non-confrontational way. From a policy point of view, it was always better to have a united voice as an industry.” – Camille de Stempel, joined AOL in 1995 becoming director of security and network policy in 1998

Figure 11: ISPA members 1995 and 2020



ISPA's role in educating politicians

One of ISPA's first initiatives was to set up teaching sessions bringing computers into Parliament, during which MPs were introduced to the internet often for the very first time. ISPA's Parliamentary Advisory Forum also organised annual lunches and dinners at the Houses of Parliament which brought MPs together with ISPA members who could explain how the internet worked and what it could be used for.

ISPA has always sought to demonstrate how the internet industry is comprised of different players from ISPs, OTT providers, platforms, data centres to cyberlockers, all with very different roles in the ecosystem. This means they cannot all be treated in the same way – an ISP and a website have very different relationships with online content, an approach policymakers follow to this day.

The impact of international regulation on the internet was becoming increasingly clear, particularly in terms of the role of the European Union, Nick Lansman, ISPA UK's Secretary General, who had previously worked in telecoms policy in Brussels set up EuroISPA in 1997, the European federation of Internet Services Providers' Associations to represent the European ISP industry on EU policy and legislative issues and to facilitate the exchange of best practices between national ISP associations. Indeed, several of ISPA's principles in its Code of Practice were taken on board by EU officials.

“Because they [the politicians] really did not know a lot about this industry... They needed to hear both sides of story...As a result, we were met with an open door by everybody.” – Clare Gilbert Laurent, early ISPA member and head of legal and regulatory departments of AOL Europe

“There was the ability for the team to get in front of the important people... and represent the industry as a whole ... the big and smaller providers... to represent everybody's rights and to represent that to the parliamentarians and particular sector groups.” – Mark Gracey, ISPA Chair from 2012, was executive with Demon Internet and THUS

ISPA's Code of Practice sets out the self-regulatory principle

ISPA has always been a key influencer in promoting changing business models to traditional industries as the internet became more prevalent, from education and schools, the travel industry and booking holidays online, to working with the advertising industry.

But the centrepiece for ISPA in the early years was its Code of Practice, which was subsequently copied by trade associations in other countries. The Code presented the view that ISPs are mere conduits for information; that they were not to become judge and jury for consumer-created content; and could not be held responsible for the content carried over their networks. This led to the debate about who or what that authority should be – the police, a judge, some other body.

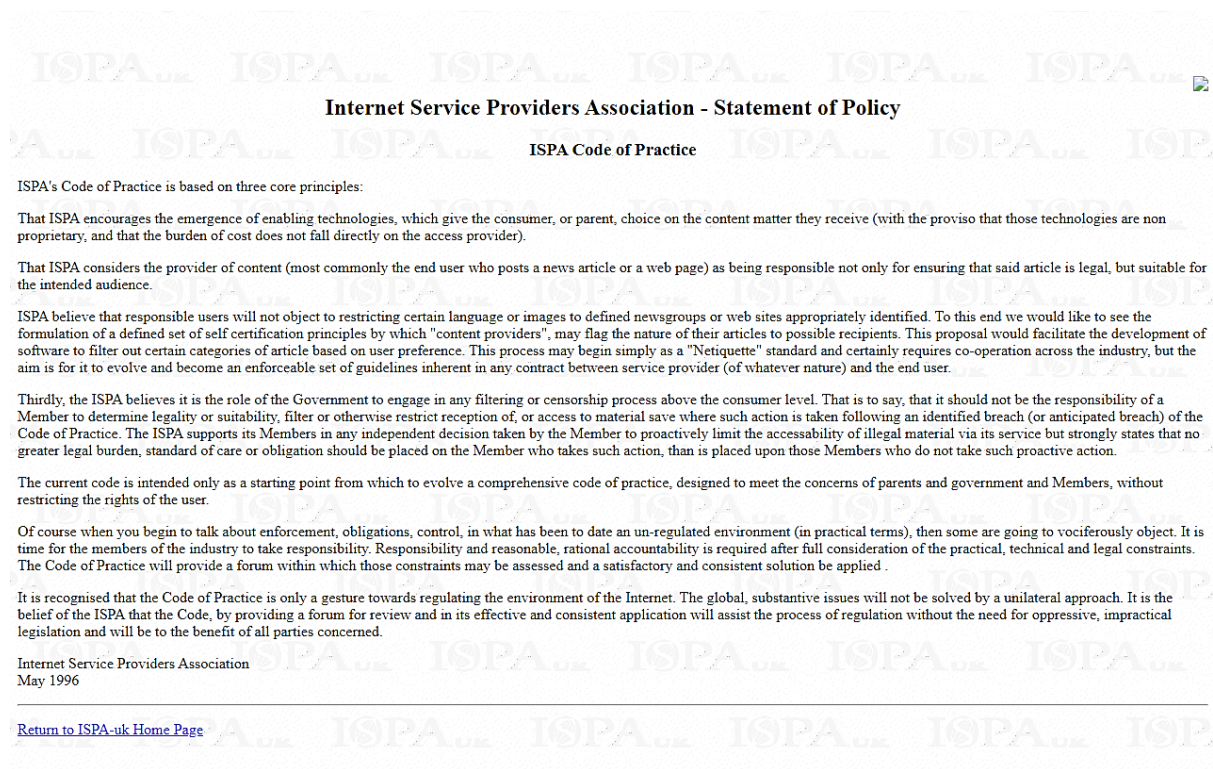
ISPA's view is that the best approach is to educate, especially as the internet matures, and to ensure that any regulation is proportionate and targeted at the right part of the Internet ecosystem. Self-regulation was and remains at the centre of the Code, shown in Figure 3, and set the scene for a number of battles with both with policy makers and the legal system in the years to come, in turn shaping the UK and international internet industry. While the Code has in many ways been superseded by regulations, guidelines and agreements, its founding principles endure.

“We very quickly set out a code of conduct for ISPA to gradually turn the press around, to try to create a stable environment for investment. It’s quite easy in hindsight to forget all the risks those early entrepreneurs took with their energy, their capital, getting into this new technology when nobody really knew what was going to happen with it. So we wanted to try to get the industry to grow up a bit and to show that this was going to change the UK economy.” – Shez Hamill

“We devised a code of conduct that all ISPA members would sign up to and comply with and I think that was a big mark in the sand for ISPA as a self-regulatory industry body... There was a lot of clamour at that stage to change the law so there was more responsibility on ISPs for everything.” – Clare Gilbert Laurent

“ISPA provided a lot of education which helped shape policy, stopping ineffectual legislation to be established... It was also very good at promoting self-regulation, so we were quite nimble and could adapt if needed, whereas if regulation had been strict it could just have stifled the business” – Camille de Stempel

Figure 11: ISPA’s Statement of Policy notice on its website in May 1996



ISPA's celebration of the UK internet industry

Another important element of ISPA's work continues to be its celebration and promotion of what was a fledging commercial industry, and the companies and individuals who continue to make a significant contribution to the sector.

In 1999 the first ISPA Awards took place, covered by the BBC and held at the Café Royal. This was a black-tie event at a smart venue, with a Government Minister speaking, which as all very unusual at the time. The BBC dubbed it the 'ISP Oscars'. Over the years the format and categories have varied, with Heroes and Villains some years, and Personalities and Executives others, but the underlying format remains the same – an acknowledgement of talent and hard work.

Annual conferences, the Parliamentary Conference series, as well as workshops and sub-committees focusing on specific industry issues, also continue to be a key feature of ISPA's work.

“With the ISPA Awards, that’s a really strong voice because it brings out the best in competition; it brings out the best in industry; it continues to create a vision for continued innovation. So, I think the ISPA awards are a great achievement because of the reputation they have built. It is an industry award but it’s one that the overall market looks to as well.” – Dana Tobak CBE, CEO & MD of Hyperoptic

The ISPAs – creating the industry's Oscars

The ISPA Awards began in 1999, judged independently by a panel of industry professionals with technical testing for ISP categories ensuring that only the top performing providers are shortlisted.

Categories and winners from 1999

- Best ISP E Commerce Service: Netbanx
- Best ISP Product: Zycom
- Best ISP Web site: Which on-line
- Best Consumer Customer Service: Internet ONE
- Best Business Customer Service: UUNET
- Most Useful Software: Microsoft's IE
- Best New Platform: iMac
- Best Hardware Supplier: Compaq
- Most Innovative New Product: Telinco's VPOP
- Best Software Supplier: Macromedia
- Best Service Supplier: BTNET
- Best European: ISP EasyNet
- Best Business ISP: Planet On-line
- Best Consumer ISP: Freeserve
- Personality of the Year: Peter Wilkinson



Categories and winners from 2019

- Business ISP: Hyperoptic
- Consumer ISP: KCOM
- Partnership: EXA, Commendation: Wifinity
- Infrastructure Provider: Openreach
- Commendation: CityFibre
- Customer Solution: BT
- Best Hosting: Storm Internet
- Customer Service: Hyperoptic
- Cyber security: RM Education
- VOIP: Voipfone
- Executive of the year: Jenny Davies – M247
- Rural ISP: Truespeed
- PR Campaign: IWF
- Internet Hero: Andrew Ferguson, Editor of thinkbroadband



“The ISPAs do bring a focus each year into how can we do things better and who is doing things better than each other... I think has been a positive force within the internet industry and I am quietly proud of my contribution to ISPA over many years. It’s been good to be involved.” – Matthew Hare, ISPA Awards instigator and CEO of Zzoomm

“If you look back and see the categories and the winners, you see how much it’s come on during that period of time and it demonstrates not only ISPA’s influence but generally the industry’s overall. So in 2005 for example the best consumer award went to Blueyonder for a 4Mbit/s service and there was still a category for best unmetered dial up. Can we even imagine a world in which there is still dial-up.” – Dana Tobak

“The ISPA Awards celebrate the wider picture and portfolio and do not just focus on the big players... they are great for the industry,” – Mark Gracey

6. Campaigning and advocacy for the industry

ISPA has always been a campaigning organisation. For much of its first 25 years this has been about ensuring action to tackle harmful or illegal content is proportionate, effective and aimed at the appropriate part of the Internet ecosystem. As internet adoption increased so too the calls to regulate.

1995 to 1997 Content on the internet, and pornography in particular

- Pornography and the availability of illegal content on the internet was an early concern during 1995 to 1997. This included the infamous letter sent by Superintendent Stephen French of the Metropolitan Police's Club and Vice Unit to ISPA instructing ISPs to remove a list of mainly news groups from the internet, which the letter said contained illegal pornographic material.
- This resulted in a stand by various ISPs and individuals, leading to the formation of cyber-rights.org and eventually ISPA helping set up the Internet Watch Foundation, viewed as one of the world's most successful tools to combat child sexual abuse material online content and to help protect children by removing child sexual abuse material from the internet.

Liability and role of ISPs becomes clearer

- The law and policymakers began to grapple with who should have responsibility for content and speech hosted online, a discussion still raging to this day. An early legal case from 2001 saw academic Laurence Godfrey take Demon Internet, an ISP, to court for failure to remove defamatory comments on an internet discussion board it hosted.
- Demon challenged the case but subsequently lost and had to pay damages. This case set a precedent that where an ISP hosted a discussion forum that it could ultimately edit it had responsibility as a publisher once it had been put on notice about potentially illegal content.
- Further legal protections were won to absolve ISPs of liability for the publication of details breaking an injunction surrounding the identities of the killers of toddler James Bulger, giving ISPs greater protection if banned material about Robert Thompson and Jon Venables was posted on the internet without a service provider's knowledge.

E-commerce Directive

- As internet adoption grew, a new legal framework was needed to encourage innovation while providing confidence for users – this was through the E-commerce Directive implemented as the Ecommerce Regulations in 2002.
- The Regulations provided internet companies with limited exemptions from liability. ISPs were deemed mere conduits and not responsible for traffic that crossed their network and were not obliged to undertake general monitor obligations, while hosting providers only had to remove illegal content hosted on their network once notified.
- This was a key piece of policy work for ISPA and the protections played an important in the development of the digital economy. Twenty years later, as we await reform of the Directive through the Digital Services Act in Brussels, these protections still play a crucial role. However, legal rulings, customer expectations and the changing market have all increased the role ISPs play.

Mid 2000s onward: the internet as disruptor

- One of the earliest impacts to traditional business models was the disruption caused by online copyright infringement to the creative industries. A decade-long battle saw rights holders lobbying to make ISPs and their customers responsible for copyright infringement.
- ISPA defended the ISP position, making the case for how difficult it would be for service providers to police their users, and advocating that the music and film industry needed to change their business models in light of the internet and technological changes.
- This culminated in measures in the 2010 Digital Economy Act that would force ISPs to take technical measures against users alleged to have engaged in online copyright infringement. Ultimately, thanks to efforts from ISPs and campaigners, the measures were never fully introduced. Instead, targeted blocking orders issued by the courts against high profile sites, and the development of legal, licensed alternatives, meant that the internet became a growth area for the creative industries.

Creating an environment for competition

- The competitive market we have today is thanks to the innovation and efforts of ISPA members over the past 25 years but is also due to regulation to promote competition.
- Local Loop Unbundling (LLU) was introduced by Oftel (later Ofcom) and was an early innovation that allowed ISPs to unbundle the 'last mile' from the exchange to a premise. Trials commenced in 2000 as the regulator forced BT to provide space in exchanges so that ISPs could sell services from the local exchange. By 2007, 2 million lines had been unbundled by a variety of different ISPs.
- In recognition of the convergence of telecoms, the internet and media, Ofcom was created in 2003 by merging the existing regulatory bodies in this space. Ofcom set out its approach through the Strategic Review of Telecoms in 2005 that put in place both infrastructure and wholesale competition. It also addressed the question of structural or operational separation of BT through equality of access and the establishment of Openreach.
- The healthy debate around competition continued and in 2016, as part of its Strategic Review of Digital Communications, Ofcom concluded that Openreach should become legally separate from BT's network division. While infrastructure should be opened through duct and pole access.

"When you look overall at ISPA as the champion not only of speed, which of course is hugely important in the broadband world, but also of people doing innovations and bringing change to the marketplace, and that to me is really the calling card of ISPA and its role in the industry." – Dana Tobak

2000 to 2016, surveillance legislation

- As the Internet became an everyday means of communication, ISPs came under increasing pressure to hand over data to law enforcement agencies. Again, this became a decade long campaign in which ISPA argued that ISPs had to have the legal protection necessary in order to be able to hand over data and ensure they were not breaching data protection law.
- There was remit creep on this with some local authorities even wanting the law to cover their ability to access data for issues such as non-council tax payments.

- ISPA and its members were focused on ensuring a proportionate approach with clear safeguards in place. The result was a framework for surveillance and interception of communications with ISPA ensuring a cost recovery mechanism for industry. The policy and legal debates around surveillance policy continue to this day.

“One issue that leaps out was the [so-called] Snoopers’ Charter – the whole concept of taking information about everybody and putting it in a single place. From the technical view you can see the logic in it. But if you put too much information in one place people become interested in it and go after it... We spent a lot of time early on ... training the police, teaching them how to ask the right questions so we could help them.” – James Blessing, ISPA Chair from 2014 to 2017, and executive with Jisc

2010s to now, ISPs supporting customers manage online choices

- As the Internet became mainstream, with families using their connections across many different devices at home and outside, pressure started to mount to provide additional support to help users manage content online
- For a time there was a divergence within the ISPA membership on the best approach to take, with four large consumer ISPs introducing free network level parental controls, and others leaving it to their customers to decide. Yet, filters and other support is now widely offered by your ISP.
- With ISP-level protection firmly established and UK ISPs leading the way on online safety through the creation of Internet Matters, the debate around online harms moved largely to online platforms, particularly social media.
- The future role of ISPs in this area looks set to focus on the potential for acting as a backstop should other parts of the ecosystem not do as required, as demonstrated by the recent (currently dropped) age verification policy and online harms white paper. Whether ISPs are even able to fulfil this function as parts of the Internet architecture start to go ‘dark’ to ISPs, such as through DNS-over-HTTPS, remains to be seen.

2018 to ongoing, broadband barrier busting

- The rise of new and existing operators rolling out gigabit networks has made enabling operators to gain access to buildings and apartments a vital part of deployment of full fibre infrastructure.
- ISPA has been working with industry and the Government to ensure upcoming legislation removes barriers to deployment including covering absentee landlords and non-cooperation.
- This has resulted in the new UK Telecommunications Infrastructure (Leasehold Property) Bill, which aims to make it significantly easier, quicker and cheaper for “gigabit-capable” broadband ISPs and telecoms firms to access big apartment blocks.

The Internet Watch Foundation – an industry first

In 1996 Peter Dawe established the Safety-Net Foundation, a not-for-profit company limited by guarantee, and based on three principles – Rating, Reporting, Responsibility – in order to tackle child pornography and illegal material on the internet.

This was in response to growing Government, police and media pressure on ISPs to take down illegal content. There had been a case in Germany when Bavarian prosecutors raided CompuServe offices in December 1995 and CEO Felix Somm was arrested for failing to block access to child pornography sites on the internet.

On 23 September 1996 an industry proposal, which all responsible service providers were encouraged to support and adopt, was presented by ISPA, LINX (the London Internet Exchange) and the Safety-Net Foundation.

In order to take the "R3 Safety-Net" approach forward, the Foundation would approach other independent parties to form a management board. This could include approaching possible directors from a range of backgrounds, including child protection groups, the police and the internet service provider trade associations. And so, the Internet Watch Foundation was set up to investigate and act against illegal material found on the Internet, particularly child pornography.

“With every new technology there are always the early adaptors and the bad guys... and so we had a problem. ISPs wanted something done but it was always someone else’s problem, so I decided to just go and do it... and I sold it to the ISPs as a get out of jail free card.” – Peter Dawe

“We were the first country and the first organisation to voluntarily remove paedophilia from the internet. And while that seems a very logical and sensible thing to do, it actually caused no end of vitriol from various parts of the wider internet community who perhaps thought there should be no rules, no law; that the internet was unique and regulation just shouldn’t exist. Of course the more sage advisers in the industry knew that if we were going to survive and going to be sensible that we had to work with government and the authorities to control the worst part of the internet or at least attempt to.” – Shez Hamill

“[The IWF was] hugely important for ISPA and for the industry. Because we wanted to ensure we weren’t carrying child abuse images but also legally it was very important we shouldn’t be liable for content going through our service that we didn’t know about. So, it was important to pick out how we could work with the police to ensure we would not be responsible for something we didn’t know about. ISPA facilitated a lot of that discussion.” – Camille de Stempel

7. Timelines – 1995 to 2020

Although the internet is highly integrated in our lives today that was not always the case. Today's coverage and access are the result of years of work and sometimes struggle.

Seven Ages of the Internet

The possibilities 1994-1997

Could broadband over the telephone network be possible, and if so, what could it be used for? This was the era of looking to see if the technology might work, and whether it would be welcomed by the phone companies.

Bubbles 1998-2001

Once the internet got going, opinion swung to the opposite extreme. The valuation of pioneering internet companies rocketed – but then the markets popped.

Hard Slog – building from a solid base 2002-2006

By now proper broadband had started to reach homes and businesses – but delivering a reliable service at an economic price was difficult. Thousands of incremental improvements eventually led to reliable and cost-effective services

Tipping Point 2007-2011

The broadband growth curve continued almost unaffected by the 2008 Crash. Users were gaining so much benefit from their broadband service that it became recognised as a vital utility.

Streaming Revolution 2012-2017

Bandwidth continued to improve rapidly both in price per gigabit and reliability. First music, then video migrated to broadband delivery on a huge scale. Smartphones plus Wi-Fi put affordable entertainment in everyone's pocket as the UK became a leading digital economy.

Fibre Nation 2018-2030

Finally, fibre comes into its own as the only way to distribute the gigabit connections users are beginning to want. Providing such infrastructure is a national concern. What will it mean for how broadband is used?

Unleashing Potential 2020 and beyond

And what of the advent of wireless technologies such as 5G, in tandem with users and providers discovering new uses of broadband that we are only just glimpsing. Where will unleashing this potential take us?

Tim Johnson, founder of Ovum and Point Topic

Policy and Regulation – setting the framework

The possibilities 1994-1997

- 1996 Government's Information Society Initiative and UK Online with E-envoy
- 1997 WTO agreement by 69 governments to make multilateral commitments to liberalise telecommunications

Bubbles 1998-2001

- 1998 LLU trials/commercial product 2000 as Oftel forces BT to provide space in exchanges so that ISPs can sell services from the local exchange
- 1999 EU Review of Telecommunications
- 2000 UK Government aims to make Britain the best place to trade electronically producing Electronic Communications Act. ESigs start to matter.

Hard Slog 2002-2006

- 29 December 2003 the duties of Oftel and all responsibility for regulating telecommunications transferred to Ofcom, the new converged regulator for the communications sector
- 2005 OECD starts using broadband penetration as one of its indicators of a nation's development
- 2006 BT creates Openreach to ensure rivals have equal access to the BT network, following agreement with Ofcom

Tipping Point 2007-2011

- 2009 Labour Government promises all UK will receive 2Mbps as a "universal service" by 2012, as recommended in the Digital Britain report by Lord Carter

Streaming Revolution 2012-2017

- 2011 Coalition Government promises "superfast broadband" of 24Mbps to 90 per cent of UK premises by 2015
- 2011 Broadband Deliver UK funding begins to be allocated
- 2013 Government promises 95 per cent of premises to have "superfast broadband" by 2017
- 2015 Prime Minister David Cameron introduces "universal service obligation" for broadband giving UK residents a legal right to request an affordable internet connection
- 2016 Digital Infrastructure Investment Fund launched with £400 million for "full fibre"

Fibre Nation 2018-2030

- 2018 Ofcom rules BT must make its telegraph poles and underground tunnels open to rival providers following Wholesale Access Market Review
- 2018 The Future Telecoms Infrastructure Review set out Government's approach to the delivery of gigabit and full fibre broadband with a target of 15 million premises connected to full fibre by 2025, with coverage across all parts of the country by 2033
- 2019 The Conservative Party manifesto commits to gigabit capable broadband to be available to all by 2025, £5bn investment is promised to address the final 20%

ISPA impact – campaigning and advocacy issues

The possibilities 1994-1997

- 1996 Letter from the Metropolitan Police to the UK ISPs telling them to remove internet content
- 1996 R3 Safety Net Agreement regarding rating, reporting and responsibility is created by ISPA, LINX and the Safety Net Foundation, with a key outcome of the Agreement being formation of the Internet Watch Foundation (IWF)

Bubbles 1998-2001

- 2000 Regulation of Investigatory Powers Act (RIPA) comes into force and provides a framework for surveillance and interception of communications, ISPA helped ensure a cost recovery mechanism was in place
- 2001 Godfrey v Demon Internet Service was a landmark court case concerning online defamation and the liability of ISPs
- 2001 Free music-sharing site Napster closes after action by bands and record labels, it relaunches as legal, paid-for service in 2004

Hard Slog 2002-2006

- 2003 The Communications Act established a new regulator to deal with the converged communications landscape; famously the term 'internet' is not mentioned
- 2006 The EU Data Retention Directive, which gave powers to compel ISPs to retain communications data collected for business purposes for a period of up to 24 months was introduced. The Directive was ultimately found to be unlawful by CJEU and the UK Government introduced its own legislation

Tipping Point 2007-2011

- 2010 Digital Economy Act passed prior to the establishment of the Coalition Government contained powers to address online copyright infringement through subscriber notifications, technical measures, and web blocking. The measures were largely shelved, with only limited subscriber notifications ever coming into force
- 2011 Web blocking increased after the High Court ruled that ISPs would have to block access to Newzbin, a site found to have facilitated copyright infringement under Section 97A of the Copyright Designs and Patents Act 1988
- 2011 Network level parental control filters are introduced by the 4 large ISPs to help users manage and control content online through an 'active choice'

Regulatory environment continues to mature 2012-2017

- 2012 The controversial Draft Communications Data Bill, the so-called 'Snoopers' Charter', was introduced. It included measures to retain internet browsing history but was shelved thanks to opposition from junior coalition government partners
- 2016 The Investigatory Powers Act provides a new framework to govern the use and oversight of investigatory powers by law enforcement and the security and intelligence agencies
- 2017 Age verification of adult pornographic sites becomes law, with web blocking a backstop enforcement measure. AV has yet to be implemented.

Fibre Nation 2018

- 2018 GDPR and privacy – the General Data Protection Regulation is implemented on 25 May
- 2019 Online Harms White Paper recommends making internet companies responsible for illegal, harmful, or otherwise disreputable content appearing on their platforms
- 2020 The COVID-19 pandemic hits and the internet is a vital part of the country's response and recovery

Technology – the bandwidth milestones

The possibilities 1994-1997

- 1997 Wi-Fi is invented and first released for consumers when the 802.11 committee was created, leading to IEEE802
- 1995 BT trials interactive TV with a 2,500 home trial in Ipswich <https://bt.kuluvalley.com/view/VBM0tELbTEI#/>

Bubbles 1998-2001

- 2000 ADSL (Asymmetric Digital Subscriber Line) rolled out in the UK at 8Mbps, ADSL2+ later boosts speeds to 24Mbps

Hard Slog 2002-2006

- 2002 Local loop unbundling begins and non-BT companies start installing broadband kit in telephone exchanges
- 2003 Advertising Standards Authority defines "broadband" as delivery of speeds at least 500kbps
- 2004 BT begins to trial the 2Mbps broadband service IPStream 2000
- 2006 Local Loop Unbundling enables ADSL2+ to take off

Tipping Point 2007-2011

- 2008 Virgin Media introduces 50Mbps broadband in the UK
- 2008 H2O Networks rolls out Fibrecity offering residential FTTH in Bournemouth
- 2008 BT announces national plan for deploying a new generation of "super-fast" broadband in the UK using FTTC (fibre to the cabinet)
- 2009 VDSL (Very High Bit Rate Digital Subscriber Line (VDSL) begins to be deployed using FTTC providing speeds up to 80Mbps
- 2009 Openreach announces plan to connect 2.5 million homes to FTTP by 2012
- 2009 Rutland Telecom installs UK's first rural FTTC project in Lyddington <https://www.youtube.com/watch?v=kHLPi2ZP9OE>

Streaming Revolution 2012-2017

- 2015 Openreach offers Fibre on Demand service
- 2015 Virgin Media begins Project Lightning to include a form of FTTP RFOG (Radio Frequency Over Glass)
- 2016 Sky completed rollout of IPv6 with 95 per cent of customers getting IPv6 access, and BT rolled out IPv6 support for all BT Broadband lines

Fibre Nation 2018-2030

- 2018 Jersey Telecom deactivates copper broadband lines with all connections being FTTP with the lowest rate starting from 250Mbps
- 2019 Virgin Media begins deployment of Docsis 3.1 in the UK allowing download speeds up to 1Gbps
- 2019 BT announce PSTN switch off by 2025

Market and services - key internet-related offerings

The possibilities 1994-1997

- 1994 Fewer than 10,000 websites. The launch of Yahoo, the BBC online as well as Amnesty International, HM Treasury, Pizza Hut and The White House
- 1995 Under 50,000 websites. The first sight of Amazon as well as AltaVista and eBay and the NY Times
- 1996 Less than 500,000 sites. Google, Apple, MSN and Lycos all appear.
- 1997 Over 1 million sites and accelerating rapidly. The first version of Netflix where you could order your VHS or CD delivered launches.

Bubbles 1998-2001

- 1998 High street electrical chain Dixons announced in September it was launching a free internet provider called Freeserve
- 1999 Nokia 7110 announced as the first WAP phone (Wireless Application Protocol), capable of browsing the internet
- 1999 Kingston become one of the first companies in the world to introduce IPTV and later (201) IP VoD over ADSL as a commercial service
- 2000 First home broadband service installed in the UK, in Basildon by NTL
- 2000 AOL introduced flat-rate internet access service in the UK priced at £14.99 per month following its Stop the Clock campaign against metered access

Hard Slog 2002-2006

- 2005 Be Broadband was the first company to bring 24Mbps to the UK market using local loop unbundling
- 2006 Launch of IPTV - BT Vision and others

Tipping Point 2007-2011

- 2007 BT announced service trials for ADSL2+
- 2007 The Virgin Media brand is launched
- 2007 iPhone is launched
- 2008 Spotify launches in Europe as the first legal streaming service with an extensive catalogue
- 2011 BT began offering 100Mbps FTTP broadband in Milton Keynes
- 2011 Hyperoptic launches a 1Gbps FTTH service in London

Streaming Revolution 2012-2017

- 2012 Netflix start its expansion into the UK
- 2012 Gigler 1Gbps/500Mbps FTTH service launches in Bournemouth using the CityFibre network

Fibre Nation 2018-2030

- 2018 Streaming overtakes physical/digital sales for the first time
- 2020 B4RN launches 10Gbps symmetrical home broadband

8. Changing role of the ISP

The role of the internet service provider has changed significantly over the past 25 years. Early providers offered plain internet access using dial up technology in order to get tech-oriented customers, academics and businesses onto the internet in order to access information and distribute material. But as time as passed ISPs moved into new areas including content, security, technical support and even advertising, with branding and marketing becoming ever more important.

This morphing from internet service provider into multi-service provider covers both residential and business broadband markets. It has been success for some, but not all and indeed not every ISP has attempted to make the journey.

From narrowband to broadband

Pipex was the UK's first commercial ISP, established in 1990 and providing dial-up internet access from March 1992. By November 1993 Pipex provided internet service to 150 customer sites. One of its first customers was Demon Internet which popularised dial up modem-based internet access in the UK. Other commercial ISPs and web-hosting companies aimed at small businesses and individuals developed during the 1990s. By May 1998 Demon Internet had 180,000 subscribers.

The continued spread and adoption of increasingly symmetric broadband with millions of times the capacity of previous offerings has spawned a rich, highly interdependent, ecosystem of services and possibilities.

Free internet access and unmetered dial up

In 1998 the UK was the first country to see subscription-free internet access, offering dial-up access for consumers for the price of a local call. Freeserve, an initiative from Dixons Group and Leeds-based hosting provider Planet Online, was instrumental in this, offering free internet access to customers buying new home PCs from Dixons stores.

Unmetered dial up became possible in the late 1990s. This meant an internet company could be set up and receive half the dial up revenues from BT. By August 2003, 34 per cent of internet homes claimed to use some type of narrowband unmetered access².

Narrowband service was gradually replaced by new broadband technologies. BT trialled its first ISDN 'broadband' connection in 1992 and the first commercial service became available from Telewest in 2000. Ofcom estimated that around four million internet homes subscribed to narrowband unmetered packages by August 2003.

By the start of the millennium BT was able to compete in broadcast TV services in the UK and cable companies continued to finance investment in broadband networks, providing competition to BT.

²https://web.archive.org/web/20070927190944/http://www.ofcom.org.uk/research/telecoms/reports/bb_research/ofcom_internet_broadband_brief/#18

Cable companies offered access speeds comparable to ADSL by using cable modem technology. NTL and Telewest both rolled out cable modem offerings priced around £40-50 per month.

Virtual service providers enter the sector

A number of consumer brands entered the market with white label offerings from the late 2010s. These included The Post Office, which launched as new, national broadband service on in October 2007 specifically designed to attract late adopters of broadband services, and later John Lewis Broadband launching with three packages in April 2012 including no activation fees, freephone support and a free wireless router.

IPTV turns ISPs into entertainers

Attracted by “content is king”

Telecom operators had long held ambitions to take a central role in the provision of television services and had been working on the IPTV technology to enable such offerings since the late 1990s. The mantra “content is king” was paramount. Kingston Communications (now KCOM) launched Kingston Interactive Television, an IPTV over DSL service in September 1999. The operator added additional video-on-demand (VoD) service in October 2001 with Yes TV, a VoD content provider. BT launched as BT Vision in December 2006.

TV for telecoms operators goes mass market

By 2008 IPTV services were being enabled by mass market take-up of broadband access, the development of robust IPTV platforms and middleware, and the rise of the internet which was helping to change consumer expectations regarding the range and timing of the content to which they have access. As of the end of June 2019, BT TV had 1.9 million customers. Lack of proven business models, however, continued to be a headache for operators, as competition increased and the goal posts shifted in terms of what must be included in an IPTV offering. With the majority of tier one and many tier two operators providing, or at least seriously thinking of providing, IPTV offerings, the reality of how to actually deploy profitable services became the prime consideration.

Changing the nature of the telco

This brought the ISP into new territory including building advertising revenues into their operations and developing VoD offerings seen as key to raising the ARPU of existing customers. Previously a differentiator for those players that provided such services, VoD was fast becoming a ‘must have’ in most markets for IPTV operators. Bidding for football and other rights saw a move into content production itself.

Combating the OTT providers

Over-the-top services were regarded by ISPs as both as a threat to their own TV service plans, and as an opportunity. The internet was developing services that telcos had themselves planned to deliver – online back-up, photo sharing, online gaming and even social networking – and distributing them more quickly, widely and freely. ISPs looked increasingly at partnerships with internet TV brands. BT,

for example, had a partnership with PodShow, a user-generated content site, to use this content on its IPTV platform.

Broadband as part of a bundled offering

Dual play has been around in the UK market almost since the start. Triple play marketing has also played a key role in getting services to market. Operators used bundled offerings to introduce their TV products, leveraging their addition as a way of adding value for existing broadband customers and reducing churn. Such packages also matched the cable competition and helped retain fixed-line telephony customers.

From triple to quad play

The merging of NTL and Telewest with Virgin Mobile resulted in Virgin Media offering a "quadruple play" of cable television, broadband Internet, landline phones, and mobile, with prices for some contracts as low as £30 a month. It is marketed as "the simplest way for customers to get all their household communications from one provider". BT Group launched its own Quad Play services in March 2015 ahead of its purchase of EE Limited running its mobile offering on the EE network.

Four fifths of UK households now take some form of bundle

According to Ofcom in its Pricing trends for communications services in the UK published in January 2020, bundled services remain popular, providing consumers with savings compared to buying the same services on a standalone basis. Four in five UK households buy more than one communications service from the same provider e.g. a dual-play landline and fixed broadband bundle or a triple-play service that also includes traditional pay TV. Those buying bundles continue to benefit from significant discounts. Bundling (rather than buying services separately) resulted in lower prices for all of the household profiles that the regulator looked at that include fixed broadband.

Security and IT support

Recent years has seen a shift by several suppliers to more innovative digital working and transformational programme approaches, selling solutions rather than connectivity which are designed to increase productivity and innovation. This means that communications services are increasingly presented as business grade tools.

Both homes and businesses are vulnerable to attack either directly via or enabled by these new channels into our lives. Industry response has been swift but sometimes not swift enough. The complexities we all face with our networks and our interaction with the online world make a single one gate fits all solution impossible but it is a battle that the service providers have to wage on their own behalf as well as for their customers.

There are thousands of applications and examples where attacks have breached security and result in outcomes that range from little to no impact or harm to globally significant data thefts that compromise business and consumer.

Despite all the complexity (or perhaps because of) the easiest hack is still the human. Even here the operators are contributing to education and support that try and protect the data, the people and the network.

A permanent revolution

Even more than most the internet industry must keep changing, evolving and undergoing sometimes seismic revolutions. All in a timescale that would leave other sectors floundering for a response. An opportunity for one is likely to be a threat for another without the capacity to adapt and change.

The shifts in where we keep our data, how we access it, what for and on which device are driving a number of solutions:

Rise of the data centre provider

The first data centres emerged in the UK during the second world war. With Colossus in the UK and ENIAC and EDVAC in US these centralisations of computing power and storage were driving components in the development of the early internet.

When the first commercial computers started to appear in the early 1950s in the UK the foundation stones for our modern networks were laid.

Advent of the cloud and the edge and the mist

Where the datacentres are on the network, core/cloud or more local with lower retrieval times is an ongoing story. With 5G, often termed a 'fixed' technology for the reliance on a fibre backbone, we see a thousand fold increase in the number of data centres, nodes and servers that can be closer to the point of use whether it is a person or more and more frequently a machine.

Artificial Intelligence and machine learning

Use of technology including artificial intelligence for supporting and serving customers will continue to grow, and we are seeing the first real forays into this space with Vodafone's use of chatbot TOBi, TalkTalk Business's MyTalkTalk app and developments at O2 Labs.

Sector specialising service providers

Specialist service providers have grown in a number of sectors including education, health, finance and an ever-expanding range of focused offerings.

Convergence continues to be rallying cry

Convergence has been a holy grail for many ISPs for many years. From early forays into convergence to the provision of quad play services, often using virtual mobile network operations to add mobile services to broadband, fixed line, and TV services. As full IP has swept through an originally analogue network we have been brought closer and closer to fully converged services and operators. Today we stand on the brink of a world where 'mobile' and 'fixed' are merged for good.

Mobility now means more than just mobile

Mobility continues to feature in broadband offerings but, as a whole the sector has made as much headway as expected. The acquisition by BT of mobile operator EE in 2016 is designed to create a converged network operator. This may be followed by a tie up between Virgin Media and O2.

The most significant area is that of Wi-Fi, both in terms of in-office Wi-Fi to allow untethered working, and public Wi-Fi hotspots. Mobile continues to be sold as a separate technology to broadband. Although a few suppliers offer discounts from one service to the other – including BT Business and Public Sector, O2 and Virgin Media Business – as well as some convergent products to tie the two technologies together in terms of voice calls, there is little innovation here.

The vital role of R&D

None of the above would have been possible without the research and development undertaken by internet service providers. In November 2019 the UK Office for National Statistics (ONS) revealed that the telecoms industry was the fastest growing sector for R&D spending in 2018, which saw ISPs and network builders increase their spending on research and development by 25.4 per cent or £192 million with a total of £947 million.

BT's role in R&D as the national incumbent

BT's Adastral Park near Ipswich in Suffolk continues to showcase the UK's R&D capabilities. Home to BT Labs, BT's global research and development headquarters, the park also houses Innovation Martlesham, a growing cluster of nearly 100 high-tech ICT companies. The research on display through 50 demonstrations and seven showcases was wide and varied, ranging from solutions for the retail sector to new ways of interacting with TV content to smart city IoT applications.

Exhibits included those using technologies we would expect from one of the world's leading communications infrastructure providers – those aiding the rapid deployment of flexible and pop-up networks, and those designed to squeeze out higher capacity and greater efficiencies. There has been growing emphasis on Big Data and analytics, machine learning and quantum cybersecurity.

BT and Openreach are not alone. The innovation that the UK is rightly famous for continues to thrive across the sector and beyond. The UK's dependence on overseas suppliers is coming under the microscope as the consequences of global access hit home. The continued and growing efforts to meet the needs of the modern network build will be ever more dependent on our own ability to innovate.

9. Trade and the economy

Adroit Economics, with data from Point Topic, have produced an economic analysis of the impact of the internet on business in particular in the UK.

Societal impact and the way the internet has changed all our lives is a significant factor but with plenty of subjective inputs and outputs. For business however the impact is more direct and more easily measurable.

Available here, along with data tables on the spread bandwidth throughout the market.

Increasing availability of fast broadband has resulted in significant business benefits

- 1.1 Increasing availability of faster and faster internet access, across the UK, not just to households but to businesses has and is continuing to have a huge impact on the economy
- 1.2 Access to faster internet access is enabling improved productivity:
 - It is enabling increased innovation, product and service development
 - It is enabling increased sales
 - It is driving increased skills and knowledge amongst the work force
 - And of particular importance right now, it is enabling staff to work from home - more on this later.

Business benefits – a survey of SMEs across Greater London identified the following benefits of faster broadband to firms

Firms achieved notable cost savings coupled with increased sales as a result of the use of faster broadband:

- Cost savings – equivalent to 4.8% of current turnover
- Sales increase – first 12 months after connection – 5.5%
- Sales increase – first 24 months after connection – 10.5%.

Underlying this, firms reported a number of productivity benefits, most notably:

- Staff time savings – 6.12%
- Increased efficiency of home and mobile workers – 11.13%

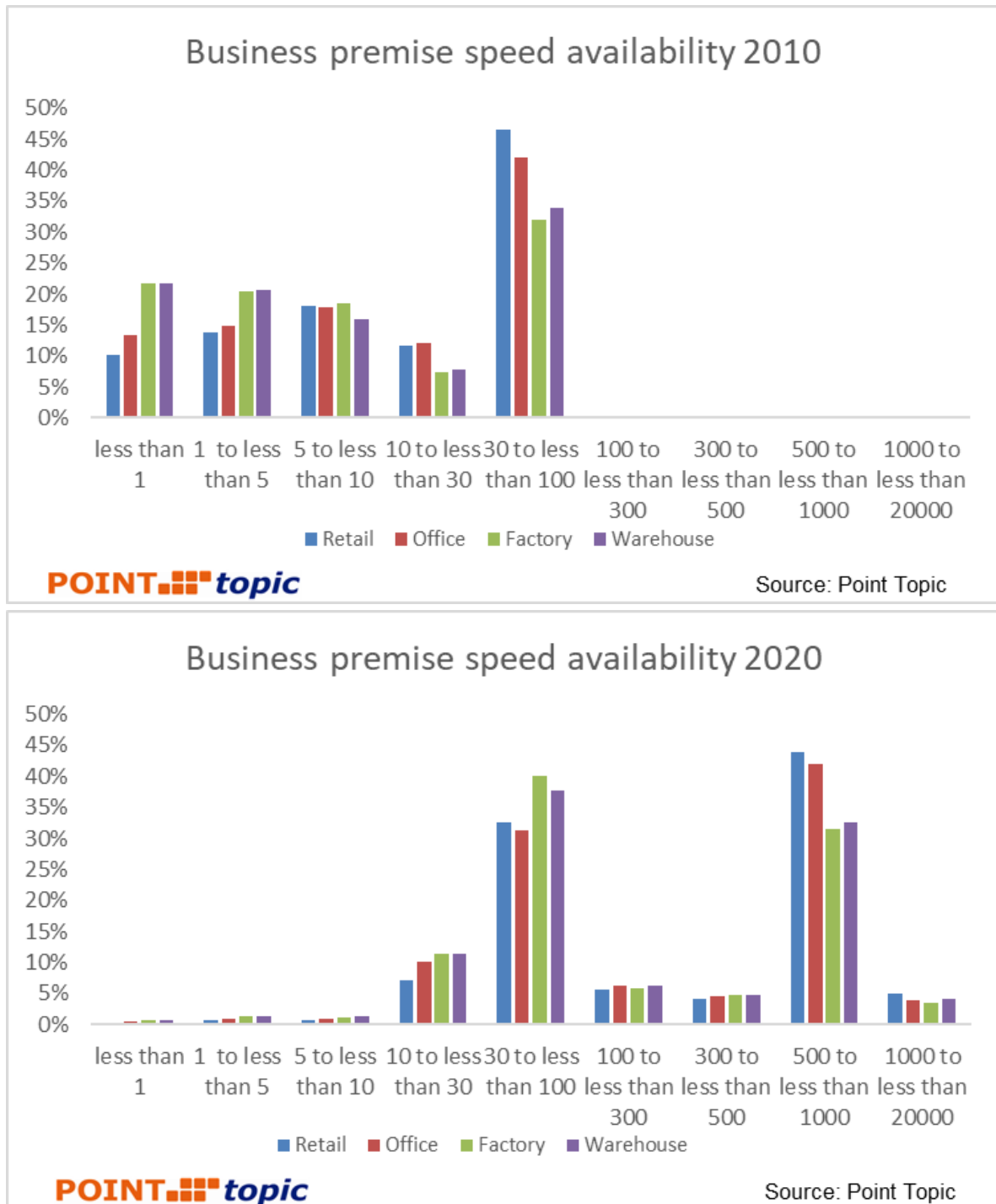
Source: Survey by Adroit Economics of SMEs accessing faster broadband across London, for the GLA

- 1.3 Similar types and levels of benefits have been identified in other surveys we have undertaken/ reviewed, across different types of area and economy – Greater Exeter, Cornwall, Greater Manchester.

Increasing deployment of broadband infrastructure has enabled delivery faster broadband across the country (UK)

These sorts of benefits are dependent on deployment of faster broadband infrastructure across the country. Over the last 10 years, we have seen significant increases in speed availability as we have highlighted. Different business premises show different profiles for the change in that availability.

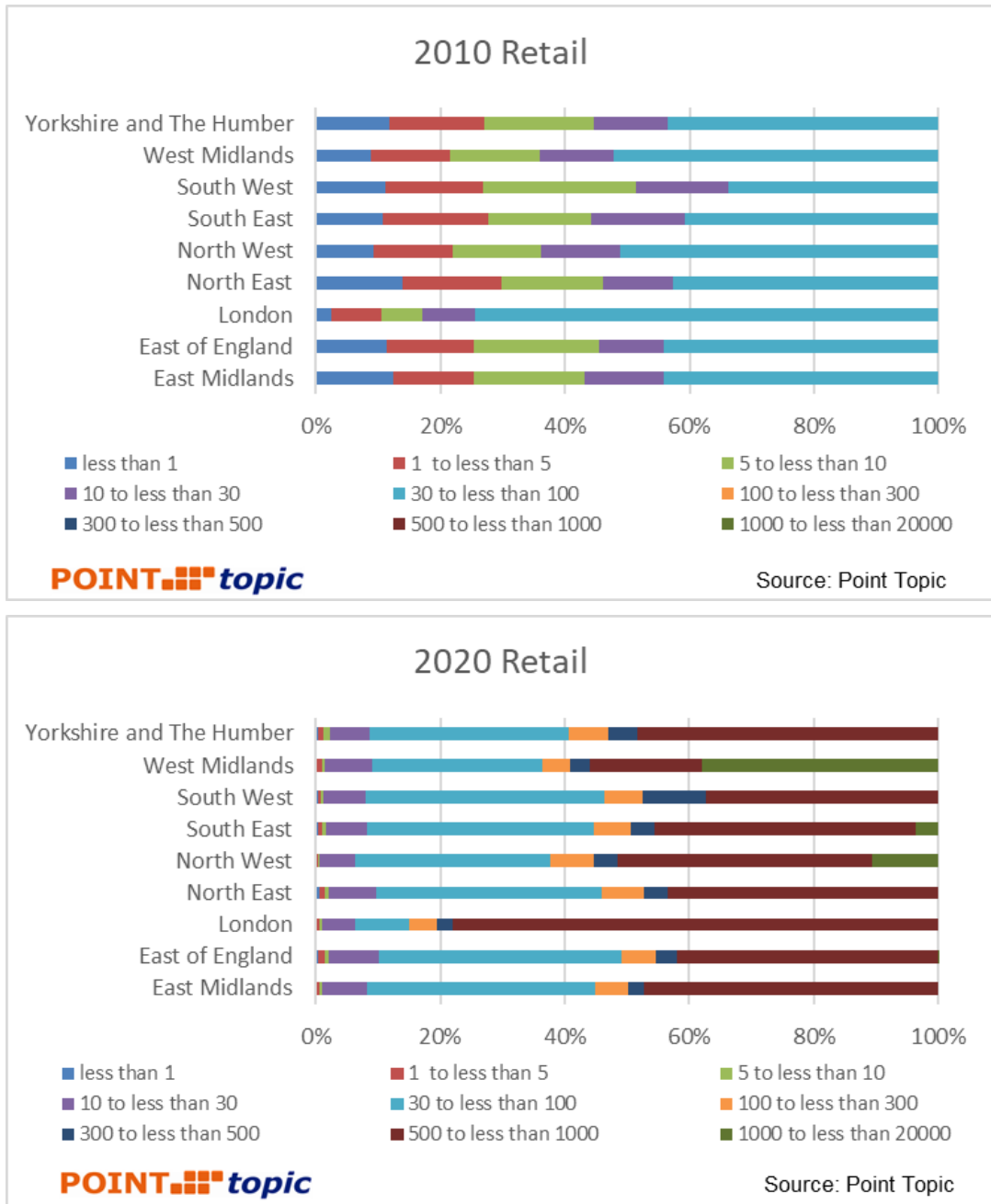
Figure 12: Comparison of business premises speeds availability in 2010 and 2020



Regional disparities in speed availability have widened though

Regional disparities in the average download speed availability have widened however, certainly for retail, typical of the pattern across the various business premises in the UK.

Figure 12: Comparison of regional speed availability disparities in 2010 and 2020



Disparities in speed availability within the devolved nations

The following tables show the relative disparity in download speeds for the four devolved nations when compared to the national average. Answers of 1.00 (in yellow) mean the numbers are the same (this often means there are 0 in both the nation and UK

Figure 14: Comparison of devolved nations to national average, 2010-2020

England – National Average

All regions difference	England	All Premises										
Average download speed	bands 2010	bands 2011	bands 2012	bands 2013	bands 2014	bands 2015	bands 2016	bands 2017	bands 2018	bands 2019	bands 2020	
less than 1	0.98	1.01	0.94	0.89	0.74	0.74	0.63	0.81	0.82	0.88	0.88	
1 to less than 5	0.98	1.00	0.99	0.94	0.97	0.99	1.03	1.05	1.05	0.98	0.98	
5 to less than 10	0.84	0.93	0.97	0.95	0.93	0.89	0.92	0.92	0.94	1.04	1.03	
10 to less than 30	1.04	0.99	0.93	0.94	0.95	1.03	1.01	1.00	1.01	0.95	0.96	
30 to less than 100	1.08	1.04	1.04	1.01	0.99	0.96	0.95	0.94	0.93	0.91	0.91	
100 to less than 300	1.00	1.00	1.23	1.07	1.08	1.08	1.08	1.07	1.07	1.05	1.04	
300 to less than 500	1.00	1.00	1.21	1.23	1.23	1.23	1.23	1.21	1.12	1.01	0.98	
500 to less than 1000	1.00	1.00	1.00	1.23	1.23	1.20	1.16	1.20	1.20	1.08	1.07	
1000 to less than 20000	1.00	1.00	1.00	1.00	1.00	1.00	1.23	1.00	1.00	1.23	1.23	
TOTAL	0.99	1.00	1.04	1.03	1.01	1.01	1.02	1.02	1.02	1.01	1.01	

Northern Ireland

All regions difference	Northern Ireland	All Premises										
Average download speed (Mbps)	bands 2010	bands 2011	bands 2012	bands 2013	bands 2014	bands 2015	bands 2016	bands 2017	bands 2018	bands 2019	bands 2020	
less than 1	1.44	0.17	0.56	0.03	0.01	0.00	0.00	0.00	0.00	1.38	1.42	
1 to less than 5	1.05	0.20	0.20	0.16	0.08	0.16	0.18	0.19	0.14	0.47	0.48	
5 to less than 10	1.60	0.28	0.31	0.19	0.20	0.24	0.27	0.28	0.36	0.71	0.59	
10 to less than 30	1.00	2.21	1.08	0.86	0.50	0.48	0.37	0.34	0.29	1.09	1.01	
30 to less than 100	0.53	1.69	1.57	1.88	1.89	1.48	1.61	1.62	1.51	1.47	1.43	
100 to less than 300	1.00	1.00	0.00	0.71	0.71	0.59	0.71	0.71	0.67	0.82	0.92	
300 to less than 500	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.74	1.39	1.84	
500 to less than 1000	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.59	0.64	
1000 to less than 20000	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	
TOTAL	1.07	0.95	0.64	0.54	0.49	0.44	0.35	0.46	0.52	0.88	0.93	

Scotland

All regions difference	Scotland	All Premises									
Average download speed (Mbps)	bands 2010	bands 2011	bands 2012	bands 2013	bands 2014	bands 2015	bands 2016	bands 2017	bands 2018	bands 2019	bands 2020
less than 1	0.90	1.10	1.45	1.83	3.32	3.74	4.68	3.26	3.05	2.05	2.08
1 to less than 5	1.04	1.25	1.33	1.56	1.30	1.42	1.00	0.93	0.97	1.46	1.45
5 to less than 10	1.63	1.51	1.33	1.42	1.62	2.21	1.83	1.85	1.57	1.04	1.10
10 to less than 30	0.84	0.70	1.26	1.35	1.41	1.12	1.21	1.32	1.30	1.26	1.25
30 to less than 100	0.77	0.65	0.65	0.67	0.77	0.94	1.02	1.02	1.12	1.29	1.30
100 to less than 300	1.00	1.00	0.00	0.74	0.74	0.79	0.74	0.76	0.77	0.74	0.77
300 to less than 500	1.00	1.00	0.04	0.00	0.00	0.03	0.03	0.08	0.49	0.44	0.48
500 to less than 1000	1.00	1.00	1.00	0.00	0.00	0.23	0.58	0.23	0.27	0.76	0.83
1000 to less than 20000	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
TOTAL	1.02	1.02	0.90	0.95	1.13	1.28	1.23	1.16	1.17	1.00	1.03

Wales

All regions difference	Wales	All Premises									
Average download speed (Mbps)	bands 2010	bands 2011	bands 2012	bands 2013	bands 2014	bands 2015	bands 2016	bands 2017	bands 2018	bands 2019	bands 2020
less than 1	1.14	1.25	1.33	1.76	1.29	0.52	0.31	0.23	0.47	0.50	0.48
1 to less than 5	1.14	1.15	1.16	1.50	1.49	0.97	1.13	1.00	0.84	0.86	0.82
5 to less than 10	1.93	1.65	1.25	1.60	1.48	0.96	1.19	1.20	1.28	0.49	0.55
10 to less than 30	0.72	0.82	1.49	1.34	1.36	0.69	0.92	0.85	0.76	1.22	1.08
30 to less than 100	0.53	0.53	0.62	0.83	1.00	1.36	1.40	1.47	1.49	1.57	1.61
100 to less than 300	1.00	1.00	0.06	0.52	0.51	0.50	0.49	0.49	0.49	0.88	0.95
300 to less than 500	1.00	1.00	0.26	0.00	0.00	0.00	0.02	0.16	0.24	1.70	1.71
500 to less than 1000	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.02	0.44	0.47
1000 to less than 20000	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
TOTAL	1.05	1.05	0.91	0.95	0.90	0.67	0.61	0.71	0.73	0.85	0.85

Source: Point Topic

We can see that in over the last 10 years, Northern Ireland have been below the national average in most bandwidth ranges, but have stayed consistent in the 30Mbps to less than 100Mbps range.

Improving business broadband speeds to 100Mbps could generate an additional £260bn GVA across the UK economy

As at today, 2020, 2.3% of UK business premises (28,500) are in areas that offer less than 10Mbps download speed; 12% (140,000) are in areas that offer less than 30Mbps download speed and just under half (46%) (560,000) are in areas offering less than 100Mbps.

Figure 15: £bn GVA uplift if businesses premises with poor broadband were able to upgrade

	Less than 10Mbps	Less than 30Mbps	Less than 100Mbps
Number of business premises	28,459	142,268	565,875
% of business premises	2.3%	12%	46%
Approx. GVA uplift if all upgraded (£bn)	14.21	67.95	259.50

A number of recent surveys, in different parts of the UK, show that business GVA increases, often significantly, if they are able to access faster better broadband.

What if:

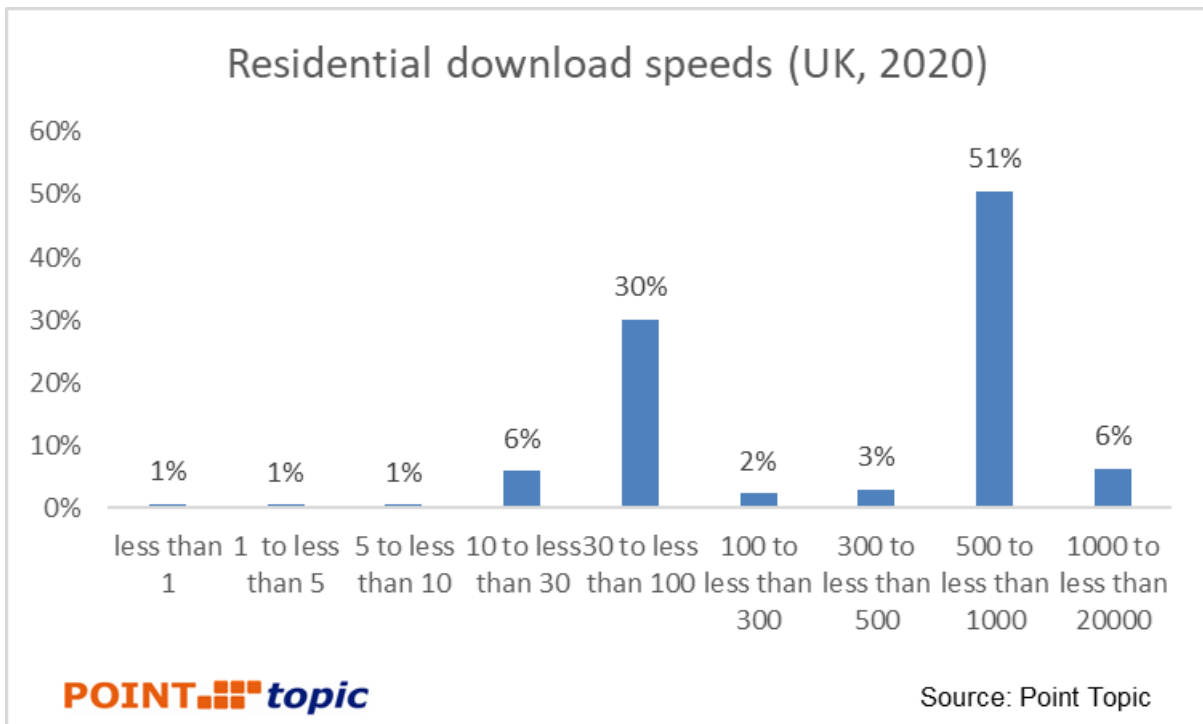
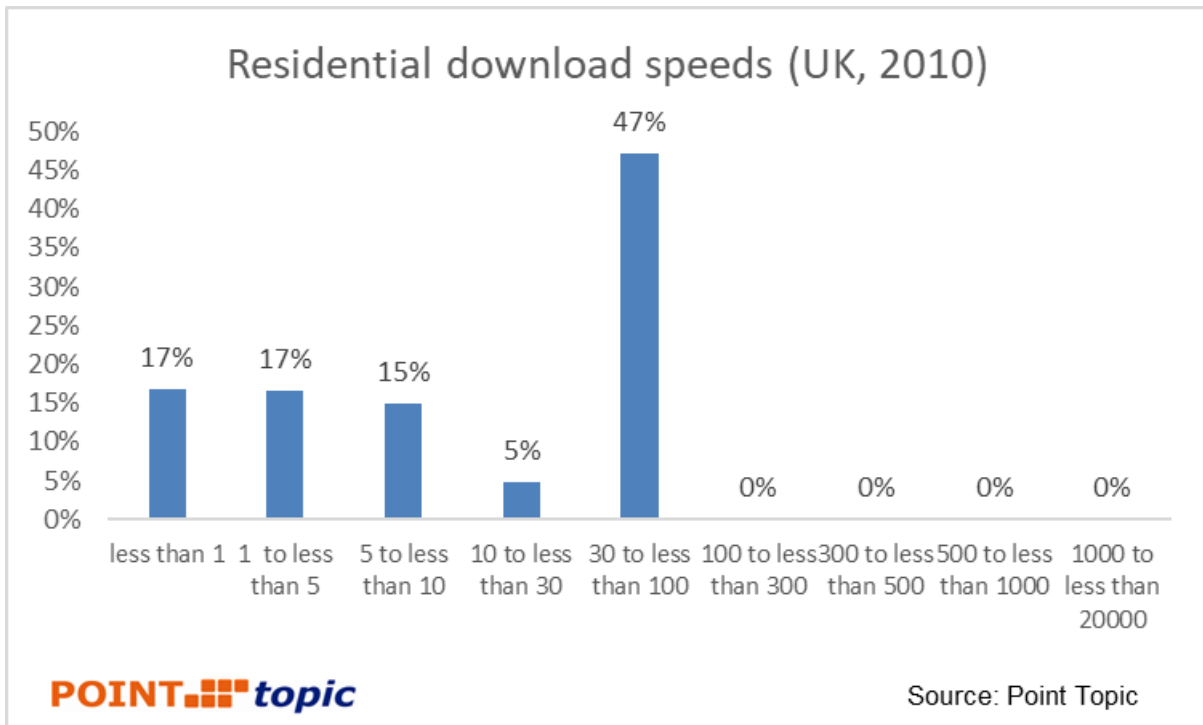
1. All those businesses in areas offering less than 10 Mbps were able to access faster better broadband? Our calculations suggest that if all upgraded, this could generate circa £14.2bn additional GVA.
2. All those businesses in areas offering less than 30 Mbps were able to access faster better broadband? Our calculations suggest that if all upgraded, this could generate circa £67bn additional GVA.
3. All those businesses in areas offering less than 100 Mbps were able to access faster better broadband? Our calculations suggest that if all upgraded, this could generate circa £260bn additional GVA.

These are of course very approximate calculations, the precise GVA uplift depends on a number of variables, such as the proportion that upgraded if faster speeds were available, the speed to which they were able to upgrade, their ability to optimise the faster broadband, and the extent of displacement that occurs – BUT – as a very high level estimate, this analysis does provide one indication that UK business GVA would/could, all else being equal, increase significantly if those areas offering poor broadband speeds were upgraded.

In residential properties, broadband speeds have greatly increased

In 2010, 53% (14,083,317) of residential properties recorded an average download speed of less than 30Mbps, whereas in 2010, 92% (26,352,771) had download speeds of above 30Mbps.

Figure 16: Comparison of residential download speeds (Mbps) in 2010 and 2020



Fast broadband is enabling increased flexible working

Increasing availability of fast broadband, to business premises, on the move and to households is enabling increased flexible working. For example, homeworking has slowly been rising as has mobile working, thanks to improving connectivity.

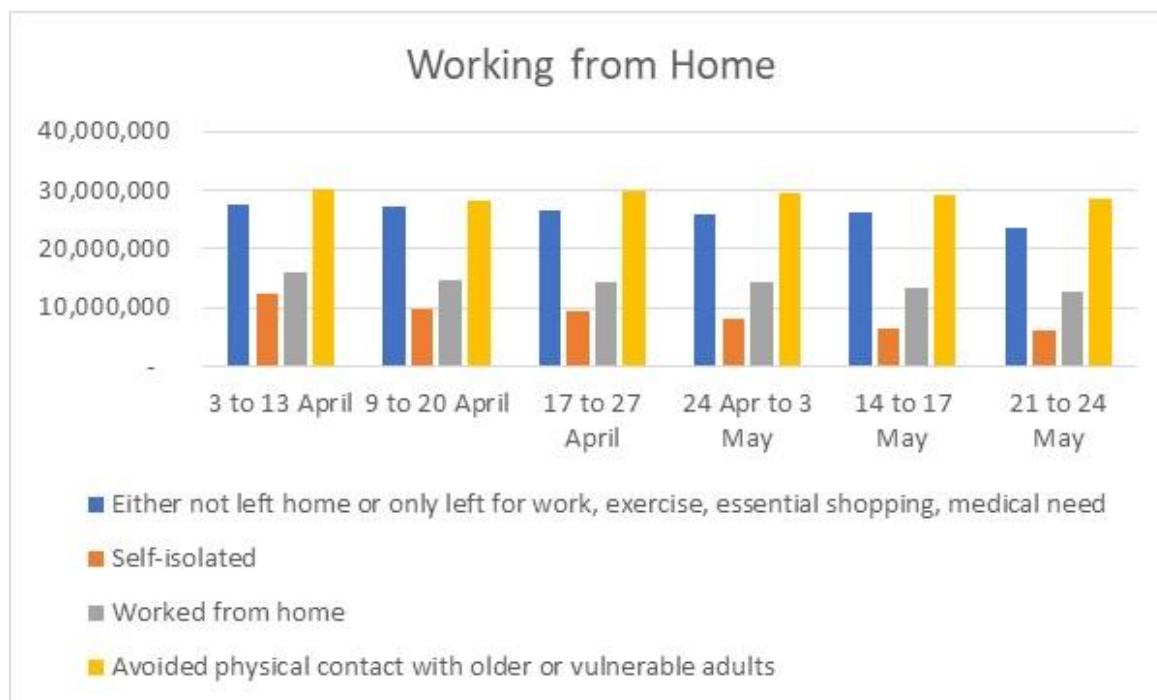
Fast broadband has enabled much of the economy to keep going during the Covid-19 lockdown

We have however seen a rapid transformation in the last 3 months. During the Covid-19 lock-down, all those who were able to work from home were asked to do so, and they are still being asked to do so, to reduce use of public transport and to reduce congestion for those who have to go in to work and will tend to use the car where possible.

This resulted in a rapid and massive migration to home working, almost overnight. Homeworking is something that the Government has been gently encouraging for years, in order to reduce congestion and pollution from commuting, but no one envisaged such a massive and rapid transformation.

Between April and May, the period for which figures are available, just over 14 million people worked from home. This represents 44% of the workforce.

Figure 17: Number of workers working from home during the Covid-19 lock-down



Source: Adroit Economics calculations

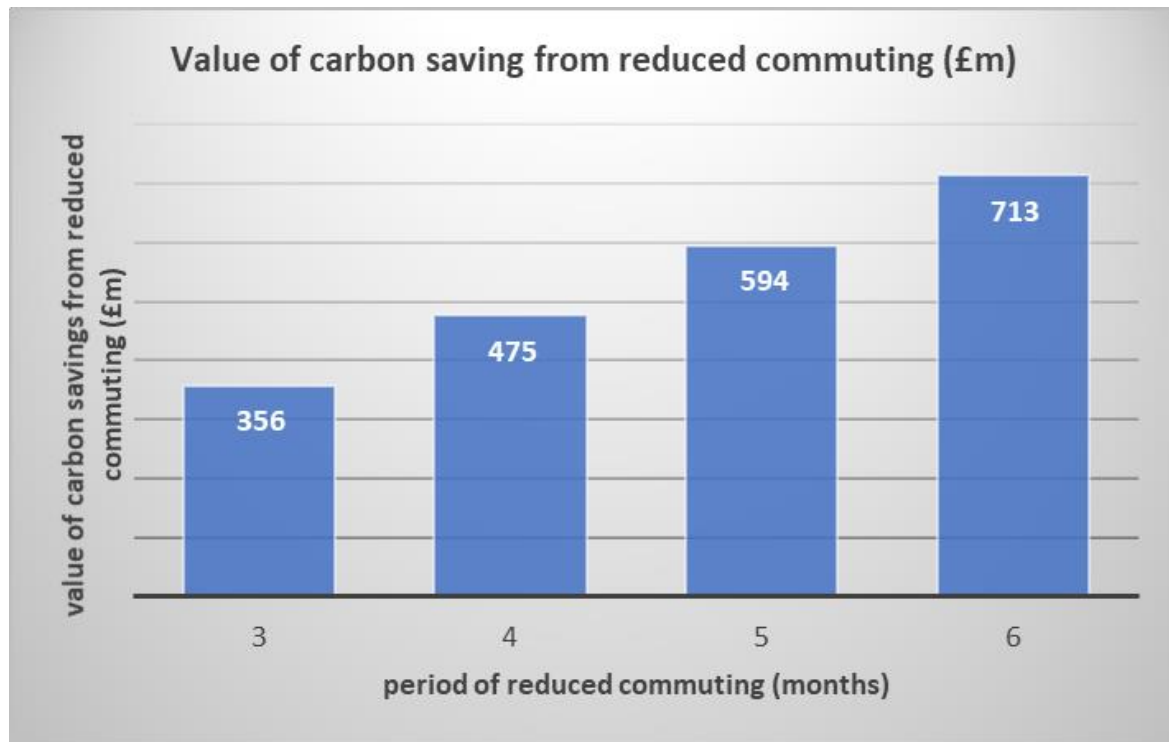
This meant that those 14m people would not be commuting to work. The average commute generates 967kg CO₂e per annum, which translates into a carbon cost of approximately £100 per commuter³.

³ Carbon saving is currently valued at £104 per tonne – HM Treasury Green Book

All else being equal, this suggests significant carbon savings as a result of the high level of home working during the Covid lock-down. Assuming home working continues at this level, this suggests that:

- Over a 3-month period, a carbon saving valued at £356m
- Over a 6-month period, a carbon saving valued at £713m

Figure 18: Value of carbon saving from reduced commuting due to more people working from home



Source: Adroit Economics calculations

If this new pattern of home working, becomes the new normal, the value of carbon saved over a year would be £1.4bn.

This is only possible because of widely available consumer broadband. Some have however struggled with homeworking, because of poor connections, usually insufficient bandwidth, particular in the more remote rural areas, but also found in pockets in urban areas.

This suggests the need for significant additional investment in rollout of network infrastructure, to residential premises, but also to business premises, enabling better more efficient connectivity between those working in the office and those working at home.