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The value of Digital Terrestrial Television in an era of increasing demand for spectrum

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Foreword

By Caroline Thomson, Chair of Digital UK

Television matters. It is one of the nation’s favourite pastimes, part of the fabric of our society. This country’s TV industry produces some of the best programming in the world. UK originated content is, quite simply, world-beating. And, importantly, is highly valued by UK consumers.

The BBC, ITV, and Channels 4 and 5 invest more than £3 billion a year in content that’s devised and created here in the UK - an investment that has driven enormous growth in the UK’s independent production sector. Much of this programming is increasingly in demand abroad and UK television export sales grew to £1.2 billion in 2012. Whether it’s drama or documentaries, arts or currents affairs, comedy or sport, entertainment or news - the programmes supported by UK public service broadcasters are among the most sought-after in the world.

The aim of these broadcasters is to deliver high-quality original content to everyone, wherever they are and whoever they might be. Free-to-air television is fundamental to this. So too is Digital Terrestrial TV which delivers Freeview, the country’s most popular platform watched in three-quarters of homes. It’s universally available, accessible using low-cost equipment and free at the point of use. In the last ten years, DTT has evolved to offer viewers extra features, including digital recording, a growing line-up of HD channels, and on-demand (most recently through YouView). This process must continue if UK television is to thrive in the years to come.

However, the health of DTT relies on spectrum which we recognise is a finite resource and for which there is increasing demand from a range of alternative users and uses. This report considers the social and economic value of the terrestrial television platform both now and in the future, in the context of current debates over the future use of spectrum. For the first time, the report provides a true insight into the vital role that terrestrial television plays for UK consumers - and crucially the potential economic and consumer impact of reducing the amount of spectrum available for broadcasting.
The report demonstrates that:

- DTT plays a critical role in the overall UK broadcasting and content ecology.
- The economic benefits of DTT are considerable and higher than previously estimated.
- DTT delivers more value than mobile broadband, when the amount of spectrum used by the respective services is taken into account.
- A strong DTT platform is critical to healthy competition in the TV market, and to the realisation of a wide range of social benefits.

Digital UK and our members - the BBC, ITV, Channel 4 and Arqiva - hope that this study will help policy makers charged with decisions on spectrum, particularly when weighing the costs and benefits associated with major changes. Digital switchover and the public’s support for Freeview are a British broadcasting success story. We must ensure that decisions taken on future use of spectrum avoid a detrimental impact on consumer choice, platform competition, content investment and the wider creative industry and its ability to drive jobs and growth.

We look forward to working together with Government, Ofcom and the wider industry to ensure terrestrial television continues to deliver for the UK.
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1. Executive Summary

DTT’s success to date

DTT is a UK broadcasting success story, delivering benefits for viewers and for the UK economy.

Since its launch in 1998, DTT has grown to become the UK’s leading television platform. It is used by 75% of households (with 40% of primary TV sets and on secondary sets in a further 35% of homes), and is present in nearly twice as many homes as its nearest rival, pay satellite. It is the leading free platform by a wide margin, with 83% share of free-to-air (FTA) households. It accounts for more viewing than any other platform, taking 44% of all viewing hours. It ensures wide availability of a low-cost multi-channel option for viewers who are unable to or choose not to subscribe to pay platforms, and therefore plays a pivotal role in providing universal, low-cost access to PSB\(^1\).

DTT also helps support significant economic activity in the TV sector. Based on the proportion of viewing that is via DTT, the platform helps deliver £3bn of TV sector revenues, £2.2bn of the sector’s gross value added and 15,000 of the jobs in broadcasting and independent production. By helping to sustain the performance of the main UK public broadcasters, DTT in turn helps guarantee high levels of investment in original UK content across the sector.

But DTT uses valuable spectrum to deliver its service. As demand for mobile data grows, the spectrum in the 700 MHz band and below used by DTT has come under increasing scrutiny. Although vital for the sustained success of DTT, it is also of potential value for mobile use. A key question for future policy, therefore, is how best to secure the continuing benefits of DTT, while ensuring appropriate provision is made for new mobile use.

In this report, we examine the economic and social value of DTT in detail, review the value of spectrum for broadcast and mobile uses, and consider the implications for future spectrum allocation.

DTT’s economic surplus

To assess the value of DTT, we need to understand the direct economic surplus it creates. Simply put, the economic surplus is the

\(^1\) Public Service Broadcasting
difference between what consumers would be willing to pay for a service, and what it costs suppliers to provide that service. (We return later to the wider benefits beyond the economic surplus that DTT delivers, both in terms of its positive impact on competition and innovation, as well as its support of important social benefits).

In assessing DTT’s economic surplus, we have taken as our starting point the 2012 Analysys Mason report for DCMS on the surplus created by spectrum in different uses in the UK. Analysys Mason estimate the surplus from DTT at £63.6bn. We have adjusted this figure, primarily to exclude certain BBC costs not associated with DTT, and to allow for the value created for advertisers by DTT. Based on this, we believe the economic surplus stemming from spectrum allocated to DTT is approximately £80bn.

**A comparison of DTT’s economic surplus with that of mobile broadband**

In the same report, Analysys Mason said that Public Mobile created value of £307bn. However, simply comparing this to DTT’s £80bn tells us little about how best to allocate spectrum between the two. To understand whether it makes sense to transfer additional spectrum to mobile from TV, we need to know which is the more efficient user of spectrum at the margin. To understand this we need to take into account:

- In creating its value, mobile uses more than twice the spectrum allocated to DTT.
- Extra spectrum for mobile would be used to accommodate data growth – but data’s value per MHz (unit of spectrum) is far lower than the average for mobile overall.
- Data growth is being driven primarily by video, which (per unit of capacity) is less valuable than existing uses of data such as email.

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2 This is a simplification – see page 19 for a more detailed discussion
3 Analysys Mason, *Impact of radio spectrum on the UK economy and factors influencing future spectrum demand*, 5 November 2012
4 Ten-year NPV basis
5 Excluding the spectrum temporarily allocated to two HD muxes, currently being rolled out
• Wifi represents an increasingly viable substitute for mobile data (today three-quarters of tablets are wifi only, with no mobile connectivity).
• Less spectrum for DTT could have a disproportionate impact on its value since the range of channels is a vital element of consumer choice.

Based on these and other factors, we estimate the average and marginal value of spectrum allocated to DTT and mobile as shown in Figure 1. In particular, the marginal value of DTT spectrum is likely twice that of mobile data. On this basis, it is hard to justify assigning additional spectrum to mobile at the expense of DTT.

**DTT’s dynamic impact on competition and innovation**

Beyond the simple economic surplus of DTT addressed in Analysys Mason’s work and our discussion above, there are also important economic externalities (benefits not directly captured by producers or consumers) associated with spectrum allocated to DTT. These are additional to the values above, and include:

*Driver of platform competition*
As the largest free-to-air TV platform, DTT plays a vital role in ensuring healthy competition between platforms. For instance, the Competition Commission has said it is an “economically significant constraint on Sky’s basic packages”. DTT also provides choice for those consumers who strongly prefer an FTA option, and because cable networks cover only around half of UK households, in many parts of the UK DTT is the only non-satellite option (and is essential for households without the option of a dish).

Platform competition also benefits channels by providing them with various routes to audiences, leaving them less beholden to any one platform operator.

*Spur to platform and content innovation and investment*
Competition between platforms drives innovation in service delivery in premium pay services, which need to stay a step ahead of the DTT

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6 See page 26 onwards for a more detailed discussion of our approach
7 Note that this doesn’t imply that DTT should be able to outbid MNOs for spectrum. Most of the value created by DTT is for audiences, but since they are not customers of DTT operators or broadcasters, this value is inaccessible, and cannot be used to bid for spectrum
8 Competition Commission, Review of the Seabright report, 28 January 2011
free platform in order to justify their price premium. By this mechanism DTT delivers value not just to its own customers, but to all UK TV consumers. Similarly, DTT acts as a spur to content investment by pay operators, which in turn contributes to the UK’s successful independent production sector and position as a leading exporter of TV content.

**Contributor to competition in broadband markets**
As broadband moves increasingly to bundled offers (including TV and voice services) provided by a small number of large players, DTT has played a critical role both in ensuring that there is a strong TV platform available in unbundled form, and by enabling the emergence of rival bundled packages. This has been the driving force behind YouView, which has enabled BT and TalkTalk to provide triple-play bundles that are competitive with those offered by Sky and Virgin. DTT is an essential component of YouView, and by extension an important enabler of future healthy competition in broadband.

**The wider social benefits of DTT**
It has long been recognised that, in addition to the economic benefit derived from the platform, significant social benefits are supported by DTT.

**Support for PSB**
An important rationale for the platform has always been the support it offers for PSB. DTT’s ability to reach over 98% of the population, unmatched by any other delivery system, plays a key role in ensuring that PSB content, with its broad mix of public purposes, has the widest possible reach and impact.

Support for the BBC licence fee, which underpins PSB, is dependent on a universally available FTA platform: any change that made PSB content available only as part of a subscription package would undermine this, and therefore weaken support for PSB more widely.

**Platform plurality**
The competition DTT provides in the platform market also delivers plurality of TV platform ownership, making it less likely that any one platform owner could be in a position to exercise undue influence over public opinion or the political agenda.

**Public Policy support**
Unlike other FTA platforms, DTT has some unique benefits of its own in supporting specific public policy goals:
• The delivery of commercial PSB is directly linked to the availability and use of spectrum – the value of which is taken into account in calibrating the level of PSB obligations the channels must support.
• Local TV services are entirely dependent upon DTT.

Future prospects for DTT

A healthy future with sufficient spectrum
Spectrum decisions must take into account not just DTT’s value today, but its longer term value.

Assuming sufficient spectrum continues to be available there is every reason to expect DTT will continue to thrive (as Ofcom and industry analysts agree). The consumer proposition will continue to improve, supported by additional HD channels and continuing improvement in and adoption of YouView and OTT services. ISPs such as BT and TalkTalk will continue to support the platform. Finally, technological development of the platform will enhance both range of services and the viewing experience itself.

Developments in the market are unlikely to undermine DTT’s prospects – for the foreseeable future, there are no effective substitutes. IPTV, sometimes suggested as a replacement, is at best a long-term prospect: fixed broadband adoption in 2030 is only projected to be 87%; and even for those DTT households with broadband (currently only 60%) there are significant market and technical challenges to be overcome, including traffic charges, broadband quality, adoption of IPTV-capable equipment and rights issues.

In combination, these factors mean that the DTT platform – provided it has sufficient spectrum to remain robustly competitive – has a healthy future.

Loss of value with insufficient spectrum
However, it is also important to consider what the future might look like if DTT no longer had access to the spectrum it needs, and consumers were forced to choose another platform. In particular, we must assess whether Freesat, the main remaining free platform, could be an effective substitute for DTT.

In a hypothetical scenario in which DTT no longer exists, we think it is highly likely that the established pay operators would be the prime beneficiaries. Sky in particular would have both the incentive and

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9 See page 56 onwards for details
ability to attract former DTT viewers to its satellite platform. It would most likely mount a concerted campaign to attract new subscribers, and would have significant advantages over Freesat in doing so, including: far greater promotional power (with a marketing budget of £1.1bn compared to Freesat’s total operating expenditure of £12m); the ability to deny channels to Freesat by paying them to join Sky’s premium package; subsidised installation; and even the use of its own ‘freesat from Sky’ option to attract users who could be subsequently up-sold. The PSBs would be constrained by policy and regulation from giving Freesat preferential promotional support.

In this context the economic and social benefits associated with DTT would be at risk:

- Consumer choice (and value) would be reduced. For 50% of households, there would only be a choice between two satellite platforms, a strong Sky and a relatively weak Freesat, and many former DTT households would move to a pay rather than free platform.
- There would be a reduction in platform competition, with knock-on effects on price, quality, content investment and innovation – in broadband as well as TV markets.
- Public support for PSB and the licence fee would over time weaken. PSBs’ viewing shares might be expected to erode by up to 30%, with adverse consequences for their delivery of important social objectives and investment in original UK content.

Another possible scenario might involve a reduction in the scope of the DTT platform to the public service multiplexes. However, this is arguably an even worse scenario than a simple abolition. It would release far less spectrum (approximately one third of DTT’s total) and impose substantial transition costs on both consumers and mux operators (for spectrum replanning). However, it would result in a far less attractive platform unlikely to be competitive in the market and would be expensive to operate (since the fixed costs would be shared between fewer channels). Such a platform might well not be sustainable, resulting over time in exactly the same adverse consequences as the ‘abolition’ scenario.

**Concluding observations**

It is generally agreed that the DTT platform is a powerful supporter of the PSB ecosystem. However, it would be very wrong to argue that

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10 A mux is a bundle of DTT channels carried together on a given frequency in a particular location
the case for DTT spectrum depends on that. In fact, DTT’s case for spectrum can be made purely on the economic value it creates from the marginal MHz of spectrum it uses.

In particular, it is a critical component of TV platform competition, and is much better placed than Freesat to provide robust competition to pay operators, as well as providing critical competition within that segment of the market that will always seek FTA TV.

By matching the innovations of pay operators (such as PVRs and HD channels), DTT requires those operators to constantly raise their game in order to justify their substantial price premium. This encourages pay TV innovation and investment in both content and platforms.

Against this background, securing sufficient spectrum to enable DTT to continue its role as a robust competitor is essential.
2. The success of DTT to date

Summary
- DTT is the most popular TV platform in the UK – it is present in 75% of homes and the primary set in 40%.
- It accounts for 44% of viewing hours.
- The platform has constantly been improving, with more SD and HD channels, PVRs and integration into YouView.
- This has been enabled by ongoing investment in the technology of the platform.
- It helps generate substantial income for UK broadcasters and in turn supports content production and jobs in the UK TV sector.

DTT’s history and market position

Broadcast TV in the UK continues to thrive. Despite the increasing range and availability of content on the internet, broadcast TV consumption has grown from 3.6 to 4 hours per person per day between 2007 and 2012.\(^{11}\)

DTT has been a critical element of the sector’s success.

Its genesis in the UK was a 1995 Department of National Heritage white paper. This opened by saying:

“Digital broadcasting could mean many more television channels and radio stations. ... It will provide significant opportunities for the British manufacturing and programme production industries. In the longer term it may be possible to switch off analogue transmissions of terrestrial broadcast services, releasing significant amounts of valuable spectrum for further broadcasting or other use”.\(^{12}\)

In the subsequent 20 years, most of these objectives have been met.

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\(^{11}\) Time-shifting via PVRs, which now represents 10% of viewing, has contributed to this growth. Fig 2.56, Ofcom, *Communications Market Report 2013*, 1 August 2013

At its launch in 1998 DTT provided a mix of free-to-air channels from the public service broadcasters (PSBs) and a pay platform called ONdigital, serving approaching 70% of the population.\(^\text{14}\) It was re-launched as Freeview in 2002, and today the platform offers 59 free-to-air TV channels (including four HD) and reaches 98.5% of the population.\(^\text{15}\)

DTT has grown to become the leading television platform in the UK, present in 75% of homes. It serves the primary set in 40% of households (Figure 2). In a further 35% of homes it is used on a secondary set. Consequently it is present in almost twice as many homes as its nearest rival, pay satellite. It is the leading free platform by a wide margin, with 83% share of FTA households. (Free satellite takes the remaining 17%).\(^\text{16}\) Thus it has played a pivotal role in providing universal, low cost access to PSB.

DTT is particularly important for certain audiences, not least because of its emphasis on free-to-air TV. For older households, 58% are dependent on DTT. In DE households, the figure is 48%. These households are particularly significant because they tend to be heavier viewers of television. Consequently DTT’s viewing share is higher than its share of households might suggest.

\(^\text{13}\) Ofcom, Digital Television Update, April 2013
\(^\text{14}\) ONhistory, ONdigital in brief [accessed 2 October 2013]
\(^\text{15}\) For the PSB channels – others have a slightly lower coverage
\(^\text{16}\) Ofcom, Digital Television Update, April 2013
\(^\text{17}\) BARB, Establishment survey – April to June 2013. Age based on BARB’s ‘housewife age’
Indeed, it is the most important platform as measured by viewing, accounting for almost 44% of viewing hours. In recent years it has been the prime beneficiary of digital switchover (DSO) since it has been the platform of choice for former analogue viewers, and for secondary sets in many more households DTT has gained 30 percentage points of viewing share over the last six years, compared to 8 for satellite (free and pay) and 3 for cable.

DTT’s improving proposition

While DSO has been one factor bringing consumers to DTT, so too has been the continually improving DTT offer. Examples of enhancements to the platform include:

- **The addition of HD channels.** Since late 2009, HDTV on Freeview has been rolled out, providing coverage of four HD channels to virtually all UK households. By the end of 2012, 7.3m Freeview HD units had been sold.\(^\text{19}\)

- **The expansion of channel line-up.** As of April 2007 Freeview offered 34 24-hour SD video channel slots.\(^\text{20}\) Today there are 49 SD slots and 5 HD slots.\(^\text{21}\) If one HD slot is equivalent to two SD slots, this represents a 74% improvement in performance.

- **Standardisation, branding and promotion of Freeview PVRs,** initially under the name ‘Freeview Playback’ and now called Freeview+, from 2007 onwards. As of July 2013, 4.3m Freeview PVRs had been sold.\(^\text{22}\)

- **The launch of YouView.** The future of DTT has been supported by the creation of YouView. YouView integrates Freeview linear TV with catch-up services, a PVR and on-demand content. Up to March 2013, we estimate £95m had been invested in developing YouView.\(^\text{23}\) As of May 2013,

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\(^{18}\) Fig 2.5, Ofcom, *Communications Market Report 2012*, 18 July 2012; Ofcom, *Communications Market Report 2013*, 1 August 2013. Small shares for analogue satellite and cable omitted

\(^{19}\) GfK, *Panelmarket*, Sales Units, December 2012


\(^{21}\) Since some of these slots are shared by different channels broadcast at different times of the day, the total number of channels on the platform is considerably larger. Figures sourced from Communications Chambers analysis of astra.org data

\(^{22}\) GfK, ibid

400,000 YouView boxes had been provided to consumers,\(^{24}\) and by August 2013 TalkTalk alone had provided 500,000.\(^{25}\)

- **Connected TV services:** Arqiva, utilising DVB-T2-capable receivers, now offers Over-the-Top (OTT) services to DTT consumers.

Today there are nine different national DTT muxes\(^{26}\), (six active and three being rolled out), operated by a mix of public bodies (the BBC), commercial PSBs (ITV\(^{27}\) and Channel 4) a not-for-profit (Comux) and purely commercial entities (Arqiva and SDN\(^{28}\)). This diversity has supported product enhancements across different dimensions. The three new muxes are COM7, COM8 and Comux. COM7 and COM8 will operate in the 600 MHz spectrum band providing additional HD channels until such time as that spectrum is allocated to an alternative use (no earlier than 2018). They will operate on next-generation DVB-T2 transmission technology, and part of their purpose is to encourage consumers to transition to this technology. Comux will provide local TV to an increasing number of locations.

<table>
<thead>
<tr>
<th>Figure 5: National DTT muxes</th>
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<table>
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<tr>
<th>Operator [Owner]</th>
<th>Mux name</th>
<th>Indicative Coverage</th>
<th>Sample Channels</th>
</tr>
</thead>
<tbody>
<tr>
<td>BBC</td>
<td>PSB1</td>
<td>98.5%</td>
<td>BBC SD channels</td>
</tr>
<tr>
<td>Digital 3 &amp; 4 [Ch 3 licensees and Ch 4]</td>
<td>PSB2</td>
<td>98.5%</td>
<td>ITV &amp; Ch 4 SD channels, Ch 5</td>
</tr>
<tr>
<td>BBC Free to View Ltd</td>
<td>PSB3</td>
<td>98.5%</td>
<td>PSB HD channels: BBC One HD, ITV HD...</td>
</tr>
<tr>
<td>SDN [ITV]</td>
<td>COM4</td>
<td>&gt;90%</td>
<td>ITV3, QVC, Quest ...</td>
</tr>
<tr>
<td>Arqiva</td>
<td>COM5</td>
<td>&gt;90%</td>
<td>Pick, Dave, Really ...</td>
</tr>
<tr>
<td>Arqiva</td>
<td>COM6</td>
<td>&gt;90%</td>
<td>Film 4+1, Viva, BT Sports ...</td>
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<tr>
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<td>COM7</td>
<td>70% (Target)</td>
<td>BBC 4 HD, Al Jazeera English HD ...</td>
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<tr>
<td>Arqiva</td>
<td>COM8</td>
<td>70% (Target)</td>
<td>TBD</td>
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<tr>
<td>Comux</td>
<td>LTVmux</td>
<td>49% (Target)</td>
<td>London Live, That’s Oxford</td>
</tr>
</tbody>
</table>

### Underlying technical improvements

The expansion in channel slots and addition of HD mentioned above result from steady improvements to the technology of the DTT platform, allowing it to do more with the same amount of spectrum. These improvements have included:

- **Use of more efficient transmission parameters.** Several improvements in transmission parameters and standards have led to a step change in capacity. For example, one

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\(^{24}\) BBC Trust, *Trust to examine BBC’s participation in YouView*, 30 July 2013

\(^{25}\) TalkTalk, *TalkTalk signs up 500,000th customer for TV service*, 28 August 2013

\(^{26}\) This figure excludes the Northern Ireland and Manchester muxes

\(^{27}\) And other Channel 3 licensees

\(^{28}\) Owned by ITV
multiplex\textsuperscript{29} has already been transitioned from one DTT standard to another (DVB-T to DVB-T2 – a complex transition which requires substantial time and investment).\textsuperscript{30} These various improvements have resulted in a 40% uplift in the aggregate capacity of the DTT platform over the last five years.

- **Improvements in compression via better encoding.** Compression is what determines how many channels can be carried in a given bandwidth of data. Technical improvements to encoding and the transition to a new generation of compression (MPEG-4) have enabled more channels to be offered over the same DTT bandwidth.

- **Improvements in compression via stat-muxing.** By dynamically allocating greater bandwidth to channels that need more (perhaps because there is rapid motion on screen), overall bandwidth requirements can be reduced. Bandwidth is ‘borrowed’ from channels that, at that moment, need less. Such ‘stat-muxing’ techniques can provide a 20–25% efficiency gain for a mux with 8 channels. All UK muxes now make use of stat-muxing.

**Economic scale**

As a result of all these developments, DTT is now a platform of significant economic scale. In the Annex\textsuperscript{31} to this document we set out a detailed analysis of this scale on several dimensions, but summarise it briefly here.

The DTT platform employs around 1,000 people directly (on operating transmitters, managing multiplexes and so on). Capital expenditure is running at £50m per year, with a total annual economic output of £440m.

But this is only a small part of the story. More important is the contribution DTT makes to the audiences and revenues of the services it carries and in turn to the levels of original UK TV content investment that they can afford. One way of estimating that contribution is to take DTT’s share of overall viewing and use that to calculate the proportion of total TV revenues, output etc. which can be attributed to DTT. This is obviously only a rough and ready

\textsuperscript{29} A multiplex is a nationwide set of transmitters carrying certain channels – in this case, the PSB3 multiplex which carries the HD channels

\textsuperscript{30} DVB-T and DVB-T2 are the first and second generations of the DVB terrestrial broadcast standard. DVB-T has been in widespread use in many countries for several years. DVB-T2 was first used in 2009 in the UK

\textsuperscript{31} Page 72
measure, but it does provide a broad-brush indication of DTT’s overall economic scale and significance.

As noted above, DTT accounts for 44% of total UK viewing. On a pro-rata basis, this means that £2.95bn of annual TV revenue (licence fee and advertising income) can be attributed to the DTT platform. On a similar basis, we can also examine the ‘gross value added’ of DTT to the sector (the value produced by the services carried by DTT less the costs of the inputs used in creating that value). Using recently reported economic multiplier analysis, we have calculated DTT’s GVA as around £2.2bn a year. In turn, DTT helps support 15,000 jobs in TV production and broadcast and annual content investment of £1.5bn.

Some of this economic activity might exist in DTT’s absence, if the PSBs and other DTT channels were able to continue to attract audiences and revenues on other platforms. On the other hand, without DTT, the PSBs might be significantly weakened, such that much of this activity would simply disappear. We will return later to this issue.

**Conclusion**

DTT has been and continues to be a great success story, based on a continually improving proposition to consumers. It is a key viewing platform, supports a large share of TV sector income, and in turn helps support TV production and jobs. We now turn to a quantification of the economic benefits of DTT, and how this relates to the spectrum used by the platform.
3. The economic value from spectrum allocated to DTT

Summary
- Spectrum allocated to DTT creates value for:
  - Viewers
  - Listeners to radio via the DTT platform
  - Advertisers
  - ‘Companion users’ (other users who share the spectrum with DTT)
- Previous work by Analysys Mason for DCMS estimated just the value to viewers at £64bn.
- We estimate the total economic welfare from DTT at £80bn.

As we have seen, DTT is a successful and vital part of UK broadcasting. However, in achieving this success DTT has made use of spectrum, an important public asset. Thus it is right to consider whether DTT is an efficient user (in an economic sense) of that spectrum. We do so over the next two chapters, building on prior work by Analysys Mason. We first look at the economic surplus created by allocation of spectrum to DTT, and then compare this (on a per MHz basis) to that created by allocation to mobile.

Prior work on DTT’s economic surplus

The starting point for any assessment of the economic value of spectrum allocated to DTT is to assess its contribution to economic welfare. Overall economic welfare is defined as the sum of ‘consumer surplus’, ‘producer surplus’ and any externalities (wider social or economic benefits not captured by the market). Consumer surplus is a measure of the difference between what consumers would be willing to pay for a product or service and what they actually have to pay. Producer surplus is a measure of the difference between what a supplier charges for a product or service and its cost of production.

In November 2012, DCMS published a report by Analysys Mason on the economic surplus created by spectrum in different uses in the UK.\(^{32}\) This included an estimate of the surplus from DTT, of £63.6bn, of which £60.7bn was consumer surplus, and £2.9bn was producer surplus. These figures are on a 10-year NPV basis, and factor in an

\(^{32}\) Analysys Mason, *Impact of radio spectrum on the UK economy and factors influencing future spectrum demand*, 5 November 2012
assessment of changes over time to the value of DTT and its adoption.

Analysys Mason estimated consumer surplus by using an assumed ‘choke price’\(^{33}\) to model willingness-to-pay for TV, in turn based on previous willingness-to-pay research which covered both the BBC and commercial PSB channels. By deducting the costs to consumers of purchasing DTT equipment, this enabled a calculation of the consumer surplus. Producer surplus was based on an allocation of broadcaster advertising and licence fee income to DTT households, less relevant distribution and allocated programming costs.

Analysys Mason acknowledge that this approach does not address externalities associated with television, such as social inclusion and cohesion, public information, and education. We return to these wider benefits in chapters 5 and 6. However, even within the scope of direct, private economic surplus, we believe that there are four adjustments necessary to Analysys Mason’s headline number, before it can be used as a basis to understand the value created by spectrum allocated to DTT:

- We differ from Analysys Mason on their treatment of the licence fee costs attributed to DTT. They attribute not just the BBC’s cost for TV, but also those for radio. We believe the costs for radio should be excluded (other than those associated with radio consumption via DTT – see below).
- Analysys Mason’s work does not address the surplus created for advertisers from TV advertising delivered by DTT.
- The Analysys Mason figure is that created by television on DTT. However, the platform also delivers radio, and so the value of radio listening on DTT is also relevant to a spectrum allocation to that platform.
- Finally, any consideration of spectrum allocation to DTT needs to factor in companion users – other spectrum users that ‘cohabit’ with DTT in the relevant bands, such as PMSE and (in future) white space devices.

We consider the above four issues in turn.

**Reallocation of radio and online costs**

As noted, Analysys Mason set against the benefit derived by consumers the cost of the BBC licence fee, including the costs to the

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\(^{33}\) A choke price is the price point beyond which no-one would buy the product in question
BBC of providing radio and, we believe, BBC online services. In one sense this is an economically pure approach, offsetting the benefits of a consumer’s decision to watch TV with the costs that decision triggers for the consumer.

However, we do not believe that it is the appropriate approach, if the issue at hand is the economic and societal value created by assigning spectrum to DTT or other uses. In this context, we believe it is better to allocate radio costs to the valuation of radio (and to exclude the costs of online services entirely). Whether the BBC spends more or less on radio (and, by extension, whether the licence fee is higher or lower) makes no difference to the consumer benefit resulting from consumption via DTT.

In the year to March 2013, the BBC spent £669.5m on radio and £176.6m on online. Converting this to a ten-year NPV gives a combined value of these costs of £7.3bn, which we believe has been inappropriately allocated to DTT.

**Value created for advertisers**

UK TV advertising revenues were £3,547m in 2012. For the commercial channels, 40% of their viewing derives from DTT. By implication, £1,419m of TV ad spend was to reach DTT viewers.

The value created for advertisers was that represented by the return on investment on that £1,419m. Marketing performance specialists Ebiquity calculate the return on investment of TV advertising is 70%. This implies that the value created by TV advertising on the DTT platform is £986m per year. On a ten-year NPV basis (consistent with Analysys Mason), this is equivalent to £8.1bn.

This value is additional to the £63.6bn that DTT creates for consumers. We note in passing that, from the perspective of commercial broadcasters, the £63.6bn is an externality – there is no practical way to monetise it directly, since DTT audiences are not in fact their customers. Rather, they seek to monetise the value they create for advertisers. The fact that the great majority of economic

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34 They have, however, deducted the sums associated with the BBC’s support for rural broadband, BBC Monitoring and the BBC World Service
36 These costs are assumed to grow with inflation
37 Fig 2.3, Ofcom, *Communications Market Report 2013*, 1 August 2013
38 BARB viewing data, calendar year 2012
39 Ebiquity (for Thinkbox), *Payback 3*, 9 February 2012. Note that it is not entirely clear whether Ebiquity’s calculation factors in production costs. We have conservatively assumed it does not
40 We have assumed a 1% real annual decline in TV ad revenues, and (consistent with Analysys Mason) applied a 3.5% social discount rate
value created is to commercial television an externality, is one of the reasons an auction-based allocation of spectrum would be unlikely to lead to an economically efficient result. (This is even before taking into account the social externalities of PSB and television more generally).

**Value created by radio on DTT**

In addition to delivering TV, the DTT platform is used for radio listening. Of all radio listening, 5.3% is via the TV, and we estimate that of this 40% is via DTT.\(^{41}\) This suggests 2.1% of radio value is derived from the DTT platform. Analysys Mason estimate the value of radio broadcast at £28.6bn. Net of the reallocation of BBC radio costs, this becomes £22.8bn, and DTT’s share thereof is £0.5bn.

**Value derived from companion users**

Spectrum allocated to DTT does not simply generate value via DTT itself – it also creates value via ‘companion users’ of that spectrum. By companion users, we mean other types of use that co-exist with DTT within the relevant spectrum bands. Key examples are Programme making and special events (PMSE), Local TV and potentially in the future white space devices (WSD).

Any decision to allocate spectrum to DTT also brings the value of the companion uses at no additional cost (in spectrum). Thus the appropriate way to assess the value of spectrum allocated to DTT is to sum the value of both DTT and its companion users.

Companion use is enabled because DTT uses spectrum in a patchwork. Adjacent transmitters use different frequencies in order to avoid interfering with each other. Thus on a local basis there are gaps (white spaces) in the usage of any particular frequency. These gaps can be used by low-power transmitters, which are not powerful enough to interfere with the adjacent transmitters. (See Figure 6.) Note that it is a particular feature of DTT that it creates usable white space of this type. Mobile, for instance, does not in practice offer viable white spaces. We now consider PMSE, Local TV and WSD in turn.

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\(^{41}\) RAJAR, *All Digital Radio Listening Q2 2013*, 1 August 2013
PMSE enables technologies such as wireless cameras, microphones, in-ear monitors and so on. These may be used by broadcasters as part of programme production, but also by much smaller events organisers such as theatres, clubs, churches and so on.

PMSE uses a range of spectrum, both within and beyond that also used by DTT. It is primarily PMSE audio and data applications that operate within DTT bands. Wireless microphones, widely used in London’s West End theatres, are one example. Currently there are no technically viable alternative bands identified for these PMSE audio applications.

While the value of PMSE is real, we do, however, agree with Analysys Mason that it is impractical to quantify it. 42

Local TV licences have been awarded in 19 locations, with a further 28 to be awarded by summer 2014. The first operator to launch was Estuary TV, in November 2013. Given untested audience demand and provider economics, we have not sought to quantify the value of local TV.

White Space Devices are currently being trialled, whereby a device would query an online database43 to discover what frequencies and what power it should use in order to secure wireless connectivity without causing interference to other users, most particularly DTT. There are many potential uses of WSDs, including rural broadband, hotspot coverage, in-home broadband, in-home multimedia and machine-to-machine communication.44

The potential of WSD is such that there is a worldwide push to develop standards and technology and to secure relevant spectrum. Companies such as Google, Microsoft and BT are active participants, and the UK is one of the leaders. Ofcom is planning multiple trials of WSD by the end of 2013.

In 2009 Ofcom estimated the NPV of white space applications at £200-320m.45 (For this analysis we will take a midpoint of £260m). We believe this is a conservative estimate, with significant upside.

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42 Analysys Mason, Impact of radio spectrum on the UK economy and factors influencing future spectrum demand, 5 November 2012
43 Other technical approaches are possible, but this appears to be the most effective
44 For further discussion, see Ofcom, TV white spaces – A consultation on white space device requirements, 22 November 2012
45 Ofcom, Digital dividend: cognitive access [Consultation], 19 February 2009. Note that this NPV is on a twenty-year basis, and therefore is not strictly comparable to the ten-year NPVs in Analysys Mason. However, we have not adjusted for this since it will be appreciably offset by both inflation since 2009 and the increased certainty around WSD applications
Summary

Combining the above items, we believe the economic surplus stemming from spectrum allocated to DTT is as shown in Figure 7. In total, a consumer surplus of at least £79.8bn is generated, implying a value per MHz of £0.31bn. As we will see, the marginal value per MHz (that associated with an incremental loss or gain of spectrum) is likely to be appreciably higher than this.

<table>
<thead>
<tr>
<th>Item</th>
<th>NPV (£bn)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TV via DTT</td>
<td>63.6</td>
</tr>
<tr>
<td>Radio &amp; online cost reallocation</td>
<td>7.3</td>
</tr>
<tr>
<td>TV advertising via DTT</td>
<td>8.1</td>
</tr>
<tr>
<td>Radio via DTT</td>
<td>0.5</td>
</tr>
<tr>
<td>White space device value</td>
<td>0.3</td>
</tr>
<tr>
<td>PMSE &amp; Local TV</td>
<td>?</td>
</tr>
<tr>
<td><strong>Assigned spectrum</strong></td>
<td><strong>256 MHz</strong></td>
</tr>
<tr>
<td><strong>Average value per MHz</strong></td>
<td><strong>£0.31bn</strong></td>
</tr>
</tbody>
</table>

Figure 7: Economic surplus from spectrum assigned to DTT

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Note that this is the spectrum allocated to the six permanent muxes – we have not included the further 48 MHz recently allocated for two further temporary muxes, since these were not included in Analysys Mason’s assessment of DTT’s value.
4. The spectrum allocation choice

**Summary**

- In making spectrum allocation decisions, the critical question is the value of the marginal MHz, *not* the total value created by a given use.
- Mobile has high total value, but its growth is being driven by data, which (based on Analysys Mason figures) has far lower value per MHz – approximately £0.19bn per MHz.
- The marginal value is likely lower, since:
  - Much growth is video, with has low value per unit of traffic
  - There is great uncertainty in mobile demand forecasts
  - Wifi is an increasingly effective and economically rational substitute
- The marginal value of DTT spectrum is driven up by:
  - DTT’s dependency on wide channel choice, which means small losses of spectrum could have serious consequences
  - The need for a minimum level of spectrum to ensure coverage and to avoid interference
- We estimate the marginal value of DTT spectrum at £0.47bn per MHz – approximately 2.5x that of mobile.

**Structuring the question**

Even if DTT creates substantial economic value, alternative uses of the spectrum currently allocated to DTT may also deliver benefits, and hence must be considered before it is possible to conclude whether DTT usage is optimal for the UK. In particular, given growth in mobile data, spectrum in the 700 MHz band and below has come under increasing scrutiny. Although used for DTT, it is also of potential value for mobile use.

Some commentators have suggested that the spectrum allocated to mobile creates more value than that allocated to DTT. For instance, Analysys Mason in their November 2012 report for DCMS said that Public Mobile created value of £307bn. This compares to the £64bn value they estimated for DTT.

It is sometimes crudely argued from such figures that because mobile creates greater economic value than DTT, it makes sense to transfer spectrum from the latter to the former.

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47 Ten-year NPV. Mid-point of their estimated range of consumer plus producer surplus
Even if we granted the premise that mobile created greater value, the conclusion still does not follow – it contains several basic errors.

What matters is not total value, but value per MHz
One of the reasons mobile may create more value in absolute terms is that it already has a far greater allocation of spectrum than DTT, occupying 560 MHz to DTT’s 256 MHz.\(^{48}\) That it has ‘done more with more’ does not demonstrate that it is a more economically efficient use of spectrum.

What matters is the value of spectrum at the margin
The total value of spectrum used for mobile anyway has little relevance. What matters is the incremental value to mobile that incremental spectrum would bring (and, conversely, what value would be lost if DTT was deprived of the same quantum). Ultimately, we must assess whether the value gained from re-allocating spectrum from DTT to mobile is more or less than the value lost.

What matters is the marginal value of all applications resulting from a given allocation
As we have seen, an allocation to DTT also enables other uses of the same spectrum, as a result of white spaces. These need to be factored into the marginal value of spectrum for DTT. Conversely, spectrum allocated to mobile carries no such white space benefits.

The marginal benefits of spectrum to mobile
The first point to note regarding mobile is that it covers a range of very different services. In particular, mobile operators provide both voice and data services. The voice services are particularly valuable. According to Analysys Mason’s estimates, of the £307bn value delivered by mobile, £206bn stems from voice.\(^{49}\) Just £101bn is from data, and this is despite the fact that Analysys Mason’s methodology allows for both consumers’ willingness-to-pay for data rising appreciably over time and for increasing adoption.

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\(^{48}\) Excluding the temporary allocation of spectrum to DTT muxes COMs 7 and 8

\(^{49}\) In the more recent work by Plum undertaking a pan-European valuation of mobile, they did not split data and voice. However, they did suggest that willingness-to-pay for voice+3G data was only 70% higher than WTP for voice alone, again suggesting that the majority of total value today comes from voice (For 4G they estimated a 140% premium over voice, though widespread adoption might well require additional spectrum, which would reduce the implied value per MHz). Plum (for GSMA), *Valuing the use of spectrum in the EU*, June 2013
This view that voice is highly valuable is consistent with the fact that mobile grew to be an enormous business well before data usage became common (see Figure 8). If we mark the beginning of mass-market mobile data from the 2007 launch of the iPhone, by that year mobile revenues were already £15.0bn (as of 2012, they were £15.4bn). Clearly voice alone was enough to create great value. Of course today’s revenues are associated with a mix of voice and data, but the critical point is that the value of voice is demonstrably large, since customers were willing to pay £15bn for this in 2007, even if they are no longer required to do so today.

**Mobile data’s value per MHz**

The fact that voice creates most of mobile’s value is doubly significant because it uses so little of the network’s capacity – Ericsson estimate just 5% in Western Europe. In other words, two-thirds of mobile’s value is being created by 5% of the network capacity, and by extension 5% of the spectrum allocated to MNOs. Moreover, virtually all future growth in demand is expected to come from data – any incremental spectrum assigned to mobile will be to enable data.

Thus the value per MHz of spectrum for mobile is as follows:

<table>
<thead>
<tr>
<th>Figure 9: Mobile Spectrum Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value (£bn)</td>
</tr>
<tr>
<td>Voice</td>
</tr>
<tr>
<td>Data</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

As we can see, the value per MHz for data is relatively low, at just £0.19bn per MHz. This is just 2.5% of the value per MHz of spectrum used to support voice.

Note that this figure assumes mobile does not require additional spectrum to deliver the increased willingness-to-pay for mobile services assumed by Analysys Mason – if incremental spectrum was required, this would reduce the value per MHz.

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51 Ericsson, *Ericsson Mobility Report*, June 2013

52 Value and usage sources per text. Spectrum per Analysys Mason, *UK mobile spectrum assignments*, 8 March 2013. [MNOs only]
The marginal value of mobile data

Further, it is likely that the marginal value of spectrum for mobile data is even lower than this figure. Much of the growth in mobile traffic in the coming years is driven by video (Figure 10). On a per byte basis (and therefore also per MHz), video tends to be a relatively low-value application, since it is so ‘heavy’. One minute of YouTube video might require 6 MB, equivalent to perhaps 1,000 emails.

Mobile operators recognise that video is less valuable per byte to consumers – as one practical example Vodafone charges 62p for a video message, versus 15p for a text. However, the video message may require almost 2,000 times the traffic of the text message.55

While non-video mobile traffic is growing, so too is the capacity of mobile networks using their existing spectrum allocation – successive generations of mobile technology and more dense cell sites both enable capacity to be grown without additional spectrum. Thus it seems likely that the need for incremental spectrum is very largely driven by video, an application with low value per byte or per MHz.

Thus while the average value of licensed spectrum for mobile data may be £0.19bn per MHz, it seems likely that the marginal value is well below this, since at the margin the data in question is video.

The significance of wifi

Despite the focus on providing spectrum for mobile operators, the macrocellular network is very much secondary in providing internet connectivity to mobile devices. Ofcom has soberly noted, “Wifi is already playing a significant role in helping meet some of the increase in the use of mobile data services indoors”.56 In fact, there is widespread evidence that wifi carries the great majority of traffic from mobile devices – Mobidia estimate 81.7% for the UK as of

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53 Cisco, VNI [accessed 16 October 2013]
54 There is of course significant variation – premium sports content may have much higher value per byte than a run-of-the-mill YouTube video
55 Vodafone, Price plan details [accessed 16 October 2013]. Traffic ratio based on 300 KB cap for video messages, and 160 bytes for a text
56 Ofcom, The future role of spectrum sharing for mobile and wireless data services, 9 August 2013
January 2013, with cellular carrying just 18.3%. 57 Both consumers and MNOs have been supporting this trend, since it provides cost savings for each, and often a better user experience.

Increasing use of wifi is enabled by three factors:

- Home wifi is now very widespread, with 89% of those with broadband having a wireless router.58 There is likely potential for even more traffic to be offloaded via home wifi, given that the peak period for mobile data use is 6pm-12am, a time when many consumers are at home.59
- Out-of-home wifi is ever more widely available, with public hotspots in retail, transport and other locations, frequently provided by third parties such as Arqiva, BT, The Cloud (Sky) and Virgin. In the year to June 2013, the number of public hotspots grew by 114% to 34,000.60
- Login to hotspots is getting easier, currently primarily via automation through apps. In future SIM-based authentication (which uses the phone’s SIM identity to log in) will be even simpler, meaning that more traffic is automatically offloaded to wifi if it is available.

A further important point regarding wifi offload is that it (primarily) provides indoor coverage. This is significant because it is primarily the desire to provide improved indoor coverage that is driving mobile operators to seek more sub-1 GHz spectrum, of the type currently used for DTT. This lower frequency spectrum has greater penetrative powers, and thus is better suited for passing through walls and providing indoor coverage. However, this is precisely the situation where wifi offload can be most effective, since the wireless router is already inside the building.

In future, wifi may additionally become more important out-of-doors too. In the short term municipal wifi is serving an increasing number of streets with high foot traffic. In the longer term “White spaces could provide new capacity, while boosting the range of devices, potentially enabling Wifi networks that stretch across towns and cities”, according to Ofcom.61

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57 Figure is for Android users. Mobidia, Understanding the Role of Managed Public Wi-Fi in Today’s Smartphone User Experience, February 2013. See also WIK Consult for European Commission, Study on impact of traffic off-loading and related technological trends on the demand for wireless broadband spectrum, 2013
58 Ofcom, Communications Market Report 2013, 1 August 2013
60 Ofcom, Infrastructure Report: 2013 update, 24 October 2013
61 Ofcom, Ofcom reveals next steps towards ‘white space’ devices, 22 November 2012
Wifi has a double impact on the economic value of mobile and the consequent case for more spectrum. Firstly, by providing an increasingly potent substitute for macrocellular, it erodes consumers’ willingness-to-pay for mobile data. One tangible demonstration of this is that 76% of tablets are wifi only\(^2\) – despite this being a device with heavy data needs, for three-quarters of customers their willingness-to-pay for mobile data is less than the price charged by MNOs.

Secondly, by enabling offload, wifi reduces the data carried over the macrocellular network, and therefore decreases mobile operators’ need for further spectrum. Moreover, because wifi traffic is four times the size of that of cellular, relatively small movements in wifi usage can have much larger proportionate impacts on cellular usage. This in turn results in considerable uncertainty in mobile volume forecasts.

**Great uncertainty in macrocellular traffic forecasts**

The potential for substantial offload to wifi is just one factor that makes future levels of mobile traffic so very uncertain. Figure 11 shows various forecasts of UK demand used by Ofcom, from PA (2009), Cisco (2011) and Real Wireless (2012). What is striking is not so much the absolute levels of projected demand, but rather the enormous range in the forecasts. For instance, there is an approximately 30x difference between the RW High and the PA Low scenarios for 2025.

Such long-term forecasts are inevitably highly dependent on their input assumptions. One such assumption is the percentage of traffic that is ‘high mobility’. Fast-moving users are challenging to serve, because they require capacity from larger, less spectrally efficient cells. Real Wireless’ forecasts assume (in line with ITU guidelines) that such traffic grows as a percentage of total traffic. However, as Real Wireless notes, if the assumption was brought in line with the current mix, spectrum requirements for mobile would fall by 28%, delaying the requirement for further spectrum until 2030.\(^4\)

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\(^1\) Ofcom, *Communications Market Report 2013*, 1 August 2013


\(^3\) Real Wireless, *Study on the future UK spectrum demand for terrestrial mobile broadband applications*, 27 June 2013
The significant sensitivity to just one input assumption underlines the great risk inherent in any value attributed today for additional spectrum allocated to mobile for use in the long term – the demand that would crystallise value from that incremental spectrum is highly uncertain. (This is in sharp contrast to the value associated with the spectrum in use for DTT, which is real and current.)

We note also that mobile traffic demand is highly concentrated – less than 10% of customers consume 50% of the data. Thus the bulk of the benefits of reallocating spectrum to mobile are not widely shared.

Conclusion re the marginal value of mobile spectrum

Mobile as a whole may create significant economic value. However, much of this value is created by voice services. In no scenario are these voice services under any threat whatsoever, and hence this value is simply not relevant to any current spectrum allocation decision. What matters is the marginal value per MHz of data traffic.

As we have seen, because data is lower value than voice, but uses far more capacity, its average value per MHz is far lower. Moreover, the marginal value of data is likely to be even less than this average: most growth is driven by video, which creates relatively low value in comparison to its capacity needs; increasing availability and usability of wifi will make this a more attractive substitute for mobile data; and the future demand that underpins the value of incremental spectrum carries significant risk.

The marginal benefits of spectrum to DTT

In contrast to the situation with spectrum use for mobile data, small reductions in DTT spectrum allocation could result in big reductions in value – in other words, the value of spectrum at the margin is high.

In particular:

- Consumers are likely to be much less willing to choose a platform that has limited channel choice.
- Service providers are less likely to invest in a platform that has a smaller customer base and less scope for future development.

The value of the marginal DTT multiplex, therefore, may be considerably higher than its apparent direct value to those channels currently using it. While they themselves would lose a proportion of

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their audiences and revenues if they could no longer be on the DTT platform, all other DTT services would also be affected as DTT take-up and revenues as a whole suffered.

**Consumer preferences**

Consumer research shows consistently that the number of available channels (SD and HD) on DTT is an important factor in their platform decision. For example, Ofcom’s research for its UHF strategy shows that DTT users value having more free-to-air channels above any other platform feature such as the ability to record and pause live TV, catch-up, PVR or better EPG.

Improved channel choice can be delivered either by simply adding more channels, or by adding HD versions of existing channels. However, since the top 30 channels are almost universally available across all platforms, and HD versions of the top four are too, this set of channels are not the basis of competitive differentiation. In most consumers’ eyes they are a given. Rather it is the long tail of SD channels and ‘mid-tier’ HD channels that tip platform choice for many consumers.

As Ofcom has noted, “the attribute of the DTT platform consumers value most highly is access to a sufficiently large number of free-to-air TV channels”. Thus a loss of spectrum at the margin that reduced this channel choice would in turn reduce the platform’s overall competitiveness, and hence affect its long-term sustainability.

**Scope for future development**

As we have seen, other TV platforms continue to innovate and evolve. DTT can be no exception if it is to continue to provide effective competition to satellite and cable platforms. This includes further provision of HD services as screen sizes increase and as competing platforms promote HD, 3D and (in time) 4K services. Scope for innovation at the interface of broadcast and the internet also needs to be accommodated. While technical developments mean that more efficient use of DTT spectrum is possible, so new demands require enough spectrum to sustain the profile and competitiveness of the platform.

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66 Ofcom, *UHF Strategy Research Summary*, February 2012

67 Dave on Freesat is one exception

68 ¶1.33 Ofcom, *Securing long term benefits from scarce low frequency spectrum (Statement)*, 16 November 2012
**Stakeholder incentives**

DTT is a multiparty platform, requiring support from broadcasters, retailers, equipment manufacturers and transmission infrastructure providers. If a scaled-down DTT ceases to be of interest to any of these parties, it may be significantly weakened or fail entirely.

If a more limited DTT results in a significant loss of take-up and a consequent reduction in viewing to the channels using the platform, then key players may decide not to invest in the platform’s future – for example, in further development of hybrid TV services, or of next-generation connected TVs. Attention would be diverted to platforms which offer greater long-term potential.

*Figure 13: DTT stakeholders and competitors*

**Indicative marginal value per MHz for DTT**

We now turn to a high-level, indicative estimate of the marginal value of DTT spectrum. Our approach is to consider how DTT’s value is concentrated in its ‘last’ spectrum. By this we mean that below a certain threshold level of spectrum, the DTT platform would have no value at all. By extension, the value of DTT rises from £0 at this threshold level to its current value (£79.8bn) as its spectrum allocation rises to today’s level of 256 MHz. Its value is thus concentrated between the threshold level and 256 MHz, and by extension its marginal value per MHz is higher than its average value per MHz.

This threshold level is unknown. However, were DTT to lose one-third of its spectrum, it would be able to provide little more than the PSB channels (and their HD variants), on a national basis. It seems
questionable whether such a limited offering would be competitively viable, and thus the value of the platform could drop to zero. In other words, the threshold level could be one-third below today’s allocation. However, to be conservative in this context, we will assume that the threshold level is two-thirds below today’s allocation. This is an arbitrary figure, but the key point is that the value of DTT would almost certainly be zero even at higher levels of spectrum allocation.

Based on this (prudent) assumption, the first third of DTT’s 256 MHz of spectrum by itself has no value, and all the £79.8bn value of the platform is concentrated in the last two-thirds of the spectrum (171 MHz). By extension, this means that the value-per-MHz of the final two-thirds is higher than the average value-per-MHz of DTT as a whole. This implied marginal value is £0.47bn/MHz.

This figure is only indicative. However, the critical point is that the marginal benefit is likely higher than the average benefit. Moreover, as we will see, depriving DTT of marginal capacity would bring substantial direct costs, in addition to the loss of value created.

Comparing the marginal value of DTT and mobile

We are now in a position to compare the per-MHz value of mobile and DTT spectrum (Figure 15). The marginal value of DTT spectrum is more than twice that for mobile data. Indeed, the difference on a pure marginal basis is likely to be even greater – the £0.19bn figure is an average for mobile data (per Analysys Mason), but the marginal value is likely to be less. As discussed above, issues such as video as primary use, increasing substitution by wifi and demand uncertainty will all act to pull the marginal value of mobile data spectrum below the average value of that spectrum.

At first sight, this comparison between DTT and mobile’s per MHz value is at odds with the generally accepted view that if the spectrum came to auction, mobile operators would outbid DTT providers.

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69 See page 69 onwards for a more detailed discussion of this scenario
However, the critical point is that the great majority of the economic value created by DTT cannot be captured by DTT operators. As we have seen, just 10% of the economic surplus created by DTT stems from advertising (which is potentially accessible by commercial broadcasters). The great majority stems from consumer (audience) surplus. However, since DTT is free-to-air, there is no way for broadcasters to access this value except via the advertising revenues generated.

Thus if the spectrum was put up to auction, there is no way the DTT operators could bid to reflect the full value that the spectrum would create in their hands. The situation is very different for mobile operators, where the value creation is almost entirely within the operators or their customers. We note that the above asymmetry exists even before the social externalities of DTT are taken into account – it is driven entirely by the economic externalities associated with the audience benefit of FTA TV.

One way to assess the outcome if this audience benefit were taken into account is via consumer research. Ofcom’s work in this area does indeed suggest that at the margin consumers prefer DTT. Consumers were asked if, given the choice, they would improve mobile broadband services or improve Freeview services. Overall, 52% would improve Freeview, compared to just 21% preferring mobile broadband improvements. Even amongst mobile broadband customers there was a strong preference for improvements to Freeview (46% to 28%).

**Transition costs**

Even if, hypothetically, the marginal value of spectrum to mobile was higher than that to DTT, it would still not necessarily follow that it made sense to transfer spectrum from one to the other. Each such transfer brings both substantial direct cash costs, and softer (but real) ‘signalling’ costs.

**Cash costs**

Spectrum replanning comes with considerable one-off cash costs, which may offset some or all of any gain that may exist from more efficient use. To effect digital switchover in the UK, Arqiva spent

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70 Bdrc continental for Ofcom, *UHF Strategy Research*, February 2012
£630m over five years (ultimately borne by the mux operators via their contracts with Arqiva).\textsuperscript{71} Digital UK spent £127m on its information campaigns, £260m has been spent on the Switchover Help Scheme\textsuperscript{72} and £180m has been spent on interference mitigation. An unknown further sum has been spent on Clearance. In addition consumers have bought new set-top boxes or TV sets to receive digital signals.

Future spectrum realignments might be even more expensive, since, in the case of DSO, consumers had a powerful incentive (in the shape of many additional channels) to make the switch to DTT at their own expense. Any future realignment that required consumers to buy new equipment but receive lesser or no incremental benefit over the existing platform would obviously be far less attractive, and would therefore be more likely to require an equipment subsidy.

Even a small shift in spectrum would be expensive. Any given RF channel is used for different muxes in different parts of the country. Thus freeing up even one such channel to transfer to another use would require a full national replan of DTT spectrum usage.

\textit{Negative signals}

In addition to the immediate cash cost, each reshuffle of DTT spectrum sends a negative signal to both operators and consumers. The EBU has spoken of the “lack of certainty for future investments” and “no innovation; risk of decline, end of DTT”.\textsuperscript{73} To take a practical example, an operator may be reluctant to sign a long-term contract for transmission based on a particular spectrum plan if there is a constant risk of adjustments to its allocation.

These issues certainly apply to the companies involved, but equally a repeated need to buy new equipment simply to continue to receive DTT is clearly very negative for consumers – other platforms have no such requirement.

\textit{Other available spectrum}

Finally, even if it were agreed that a given tranche of spectrum would be more valuable in mobile use than DTT use, and it was worth the transition costs to make the transfer, such a transfer still might not be appropriate. For example, there might be other harmonised\textsuperscript{74}

\textsuperscript{71} Arqiva, “Digital Switch Over”, [website visited 17 January 2013]
\textsuperscript{72} Digital UK, “End of analogue era as switchover completes”, (Press release), 24 October 2012
\textsuperscript{73} Darko Ratkaj (EBU), The 700 MHz Band: Impact of the UHF spectrum reallocation on TV markets in Europe, October 2013
\textsuperscript{74} Harmonised spectrum is spectrum that has been internationally agreed as appropriate for mobile use. Absent such harmonisation, the lack of international economies of scale for handsets and network equipment make spectrum bands unviable for mobile use
spectrum in some other use less valuable than DTT which could instead be transferred to mobile to meet its needs. This would clearly create greater net value. For example, a requirement for greater mobile spectrum could in part be met from the 2.3-2.4 and 3.4-3.6 GHz bands. These are both harmonised for mobile, and Ofcom anticipates the release of spectrum in these bands by the MOD.75 Another alternative would be to ‘refarm’ spectrum already occupied by mobile but using older technologies, by deploying more efficient technologies such as LTE that allow greater capacity for a given amount of spectrum.

**Conclusion**

There is a consensus that in aggregate mobile creates more value than DTT from its spectrum use. However, this statement is almost entirely irrelevant to the issue of whether further spectrum should be transferred from DTT to mobile. For that issue, the critical question is whether DTT or mobile would make better use of the marginal MHz. As we have seen, there is strong evidence that DTT would in fact create greater producer and consumer surplus from the marginal MHz, even before taking into account DTT’s social benefits.

75 Ofcom, *Future demand for mobile broadband spectrum and consideration of potential candidate bands*, 18 March 2013
5. DTT’s dynamic impact on competition and innovation

Summary

- DTT has an important dynamic impact on competition and innovation.
- As the largest free-to-air platform of scale it performs a vital role in ensuring that viewers can choose between different types of platform when accessing multi-channel TV.
- Through the services it delivers, it provides an important competitive constraint on the prices charged by pay TV platforms.
- It helps drive innovation in technology, services and pricing across the sector.
- It incentivises other platform operators (and the channels they host) to invest more in original UK content.
- It offers a more open customer interface than other platforms, and through its link to IPTV, allows consumers to access a wide range of new content providers.
- It offers a valuable alternative to bundled packages of television, broadband and phone services which, over time, could significantly reduce competition in related broadband markets.

The preceding sections have considered the economic surplus created by DTT, and how (on a per MHz basis) this compares to that of mobile. While economic surplus is a useful metric, it is not a complete picture. In particular, it omits ‘externalities’, benefits not directly captured by the purchaser or provider of a particular product. One critical externality from DTT is the dynamic impact it has on competition and innovation in the wider market. This means it delivers economic value not only to those who use the DTT platform, but to suppliers and consumers of all broadcast services in the UK. In this chapter we set out this benefit.

Competition across the supply chain

Figure 17 shows the supply chain for broadcast TV in the UK.

76 Analysys Mason’s report (on which the preceding chapters were based) acknowledges that external benefits were out of scope for their figures.
DTT, as a key TV platform, most obviously has an impact on competition between platform providers. But this is to over-simplify the way the TV market works in practice. Although consumers may well take into account their preferences for aerials, dish or cable when selecting a TV platform, their decisions will also be driven by the content offered on those platforms, the subscription options available, and the ancillary services which add value to the package – such as the quality and ease of use of an electronic programme guide or PVR.

In assessing the dynamic role of DTT, therefore, we must examine not just its role as a distribution platform, but also as a downstream provider of packages of content, services and related features.

**Platform competition**

The most obvious place to start is the role of DTT as a distribution platform. The DTT platform, as the largest free-to-air TV platform of scale, plays a vital role in ensuring that consumers can choose
between different types of platform when deciding how to access multi-channel digital TV.

In its recent report on the future of UHF spectrum\(^\text{77}\), Ofcom highlighted the importance of sustaining consumer choice across TV content, platforms and equipment, and discussed the concept of the sustainability of the DTT platform as a contribution towards achieving this goal.

In the second quarter of 2013, digital satellite reached 38% of UK households via Sky and 5% of households via Freesat, cable reached 16%, and DTT reached 40% (households with DTT only). Including multiple sets, DTT reached 75% of households.\(^\text{78}\) Overall it has a 44% share of viewing.\(^\text{79}\)

Without DTT, consumer choice of TV platform would be highly restricted in some parts of the UK, as Figure 18 shows. Because cable networks cover only around half of UK households, in many parts of the UK DTT is the only non-satellite alternative. DTT is also one of effectively only two platforms (the other is Freesat\(^\text{81}\)) that offer a free at the point of use option for accessing multi-channel TV, and as such is very important for older and lower income households, as well as those who simply prefer not to access pay TV.

Platform competition enhances consumer choice in two broad ways: the reception equipment needed and its installation costs, and the price and quality of broadcast services offered.

Regarding the first point, DTT enables those who cannot or do not want to install a satellite dish to receive services through a more conventional rooftop aerial. It enables consumers who do not want to purchase a set-top box to access multi-channel TV through pre-installed tuners in their receivers. Most importantly, it allows consumers to choose a free-to-air service package, which does not require any ongoing subscription.

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\(^{77}\) Ofcom, *Securing long term benefits from scarce spectrum resources – A strategy for UHF bands IV and V (Consultation)*, 29 March 2012

\(^{78}\) BARB Establishment Survey, Q2 2013 and operator data

\(^{79}\) BARB viewing data, calendar year 2012


\(^{81}\) Note that there is also freesat from Sky, though this currently receives little marketing support
The importance of a free-to-air service to consumers is highlighted by research commissioned annually by Freeview. In this study, a conjoint methodology is used to investigate the drivers of platform choice. Consumers consistently cite costs – both set-up and ongoing – as the most important factors in their platform choices. For consumers that are constrained by costs, DTT is essential in providing an alternative to free satellite. Also, by providing a near universal free-to-air platform, DTT also plays a vital role in constraining the costs of pay providers (the competitive constraint is discussed in more detail below).

**Competition in content provision**

Platforms are of little value without a good choice of content. In parallel with their platform services, Freeview, Sky and others compete against each other in offering packages of content tailored to meet the needs of each platform’s customers. Competition here helps provide consumers with a choice of ways in which they can access individual TV channels or bundles of channels and content, either free-to-air or at attractive subscription rates.

The importance of DTT (and the free-to-air services available on the DTT platform) in creating a more competitive TV market has been recognised by the Competition Commission.

**Competitive constraint on Sky**

During its recent investigation of the pay TV movies market, the Competition Commission was presented with an academic analysis of competition from DTT, commissioned by Sky. This showed that variations in the geographic availability of DTT had a statistically significant effect on the percentage of households subscribing to Sky’s basic and premium packages. The analysis concluded that Freeview was an important competitive constraint on Sky, and had a significant impact on demand for pay TV subscriptions.

The Competition Commission broadly accepted these results, noting that DTT’s effect on competition was largely driven by the impact of free-to-air channels on the platform. They suggested that DTT’s main effect was to reduce consumers’ willingness-to-pay for Sky basic

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82 Communications Chambers analysis of TV platform websites
83 Paul Seabright, *The effect of DTT availability on households’ willingness to subscribe to Sky’s pay TV services*, 13 January 2009
packages (which in turn could have an adverse effect on the ability of Sky to on-sell premium packages).

Turning to scope for entry or expansion of rivals, the Commission noted that large-scale entry into pay TV is not easy. This finding is also relevant for TV distribution, where economies of scale and scope mean that only a limited number of platforms can co-exist. Moreover, the ability of new platforms to gain market share is made harder by limited access to unique content and bundling of TV distribution along with other communications services. The Commission noted that there is a possibility that new developments will in future change the market structure and increase the extent of competition, in particular the future role of the internet and IPTV. But they concluded that these developments will take time to affect the market and will not lead to rapid change in the strength of competition in the near future.

The Commission also noted that there could be a long-term beneficial impact of YouView (with DTT at its core) on the pay TV market, but that – given forecast take-up rates – this would take some time to materialise. We agree with this view, and suggest that in the absence of DTT, entry barriers might be higher rather than lower (see below for more on bundling). DTT, indeed, will help over time to enhance entry by new providers into key communications markets such as broadband and on-demand pay TV.

The Commission also referred to the high level of concentration in the UK pay TV market. Using the Herfindahl-Hirschmann Index (HHI) which is a commonly used tool in competition analysis, the Commission noted that the HHI for pay TV is around 5,000, suggesting that by general standards\textsuperscript{84}, it is a very highly concentrated market. If the HHI analysis is applied to the TV platform market in the UK, a concentration index of around 3,000 is found. Without DTT, concentration would be significantly higher.

International comparisons provide some evidence of DTT’s role in throttling pay TV price increases. For example, in Ireland DTT penetration is low (8% according to Ofcom in 2012\textsuperscript{85}). While the dominant pay TV offering is comparable to that available to consumers in the UK, Irish customers contributed ARPU of £470 in 2011, 30% more than in the UK’s £362 in the same period.\textsuperscript{86}

\textsuperscript{84} The HHI is calculated by summing the squares of the percentage market shares held by respective firms in a market. Recent UK merger assessment guidelines suggest that the OFT may regard HHI values above 2000 as highly concentrated.


Platform competition is also potentially helpful to channel and content suppliers, who are not restricted to only one platform when negotiating carriage deals. Of course, certain channels may choose to accept restrictions to one platform in exchange for payments, but the availability of platform choice gives them leverage in those negotiations.

Without DTT, it is entirely possible that Sky would be able to take advantage of its position as much the largest TV platform to increase its prices to subscribers and drive harder bargains with the channels it carries. Competition analysis typically involves the application of the so-called SSNIP test to ascertain whether it is feasible for a company to introduce a small but non-transitory rise in its prices (usually 5%) without being worse off as a result through loss of sales. If it can, then it may be thought to possess market power in that market. If Sky were able to secure a 5% increase in its TV subscriber rates without competitive constraint from DTT, that could amount to a loss of consumer value, or surplus, of some £300m a year.

**Platform innovation**

Competition also helps drive platform innovation. In the days of analogue terrestrial TV, the Sky platform led the way in technical innovation. It was forced to do so to win subscribers from the existing terrestrial platform. As terrestrial and cable platforms have caught up with Sky’s earlier lead, there has been further incentive for all platforms to improve and extend their customer proposition as illustrated in Figure 20. As premium pay services, Sky and Virgin Media need to stay a step ahead of the DTT free platform. Each time DTT catches up with Sky/Virgin’s latest innovation, Sky/Virgin have an incentive to look for further improvements. Recent innovations from Sky include Sky Go, On Demand and Sky Store (online movie rental).

The most recent developments in TV distribution have involved innovations in the use of IPTV and other IP-related services alongside conventional broadcast services, to deliver streamed and on-demand services both to living room TV sets and increasingly to tablets and smart phones. These are known as hybrid TV services. DTT has played a key part in this upheaval, as it is the platform that benefits most immediately from the potential offered.

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87 Although in practice their leverage here may be limited for those channels which place a premium on audience reach – such channels will need to strike deals with all platforms.

88 Based on data from Sky, *Annual Review 2013*, 26 July 2013. £577 ARPU; 10.4m TV customers. All customer ARPU has been used since TV customer ARPU was unavailable.

89 The Competition Commission in its Investigation of the Movies on Pay TV Market, August 2012, noted for example that, in some instances, it would not be in Sky’s interest to launch similar new services with urgency which might cannibalise its existing business.
specialist hybrid TV team, dedicated to developing innovative new services, and through ‘Connect TV’ enables IPTV services to be integrated with conventional broadcast services on the Freeview EPG.

YouView, which combines broadcast and on-demand broadband services through a single user-interface is a good example of a DTT-related innovation which has enabled significant new players to enter the market (for example TalkTalk) and at the same time is prompting serious competitive response across other platforms, to the benefit of the UK broadcast sector and consumers generally. It is no longer

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90 Communications Chambers analysis based on operator annual reports, press releases, histories and statements.
enough for platforms to offer broadcast services alongside PVRs. Consumers now increasingly demand access to on-demand services via broadband as a seamless part of their main TV package.

**Impact on content production**

Competition between platforms and channel packagers in turn affects investment in original content and content rights. This operates in two ways: first, the high levels of investment made by PSB channels which are at the core of the DTT proposition set the benchmark in audience expectations (as described earlier), and second, as competing platforms battle to offer more attractive content packages to grow and secure their customer base.

Unique and innovative content is a key weapon in attracting and retaining users to a platform. Over the past 20 years or so, Sky has succeeded in acquiring rights to premium content as a means of driving dish take-up and retaining customers, and has promoted acquired US dramas and comedies as a way of attracting subscribers. More recently, BT Vision has tried to do the same with Premier League and European Champions League football rights.

Many of the key steps in content innovation (sports coverage, HDTV, 3D etc) have originated in pay TV, as Sky and others have been prompted to find ways of keeping ahead of their free TV rivals. As free-to-air TV has caught up with each new innovation, the commercial market has been spurred into further new developments.

But not all consumers are attracted by premium sports content. More recently, Sky and other multi-channel broadcasters have recognised that further market growth (or customer retention) depends on offering unique UK-originated content that is unavailable on the DTT platform. Competition between DTT and pay platforms has therefore directly stimulated further content investment.

For example, the high level of UK content investment from the main PSBs helps encourage other broadcasters – the multi-channel providers – to follow suit. Last year they invested some £500m in original UK content91, (an increase of around 27% over the past 3 years).

This overall framework supports “competition for quality” – which Ofcom has described as a virtuous cycle of investment in UK content, which supports exports, feeds back to revenues, and then again into content production.

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91 Based on data in COBA, Economic Impact Report 2012 by Oliver & Ohlbaum Associates, September 2012
Impact on broadband markets

DTT also has an impact on wider competition in the UK broadband market.

Broadband provision is a highly concentrated market, in which broadband services are increasingly sold as part of a bundle of media and telecoms services. The four major broadband providers, BT, Virgin Media, Sky and TalkTalk accounted in 2012 for 87% of the total broadband market, compared with 76% in 2007. Sky, in particular, has increased its market share from 8 to 19% during that period. A key feature of this market has been the increasing consumption of bundled services offered by the main providers: the proportion of total telecoms purchases accounted for by bundles rose from 40% in 2007 to 60% at the start of 2013. According to Ofcom, as of the start of 2013, 27% of households bundle pay TV with at least one other telecoms service, and 21% take a triple play package of fixed voice, broadband and multi-channel TV.

Once consumers have signed up for a service bundle, the switching costs involved in transferring one or more services to another provider can be quite high. According to research carried out for Ofcom in 2010, only 3% of those with a bundle of services had switched their whole bundle to another supplier in the last year.

DTT has a role to play in helping to prevent any further reduction in competition. First, it provides a route to high-quality TV services that can be accessed outside of any bundle offered by the main TV/broadband providers. Second, when accessed as part of a hybrid broadcast/broadband service such as offered by BT and TalkTalk via YouView, it can help provide an attractive bundle of services in competition with those offered by Sky and Virgin. In DTT’s absence, there is a risk that the Sky and Virgin bundles would further increase market share at the expense of the services offered by BT and TalkTalk, resulting in increased market concentration.

Conclusion

Alongside its economic welfare contribution, DTT has a key role to play in securing dynamic competition between platforms and content providers in the UK TV sector. It has ensured that consumers have a

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92 Ofcom, *Technology Tracker, Wave 2 2013*, September 2013
93 Ofcom, *Communications Market Report 2013*, 1 August 2013
real choice between TV platforms, and in so doing has created incentives for innovation and competitive pricing across the sector. As platforms strive to maintain or increase their customer base, the existence of a strong free-to-air DTT option has encouraged rival platforms to invest in original UK content and innovative services. Without DTT, there is a risk that a more concentrated market would bring higher prices and less innovation.
6. The social value of DTT

Summary
- The social benefits supported by DTT are widely recognised.
- DTT delivers near universal availability of a range of free-to-air TV services, which ensures value and choice for everyone, no matter how well-off or where they live.
- DTT importantly helps sustain the TV licence fee and also supports the public service obligations of commercial PSBs such as ITV.
- DTT provides a unique conduit for UK broadcasting policy, enabling more effective delivery of goals such as acceptable content standards.
- DTT also secures greater plurality in platform ownership, ensuring that no single platform owner is so powerful that they can exert undue influence on public opinion or political agendas.

The social benefits of a free-to-air television platform

As we have seen, the DTT platform brings substantial economic benefits. However, as is widely acknowledged, DTT also brings significant social benefits that are not properly captured by standard economic welfare analysis of the type described earlier. We think these can be summarised under four headings:

- The guarantee of universal access to PSB channels.
- Support for a wide range of UK originated public service content.
- The universal availability of a low-cost multi-channel platform.
- Securing plurality of TV platform ownership.

Universal free-to-air access for PSB

The first key social contribution made by the DTT platform is to ensure that the PSB channels are universally available throughout the UK, with no ongoing subscription charge. The three PSB multiplexes reach 98.5% of the population – which, as noted in the previous chapter, is greater coverage than offered by any other platform.

DTT’s closest rival for coverage is satellite. But for a number of UK households it is simply not possible to receive a satellite signal. In some premises – including those that are listed or within conservation areas – dish installation is prohibited due to planning restrictions. In others it is not possible to achieve “line of sight” with the satellite, due to landscape features, buildings or trees. Various
studies have sought to quantify the number of households affected and although no definitive number is available. Sky estimates its coverage at 98%. However, 1.2 million – approximately 5% of – UK homes are in conservation areas and may not be permitted a dish. Sky reports that 2% of homes visited could not have dishes installed. This is a lower bound on the portion of houses that cannot receive satellite, since households who are aware that they could not have a dish (because of planning rules, their location, landlord issues and so on) would not request an installation in the first place.

The licence fee in particular is inextricably linked to the existence of a free-to-air platform: if consumers were required to pay a subscription, even for a basic tier of services, support for the licence fee in addition to this payment would be severely undermined, thus endangering the long-term viability of the range and quality of services offered by the BBC, and potentially unpicking the central feature that sustains PSB.

Universal and FTA access to PSB is important, of course, because of the social value associated with PSB content:

- Impartial and accurate news and information: the guarantee of universal access to a wide range of views and opinions, underpinned by strong, reliable, impartial and authoritative news and information.
- UK culture and entertainment: the guarantee of services that reflect and celebrate the diversity of UK drama, music, comedy, sport and entertainment, and which promote social cohesion and understanding.
- Content for all communities and segments of UK society: the guarantee of services that treat equally the needs and interests of all citizens, including news and other content for local, regional and Nations audiences.
- Content for all to share: the guarantee of programmes and events that the whole nation can share, free at the point of use.

These objectives are also recognized as being important by consumers, as determined by Ofcom in their annual review of the UK’s PSBs (Figure 22).

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94 Catherine Bottrill, Oxford University, *Homes in Historic Conservation Areas in Great Britain*, August 2005
95 Ofcom, *Infrastructure Report*, 1 November 2011
Support for high-quality public service content, made in the UK

DTT also supports UK content more generally. The UK TV sector exhibits a high level of investment in original high-quality TV content when compared with international rivals. This has been to a large extent achieved by the overall UK public service funding and regulatory system (the public service broadcasting ecology). DTT is not the primary driver of this, but it does play an important role in reinforcing this overall system, helping secure the high audience reach achieved by the main PSBs and, in turn, public support for the system as a whole:

- The BBC, funded by the licence fee, has at the heart of its remit a responsibility for investing in a wide range of UK programming, and making that content available on a universal basis. DTT plays a key role in delivering the audience reach and impact it needs to fulfil that goal and maintain public support for the licence fee at consistently high levels. In turn this helps set a benchmark for investment across the TV sector as a whole.
- DTT helps commercial PSBs achieve audience reach and share, which in their case directly drives advertising revenues and content investment. Their content investment is further incentivised by the regulatory benefits that derive from their PSB status, such as EPG prominence rules. In return for access to spectrum, and prominence on EPGs, commercial PSBs must meet a number of public service obligations including both positive content requirements and delivering universal access.
- The competitive impact of both the BBC and commercial PSBs has acted as an incentive for other commercial

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97 Audience rating of importance of PSB purposes. Proportion of respondents assigning a score of 7/8/9/10 rating out of 10
broadcasters to increase their investment in original UK content.

- The impressive range of content available free-to-air via DTT encourages pay platforms to invest in their own content to justify their price premium.\(^{58}\)

At a time of spectrum scarcity, these interlocking benefits and obligations have created a system of strength and stability underpinned by a variety of strong broadcast institutions, with different funding and ownership structures, demonstrably committed to meeting public service goals, as well as very high levels of investment in quality content in order to maintain high audiences.

Overall, the investment supported by DTT plays a catalytic role in the economy in sustaining a vibrant and creative UK production sector:

- It helps support a critical mass of skilled people and resources in the UK creative sector.
- It has provided funds for creative innovation and risk taking which a purely commercial market might not have supported.
- It has enabled a dynamic and entrepreneurial independent production sector to grow and prosper.
- It has helped contribute to our strong export performance.
- It has established the conditions that have begun to attract further international investment in the UK, taking advantage of its production base.

**Availability of a low-cost multi-channel platform**

The existence of a free-to-air multi-channel platform drives social inclusion by ensuring that all citizens have access to a range of television and radio services at minimal cost. As we have seen, the DTT platform is used by a larger share of households in lower income groups: and its widespread availability on second sets has an impact on three-quarters of households, guaranteeing multi-channel television at low cost throughout the house.

A free-to-air platform will also ensure that all users are able to benefit from technological advances, such as HD or the development of 'connected TV'. As discussed at greater length elsewhere, the universal availability of a free-to-air platform acts as a competitive spur to subscription only providers, thus enhancing provision for those willing to pay.

\(^{58}\) We discuss the impact on content spend from competition between broadcasters and between platforms in greater detail on page 45.
DTT has also allowed the PSBs to offer an expanded portfolio of FTA services, alongside a number of free commercial channels. Clearly, the existence of an attractive multi-channel service (which goes beyond the PSB offer) on DTT has a vital role to play in sustaining the attractiveness of the PSB offer. A weaker multi-channel offer will attract fewer viewers, which will in turn undermine the ability of the PSBs to continue to invest in their distinctive content. And a service without the non-PSB channels would be one where the PSBs were responsible for the costs of the whole network, thus further reducing their ability to invest at the same level in high-quality content.

**Plurality of platform ownership**

The PSB system guarantees plurality of public service content supply (with the BBC, ITV, Channel 4 and Channel 5 all playing a role in the overall PSB ecology). In turn, this helps secure plurality of provision in the wider broadcasting market, especially important for news.

But DTT has an additional role to play in helping secure plurality of platform ownership. Platform operators, through their control of vital distribution channels, have an opportunity to influence the range and content of the services they distribute. They may even own their own content services to which, if they so wished, they might be able to offer favourable treatment on their platform. This poses the risk that powerful, platform operators could use their position to influence public opinion or the political agenda.

DTT, by offering an alternative platform choice with scale and reach, and with no single owner, helps to provide a safeguard against any such outcome.

**The distinctive characteristics of DTT**

To some extent, these benefits might be delivered by other free-to-air platforms. However, the distinctive nature of DTT underpins the delivery of these benefits in a number of unique aspects:

- Support for both the rationale and the delivery of PSB.
- Efficient delivery of regional and local services.
- Particular incentives for PSBs, other broadcasters and the delivery of broader public policy goals derived from the ownership characteristics of the platform.

**Support for PSB**

The PSB system is dependent upon two major public policy interventions:

- The licence fee.
• The ability to impose PSB obligations in return for reserved spectrum.

The licence fee is linked to universal access: and the ability of DTT to reach over 98% of the population is unmatched by any other delivery system. At present, the offer of a complementary free-to-air satellite service ensures coverage for the very small number unable to receive terrestrial transmission: but in the absence of DTT, the number of people for whom access could be guaranteed would be reduced, by perhaps 600,000 to 1.2m.

If the licence fee is crucially supported by the DTT platform, then the contract that underpins the provision of commercial public service content is effectively dependent on it.

The value of the obligations that can be placed upon the commercial PSBs is partly dependent on the value of the spectrum that is reserved for them on the DTT platform. This structure was reviewed as recently as last year, and reaffirmed by the Government as the basis for the continued delivery of a plurality of public service channels. In its report to the Secretary of State in May 2012, Ofcom stated that the value of the PSB benefits, including spectrum, to ITV was likely to match the content obligations for at least a significant portion of the licence period\(^9\); and when the Secretary of State for Culture, Media and Sport recently gave the go-ahead for Ofcom to renew the licences for Channel 3 and 5 for another ten years, she made explicit the expectation that the licensees would continue to be required to deliver PSB obligations as part of those licences.

After some years of rebalancing public service obligations, it was acknowledged by the Secretary of State, when approving the award of new licences to the commercial PSBs, that the level of those obligations was now close to the minimum required to meet public policy goals\(^10\). A weaker free-to-air platform, not supported by the particular characteristics of DTT, might reduce the amount that broadcasters were able to invest in public service content. Regional TV news, in particular, would be at risk.

The only other real value that PSBs can be granted, over and above the reserved spectrum, and prominence on EPGs, is the guarantee of carriage, via ‘Must Carry’ rules – which, it should be noted, have

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\(^9\) Ofcom, \textit{Licensing of Channel 3 and Channel 5}, 23 May 2012

\(^10\) “I agree with you that ‘the level of the current obligations faced by the PSBs is approaching a set of minimum requirements for contribution to public service purposes’ and I am determined to see these preserved (if not strengthened in the next ten years.” \textit{Secretary of State letter to Ed Richards}, 16 November 2012
never been invoked. These alone would be unlikely to sustain commercial PSB.

Efficient for regional and local channels

DTT, with different masts serving different parts of the country, can (relatively) easily provide distinct regional versions of national channels as well as stand-alone local channels. By contrast, there is no way to segment a particular satellite transponder slot for a particular region in the UK – all regional and local channels must each be broadcast to the entire UK (and beyond). This means that to carry ten regional versions of a channel, ten separate transponder slots must be used. The 47 local TV channels would, similarly, need 47 slots, which would simply be unviable economically.

The ownership structure of DTT

The DTT platform is quite unlike either the satellite or cable platforms, in that it is the result of the long-term licensing of a public asset, rather than the ownership of a proprietary distribution system or network.

This has had two positive effects in relation to the social benefits of the platform: it has resulted in a diffuse pattern of ownership which makes the broadcasters fundamentally free from the commercial goals of a single proprietary owner: and it has guaranteed the opportunity for the platform to be used to deliver some explicit public policy goals.

Advantages for ‘public policy’

Notwithstanding the trend of public policy, in the UK and Europe, to promote broadly market-based policies for spectrum management, it is nevertheless the only one of the TV distribution platforms for which spectrum has been set aside by the state for the unique use of public broadcasting. The use of this spectrum, being subject to specific multiplex licences gives the state the opportunity, whether it seeks to exercise it or not, to use the resource to meet specific public policy goals.

Sustaining UK standards

The core of the DTT platform is the mix of PSB services offered across the public service multiplexes. At a time of increasing diffusion of both content and distribution, the existence of a coherent service based securely around a set of channels that conform to the highest possible standards of content creation and editorial integrity will be important in sustaining support for obligations set and enforced in the UK – for instance, on impartial news and current affairs, or
services that offer adequate protection to children and other vulnerable audiences.

As well as UK content standards, the prominence of public service content is an essential feature of the public policy regime. This will be increasingly difficult to enforce as more content is delivered via connected TV services, which are much more difficult to bind to the existing EPG prominence rules. With the PSBs at the heart of the platform, the enhancement of the television service with the addition of on-demand services gives the best possible chance of continuing to secure prominence, on one platform at least, of public service content.

**Concluding comments**

The social benefits derived from the DTT platform are largely, but not uniquely, driven by the PSBs: but alongside the guarantee of services that meet high public purposes, the availability of universal, low-cost multi-channel television, and a route to other technological developments, is a powerful promoter of social inclusion.
7. The future of DTT

Summary

- There is consensus that DTT will be an important (and likely leading) platform for many years to come, assuming it continues to receive sufficient spectrum.
- IPTV as an alternative faces many challenges, including limited broadband uptake within Freeview households; constraints of broadband capacity; traffic charges; and channel reluctance to move to streaming.
- DTT will have increasing importance as a component of a wider set of services, such as YouView, as part of a bundle with broadband or in combination with OTT services such as Netflix.
- Continuing investment in the platform will also enhance DTT’s stand-alone offer.
- However, if DTT was weakened by a loss of spectrum, there is likely to be a significant shift to the pay platform operators – Freesat would struggle to compete with their resources.
- In a ‘pay dominant’ world, we would see:
  - A significant decline in platform competition, with negative impacts on price, choice and innovation
  - Risks to the established PSB ecology as the licence fee would come under pressure and the commercial PSB ‘bargain’ (spectrum for PSB content) would no longer be available
- This would threaten the internationally successful UK content production sector, which the existing system supports and delivers.

As we have seen, DTT creates substantial economic and social value. However, there remains the question as to whether it will continue to do so in future. Hypothetically, the value of DTT could be reduced in one of two ways. It might ‘wither on the vine’ – despite retaining sufficient spectrum, it might be that the market moves away from DTT. Alternatively, if DTT was deprived of spectrum, it might be that other platforms would deliver equivalent value in its place. As we set out in this chapter, both of these are unlikely. With sufficient spectrum to remain competitive, DTT will continue to be a pivotal platform. Without spectrum, the UK will lose a significant portion of the value delivered by DTT.
**DTT’s future with sufficient spectrum**

There is consensus that DTT will be a key platform for many years to come. According to Ofcom:

> “analysts predict that, absent major changes in the amount of available spectrum, the DTT platform will continue to hold a significant share of primary TV sets for at least the next decade.”

For example, 3 Reasons forecast that by 2022, DTT’s share of primary sets will be very slightly up from today (Figure 23). Analysys Mason, in their work for DCMS, take a similar view, saying that DTT’s share will remain steady throughout their forecast period (to 2021).

There are several reasons that DTT will retain or grow share.

**Continuing enhancements to DTT’s value**

As we have noted, in the past DTT’s value has been enhanced by Freeview+ PVRs, an increasing channel line-up, the addition of HD and so on. Future growth in DTT’s value to consumers and society will be supported by the additional HD channels being rolled out (on the COM7 and COM8 muxes and through any potential future switch of the entire platform to DVB-T2); Local TV; and the continuing adoption of YouView. YouView’s proposition is constantly improving, with the addition of new catch-up and on-demand services, improving apps and so on. This will both deliver greater value to existing DTT households, and provide reasons for households currently on other platforms to switch.

**DTT as a component of bundles**

Bundles (combinations of telephony, broadband and TV from a single supplier) are ever more important to consumers and to operators. For telecoms providers such as BT and TalkTalk, who are not

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**Figure 23: DTT share of main sets**

<table>
<thead>
<tr>
<th>Year</th>
<th>Share (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>0</td>
</tr>
<tr>
<td>2000</td>
<td>5</td>
</tr>
<tr>
<td>2002</td>
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</tr>
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<td>2012</td>
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</tr>
<tr>
<td>2014</td>
<td>40</td>
</tr>
<tr>
<td>2016</td>
<td>45</td>
</tr>
<tr>
<td>2018</td>
<td>50</td>
</tr>
</tbody>
</table>

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101 ¶4.32 in Ofcom, *Securing long term benefits from scarce spectrum resources – A strategy for UHF bands IV and V (Consultation)*, 29 March 2012

102 Ofcom, *Securing long term benefits from scarce spectrum resources – A strategy for UHF bands IV and V (Consultation)*, 29 March 2012 (for historic data) and 3 Reasons LLP Autumn 2013

103 Analysys Mason, *Impact of radio spectrum on the UK economy and factors influencing future spectrum demand*, 5 November 2012

104 YouView is to some extent a hybrid of a pay and an FTA TV service. However, we believe it is appropriately ‘bracketed’ with DTT for the purposes of this paper. Certainly it delivers the same benefits from the same spectrum, including widespread coverage, TV at zero incremental cost (thus avoiding any threat to the licence fee), prominence and viewing share for PSBs, competition to satellite and cable and so on.
historically major TV providers, this has been an incentive to develop a competitive TV offering (in particular, YouView). In effect, these operators are now agents for the DTT platform, embedding it within their consumer proposition. This is powerful support that Freeview has not previously enjoyed.

**Improving transmission and compression efficiency**

As muxes and customer receiving equipment transition to improved transmission technology (DVB-T2) and video compression (MPEG4 and, in the longer term, HEVC), the DTT platform will be able to deliver more or higher definition channels from the same quantum of spectrum. This will ensure that DTT remains competitive against the improving offers of other platforms. (Note that the transition to DVB-T2 is a major undertaking, and would require a co-ordinated effort on the part of industry, government and consumers).

**The rise of Over-the-Top services**

In the past, customers wanting premium TV such as movies and sports had little choice but to subscribe to a pay TV platform to get them. However, today they can access premium content from services such as Netflix, LoveFilm, BT Vision and Sky’s Now TV for sports. Such content arrives via an internet connection, and therefore there is no requirement to change TV platforms to obtain it. Indeed, an existing customer of Sky, now able to secure movies via Netflix, may abandon pay TV entirely, on the basis that the subscription costs for the incremental basic channels beyond those on Freeview is no longer worthwhile. This supports share gain by DTT at pay TV’s expense.

This shift away from pay TV in response to the internet is known as ‘cord-cutting’. While in its early days, the US may be a leading indicator since it is gathering pace there – in the twelve months to June 2013, US pay subscribers fell by 911,000, compared to a fall of 258,000 in the preceding year.105

Note that we believe Over-the-Top (OTT) services are complementary to DTT not a substitute, since they allow consumers to enjoy some of the benefits of pay TV without needing to switch away from the DTT platform. Moreover, the fact that OTT services are of interest to a subset of customers certainly does not imply that IPTV more generally might replace DTT – this would require a much larger shift

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in viewing by a much greater number of customers, and is likely to be impractical for many years to come.\textsuperscript{106}

For all the above reasons, the DTT offer is likely to continue to be very attractive to consumers, either stand-alone or as a complement to OTT services.

\textbf{Strategies of existing operators}

Over the past decade, Sky (and to a lesser degree Virgin Media) have pursued a target of increasing subscribers to their proprietary broadcast platforms. More recently, their focus has turned to driving ARPU through selling more services to their existing customers. Looking ahead, they must respond to the risk of ‘cord cutting’ while avoiding cannibalisation of their existing customer base (and revenues).\textsuperscript{107} One option for Sky seems to be the launch of new OTT services, such as Now TV, that aim to attract new subscribers without affecting their ‘traditional’ pay TV customers.\textsuperscript{108} Virgin is primarily emphasising its broadband rather than its TV offer.

While these strategies may affect DTT at the margin, they are unlikely to make significant inroads into the DTT customer base. Of course (as we describe later) this does not mean that pay platforms would ignore the prospect of adding to their subscribers if DTT no longer existed.

Freesat will certainly continue to pursue growth. However, lacking the marketing support of the likes of BT and TalkTalk (via YouView), it is likely to make only modest inroads into the market. Overall growth for free satellite services (including freesat from Sky) appears to have stalled since the completion of digital switchover (Figure 24).

\textbf{Potential new entrants}

If existing players are not an increasing threat to DTT, it is possible that new entrants might be so. In this context, some argue that DTT will be replaced by IPTV. However, as Ofcom has

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure24.png}
\caption{Free satellite growth 2008 – 2013 (millions of households)}\textsuperscript{109}
\end{figure}

\begin{footnotesize}
\begin{itemize}
\item \textsuperscript{106} See below for a more detailed discussion
\item \textsuperscript{107} See, for example, Lara O’Reilly, \textit{Sky’s retention strategy drives revenue uplift}, 1 November 2012. Cable’s share of households has been flat since 2005: Ofcom, \textit{Digital Television Update}, April 2013
\item \textsuperscript{108} Screen Digest, \textit{Sky sees future in OTT as upsell becomes focus}, 26 July 2013
\item \textsuperscript{109} Ofcom/GfK NOP consumer research as quoted in Ofcom, \textit{Communications Market Report 2013}, 1 August 2013
\end{itemize}
\end{footnotesize}
said in its UHF strategy consultation, such a transition from DTT to IPTV is “very speculative”.¹¹⁰ In its subsequent statement Ofcom took the view that IPTV services did not have the potential to substitute for DTT until after 2030.¹¹¹ For the reasons set out below, we agree with this view.

The IPTV scenario assumes radical changes in consumer behaviour that are not supported by current trends – viewing of linear broadcast channels is remarkably resilient. Although there is growing consumption of content through on-demand services such as BBC iPlayer and on portable devices, much of this appears to be incremental to linear TV, not substitutional, and it will be some time before most consumers are willing to give up their TV channels. There are also significant practical and cost barriers that will work against the large-scale use of IPTV to deliver high-quality streamed audiovisual content to mass audiences.

As of today, only a minority of households make use of IPTV services, with only 40% saying they use them even once per month.¹¹² IPTV’s share of total viewing is still relatively small. Even for the BBC (which, in iPlayer, has the most used online TV service in the UK), IPTV represents just 2% of viewing.¹¹³

These figures will gradually increase, but many other barriers will remain:

**Lack of fixed broadband access**

Many households (including 40% of DTT households) do not yet have broadband access.¹¹⁴ While this figure may gradually decline, the broadband adoption rate has slowed dramatically. Indeed, over the last year it has not increased at all.¹¹⁵ Based on Ofcom figures, we estimate broadband penetration for 2030 at 87%,¹¹⁶ with 13% still without fixed broadband. As today, the percentage of those offline amongst DTT households will be higher than this 13% average. Thus even in 2030, it will be simply impossible for IPTV to act as a substitute for over 13% of DTT households.

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¹¹⁰ ¶4.24 in Ofcom, *Securing long term benefits from scarce spectrum resources – A strategy for UHF bands IV and V (Consultation)*, 29 March 2012

¹¹¹ ¶4.16 in Ofcom, *Securing long term benefits from scarce low frequency spectrum (Statement)*, 16 November 2012

¹¹² Fig 2.13, Ofcom, *Communications Market Report 2013*, 1 August 2013. Note that 16% report using TV and film services such as Netflix, but it seems likely that this group will be (primarily) a subset of the 40% using catch-up services

¹¹³ ¶2.1.4, Ofcom, *Communications Market Report 2013*, 1 August 2013

¹¹⁴ BARB, Establishment survey – April to June 2013

¹¹⁵ Fig 4.17, Ofcom, *Communications Market Report 2013*, 1 August 2013

¹¹⁶ Ofcom, *NCC model*, 28 September 2012 for broadband households. We have assumed 0.7% household growth from today’s figure of 26.3m
Even those with broadband may not be able to use IPTV

Not all broadband connections can reliably support TV streams (particularly HD or multiple SD streams). As of today, 11% of ADSL 2+ connections have average speeds of under 2 Mbps, and a further 29% have average speeds under 4 Mbps. Today, a high-quality HD TV stream might require 5 Mbps (particularly for content with much movement). Even allowing for the benefits of improving video compression, it will be many years before such connections could support both a single HD stream and any other significant internet use simultaneously.

Internet-connected TVs are still rare

Just 5% of households have a smart TV that is actually connected to the internet. While this is gradually changing, progression is slow. Even today, less than 30% of sets sold are ‘smart TVs’ with internet connectivity. If the great majority of sets currently being sold are not internet connected, this suggests we may need to await the replacement of today’s new TV sets before IPTV can be widespread (though some non-smart TVs may be online via STBs such as YouView or smart blu-ray players).

In-home networks will be needed

In-home networks are required to link sets to broadband routers. Unless the home’s TV set(s) happen to be near the broadband router, consumers will need to establish a home network – likely wifi – and connect their sets to this network. This may be challenging, particularly for the digitally disadvantaged who make up a substantial portion of today’s DTT households (as indicated by the 40% of such households that do not have broadband today).

Widespread use of wifi for IPTV will strain capacity

Moreover, heavy use of wifi for hours of IPTV viewing per day may strain the capacity of unlicensed wifi spectrum – for instance, it will reduce the speeds available for other purposes in the home in question, and for neighbours of the IPTV-using household.

For those on broadband packages with traffic limits, IPTV may be expensive

Broadband traffic charges can make heavy use of IPTV as a substitute for linear broadcast very expensive – typical SD viewing can total well

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[117] Annex 1, Fig 1, Ofcom, *UK fixed-line broadband performance, May 2013*, August 2013

[118] Note that the Government has a target of 95% availability of superfast broadband (speeds greater than 24 Mbps) by 2017 – see HM Treasury, *Investing in Britain’s Future*, June 2013. However, availability and take-up are of course very different

over 100 GB per month if streamed. While ISPs do offer unlimited downloads for some packages, others are limited to as little as 5 or 10 GB per month.

**Widespread IPTV may undermine unlimited broadband packages**

Further, widespread use of the internet for viewing linear TV would generate so much traffic that it would undermine the usage assumptions that enable ISPs to offer unlimited usage packages for broadband. The 100 GB per month from IPTV mentioned above compares to today’s average usage of 30GB. This might well force them to abandon such packages, instead introducing traffic charges for all.

**Channels may be reluctant to switch to IPTV**

Substitution by IPTV of DTT is only possible if channels support it. However, channels both large and small have reasons to be cautious of such a switch. For large channels, a key challenge is cost. Each incremental viewer brings incremental cost (unlike with DTT, where costs are fixed regardless of number of viewers). A broadcaster must pay for servers, peering links to ISPs, CDNS and so on. This can make IPTV streaming very expensive at large scale.

For smaller channels, a key challenge is discoverability. On DTT, a channel can be readily found on the EPG (albeit those at the top have an advantage). On IPTV, it may be much harder to find a given channel. Menu structures may vary from TV to TV and from STB to STB; there is no guarantee of a consistent channel number that can be advertised; the range of competing channels may potentially be much larger; and so on.

Both large and small channels face an additional challenge – rights. Channels frequently have the right to broadcast a particular programme, but not to distribute it online. Content owners may sell such rights separately, or be reluctant to allow any online provision. Thus a channel seeking to provide a linear stream online might be left with certain blank spots in its schedules, for the programmes it did not have digital rights to.

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120 Communications Chambers analysis
121 See for instance TalkTalk's Lite package (TalkTalk Broadband Traffic Management [accessed 7 October 2013]) and PlusNet’s Essentials package (PlusNet, Broadband only, [accessed 7 October 2013])
123 Note that a technology known as multicasting would reduce the amount of internet traffic necessary to deliver linear TV. However, this has been available for many years and has not yet been widely implemented by ISPs (BT aside). Moreover, ISPs who are also pay TV operators might be particularly reluctant to enable it, since this would support Over-the-Top free alternatives. Multicast would also potentially require consumers to replace their home equipment, including routers, STBs and/or TVs before they could take advantage of it
124 Again, multicast could greatly reduce this problem, were it to be implemented
Given all the above practical impediments to the substitution of DTT by IPTV, it seems – at best – to be a very long-term prospect.

Conclusion

Thus, assuming it retains sufficient spectrum, DTT’s future will be robust. This consensus view is supported by the ongoing enhancements to the platform; the lack of increased strategic threat from existing competitors, and the substantial hurdles – technological, cost, quality and consumer acceptance – facing an IPTV replacement of DTT. We now turn to the loss of value if DTT were deprived of spectrum.

Loss of value absent DTT

As we have seen, IPTV is unlikely to be a viable mass market replacement for broadcast TV. Thus if consumers were, hypothetically, to be deprived of an attractive DTT offer, they would likely switch to one of the existing main platforms – pay or free satellite from Sky, cable TV (if available in their area) or free satellite from Freesat. We believe most consumers would end up on pay operator platforms, and in particular Sky. In this section we first set out our reasons for this belief, and then set out the adverse consequences of such a transition.

The likely transition to pay operator platforms

Without the DTT platform there are several reasons to believe that Sky and Virgin would be the main gainers, with Freesat taking only moderate share.

Pay operators have historically competed successfully with Freesat

In the years before DSO, Sky in particular was able to increase its market penetration as households prepared for digital TV. Freeview monitored the TV platform destination of households that had yet to switch over six months before their region’s analogue switch-off, and found that nearly seven times as many consumers took pay as did Freesat (see Figure 25), with Sky getting the great majority of these.

It is hard to imagine that Sky and Virgin would not mount a concerted effort to win new customers at any switch-off of DTT, and that they would not once again attract a large share of former

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125 Kantar Media, *DSO Conversion Destinations*, 2007 - 2012
terrestrial households.

We also note the far greater scale of the pay operator’s marketing operations – for example, Sky spent £1,116m on marketing in FY2013.\textsuperscript{126} This compares to Freesat’s total operating expenditure of £12m in its FY2013.\textsuperscript{127}

**Sky has potential to take channels exclusive to weaken Freesat**

Moreover, we note that Sky has a particularly powerful tool (beyond consumer campaigns) to ensure that Freesat does not emerge as a major competitor. Freesat and Sky customers have different boxes and EPGs, but they are watching the same satellite signal. However, Freesat customers are not able to watch encrypted channels – these being the channels that are in Sky’s premium tiers. For example, Dave is not available on Freesat because it is in Sky’s ‘Entertainment Extra’ pack.

Therefore if Sky is willing to pay a channel to be in one of its premium tiers, it deprives Freesat of that channel, and thereby weakens its competition. Today, when Sky’s main FTA competition is DTT, this is not necessarily a worthwhile approach. However, if consumers’ main choice was between Sky and Freesat, there would be every reason for Sky to seek to deprive its key rival of content, leaving Freesat with a weaker channel line-up.

**Unattractive economics for consumers**

While Freesat would be cheaper over the longer term for consumers than pay, in the shorter term it would be more expensive. A Freesat HD box and dish installation cost £170 even without a PVR. Given that installation and a PVR come free from pay providers (as well as a wider channel choice), this may make pay TV relatively attractive, particularly since the incremental cost of pay TV as part of a triple play bundle can be under £10 per month.

**Sky may deploy freesat from Sky as direct counter to Freesat**

In addition to its primary pay satellite option, Sky also has its own FTA satellite offering, freesat from Sky. Historically, Sky has used its own freesat as a retention tool to retain customers ‘spinning down’ from a pay offer. It uses the same box and dish as their existing services. However, Sky has (in general) not actively marketed this product.

That said, in a world where DTT is disappearing, they might well give freesat from Sky greater prominence. At least some portion of DTT

\textsuperscript{126} Sky, *Annual Review 2013*, 26 July 2013

\textsuperscript{127} Freesat (UK) Ltd, *Directors’ report and financial statements, Year ended 31 March 2013*, 13 June 2013
households fundamentally prefer a subscription-free option, and freesat from Sky would be a method to capture these customers. By itself, this might not be commercially attractive to Sky, but as bundles become increasingly common, Sky could also be selling these customers telephony and broadband, which would provide ongoing revenues. Moreover, it would provide Sky with a larger customer base to whom it could sell other services such as Now TV (and, should the customer’s circumstances change, traditional pay TV).

Pay operators would benefit from any transition support schemes
In a scenario where DTT was being ‘turned off’, it is possible there would be transitional support arrangements – for instance, financial support for the purchase of new equipment or dishes. While this might ease the switch to Freesat, it is hard to imagine that this support could legitimately be denied to other platforms. Why should a customer moving to Freesat receive a subsidy but a customer moving to freesat from Sky should not? Such support would make customer acquisition even more attractive for Sky, giving them additional incentives to market aggressively.

PSBs would have limited ability to ‘steer’ switchers
While the PSBs might prefer DTT households to transition to Freesat (particularly ITV and the BBC, who own that platform), they would have limited ability to encourage them to do so. The BBC in particular has an obligation to be platform neutral, and would not be in a position to use its marketing power to do more than let audiences know the range of options available. Licensed PSBs must adhere to strict cross-promotion codes and other licence conditions that would prevent preferential promotion on screen of Freesat. Even if Freesat itself wished to provide incentives by paying households to switch, the costs of so doing would be prohibitively high compared with the likely returns.

Consequence of transition to pay operators
For the reasons above, we expect the majority of Freeview households would, in the absence of DTT, transfer to Sky or (where coverage permits) to a mix of Sky and Virgin. We now consider the consequences of this outcome.

Audiences and revenues
PSB channels would face more competition for viewers on the Sky and Virgin platforms, and would see further slippage in their
audiences – reducing share by as many as 30 percentage points amongst viewers who switch based on current viewing patterns\textsuperscript{128}.

For the BBC, this risks prompting a gradual erosion of support for the licence fee (see below). For commercial PSBs, we estimate a loss of advertising revenues (as viewing volumes and reach fall) of between 10\% and 16\%\textsuperscript{129}. This could impact over time on the ability of these channels to compete with high production value programming, and on the genre mix of their output.

Ofcom analysis – supported by the BBC’s own research – shows that a PSB channel funding gap would create “real risks around regional news, children’s provision and – to a lesser extent – national news and some specialist factual content”\textsuperscript{130}.

ITV and others could decide to re-balance their channels towards a mix of pay and free-to-air, reducing the overall supply of free-to-air channels. Multi-channels, in contrast, might see some increase in audiences and income.

**Competition**

The market share taken by the Sky platform could increase to almost two-thirds, with the pay operators in total taking over 90\% (as shown in Figure 26). At the same time, Freeview would have disappeared, Freesat would remain a marginal player, and the impact of IPTV or hybrid broadcast and internet services would be limited. For many households (approximately 50\%), platform choice would have reduced to just two – Sky and Freesat.

There would therefore be a significant reduction in competition. Investment and innovation in the provision of platform and wider TV content services in the UK would be adversely affected. Pay operators would have less reason to invest in original content, or to provide Over-the-Top services such as Now TV. Prices of pay TV services could well rise, no longer constrained by a strong free-to-air alternative. Channel

\textsuperscript{128} BARB viewing data, calendar year 2012, based on shares of viewing for PSB and portfolio channels of 91\% on Freeview and 61\% on Sky and Virgin Media.

\textsuperscript{129} In the absence of Freeview we have assumed that viewers move to Sky, Virgin Media and Freesat pro rata. We have also assumed that the proportion of viewing to PSB multi-channels remains constant in these households. The result is a decline in viewing for the commercial PSBs of 16\%. Acknowledging that there may be resulting changes in advertising rates demanded by the PSBs, and that existing Freeview viewers may skew towards the PSB channels changing by-platform viewing patterns, we estimate that the impact on revenues will be between 10\% and 16\%.

\textsuperscript{130} Ofcom, *Ofcom’s Second Public Service Broadcasting Review: Putting Viewers First*, 21 January 2009

\textsuperscript{131} BARB, *Establishment survey, Q2, 2013*
suppliers, too, would have less leverage when negotiating distribution of their services on the dominant platform.

There would be a related impact on competition in the provision of broadband, as pay operators would be in a very strong position to offer bundled TV, broadband and phone packages. BT and TalkTalk, in contrast, would struggle to offer attractive rival bundles, having lost access to a potentially large customer base in free-to-air TV households.

Pay TV operator dominance of broadband could in turn threaten OTT video providers such as Netflix – they would be dependent on the networks of pay operators in order to reach their customers. In other markets, pay operators have used this leverage to push for fees from OTT providers.132

Social objectives
This outcome would end the significant role played by universal access to free-to-air TV. Although the free satellite options would remain, most households would rely on a pay platform to access their TV services. Some (outside satellite and cable coverage) would be left entirely without a means of accessing broadcast TV.

The link between free-to-air, universally available TV and the licence fee would be weakened, and this could over time call into question public support for the licence fee, with potentially serious consequences for the long-term health of PSB. Although subscribers to pay TV platforms are currently willing to pay both a subscription and a licence fee, there will be resistance among some, especially those in lower income households, who will be compelled to pay both. If the programme offer from the PSBs is weakened, this would fuel such resentment, especially if they are consuming less PSB output.

Further, the key mechanism for securing PSB obligations from the main FTA commercial broadcasters (access to DTT capacity) would have disappeared, with an impact on their programme mix. For example (as noted above) regional TV news would be severely impacted and almost certainly dropped.

In the short run, investment in high-quality UK content would likely be sustained by the BBC, although commercial PSBs could cut back original content funding as their revenues faced more competitive

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132 See for instance the Comcast/Level 3 peering dispute. Level 3 was seeking to deliver Netflix traffic – previously Level 3 and Comcast had been exchanging traffic at no cost, but once Netflix became a Level 3 customer, Comcast began imposing charges. Jim Barthold, “Netflix faults Comcast in Level 3 dispute”, Fierce Cable, 22 February 2011
pressure, and as regulatory obligations fell away. Investment in children’s and factual content as well as UK drama and comedy could be reduced\textsuperscript{133}. News programming provided by the commercial PSBs might be reduced, with consequences for plurality.

In the longer run, weakening support for the licence fee could have a much more significant impact on support for a BBC of scale and scope, and – in turn – on funding of UK content. If public funding declines materially, so we might enter a downward spiral of declining revenues, investment and audiences for the main PSBs. This could also reduce the incentive for other channels and platforms to invest in UK content to the same degree. A potentially significant fall in original content on the main PSBs would at best be only partly offset by new investment by other channels. This loss of investment could well deprive the UK’s independent production sector of critical mass, leading to the decline of what is currently an international success story.

The UK Government would lose most of its strategic influence over the operation and development of TV platforms.

There would be a significant negative impact on services that depend for their distribution on the infrastructure put in place for DTT. Broadcast radio could be the most obvious casualty here, which would have to pick up a far greater share of the common costs of distribution and masts, or move to a combination of satellite and internet. This would fundamentally weaken the economic viability of radio broadcasting.

**Conclusion**

As we have seen, there is likely to be a significant loss of value absent DTT. Without DTT, the pay TV operators would be very well placed. They have the scale, marketing budgets and competitive leverage to capture a high percentage of the households that previously relied on DTT.

If pay operators do take share of 90% or more, this would lead to a number of adverse consequences. Clearly competition amongst TV platforms would be greatly weakened. The PSB ecology would be severely threatened – the case for the licence fee would be damaged, and there would be no basis for PSB obligations on commercial players. Moreover, viewing to PSB channels could drop significantly. In combination, these trends would reduce content investment, depriving viewers of attractive programming and indies of vital

\textsuperscript{133} Ofcom, *Ofcom’s Second Public Service Broadcasting Review: Putting Viewers First*, 21 January 2009
revenues. Radio too would be threatened by the need to absorb greater transmission costs.

Thus a scenario without DTT is likely to see substantial value destruction.

**Loss of value from a more limited DTT proposition**

Our analysis above has considered a world in which DTT disappeared. However, there are intermediate options for DTT that involve a more limited broadcast service using less spectrum capacity. Could most or all of the benefits be realised while making some spectrum available for other uses?

Clearly there are many such options for DTT, involving varying service combinations and spectrum requirements. It is not the remit of this report to conduct a detailed cost/benefit analysis of all of these.

Instead, we have examined one representative option as a means of testing its implications for our analysis. We assume that, to protect universal access to PSB channels, the DTT platform is reduced to just the three ‘PSB’ multiplexes, which provide the leading PSB channels,\(^\text{134}\) and their regional and HD variations. This, we understand, would release approximately one-third of the spectrum currently used for DTT. The amount of spectrum needed for just the three PSB muxes is more than half of the spectrum needed for the current six, due to the margin needed to address adjacent territory interference issues; the higher coverage of the PSB muxes; and the need for regional variation of some PSB channels.

Our analysis suggests that this option would not perform well in terms of the key economic and social benefits associated with current DTT provision.

**Audiences and revenues**

A more limited and less dynamic DTT platform would see its customer base gradually eroded, as suggested by the audience research referred to earlier. A limited offer DTT would almost certainly lose popular channels from the main PSB portfolios as well as some of the more specialist niche channels. While the immediate impact on the licence fee and PSB commercial revenues might be less marked than in a no-DTT world, there would be a longer-term risk to PSB funding. Moreover, the remaining DTT mux operators would face increased costs, since the (largely fixed) costs of operating the DTT

\(^{134}\) Including all BBC channels, 3 ITV channels, 5 Channel 4 channels and Channel 5
platform would be shared across fewer operators. Over time, the DTT platform may become unviable.

**Competition**

Today, the DTT platform has 54 channel slots (HD and SD). A three-PSB mux would offer just 19 channel slots, since the COM (commercial) muxes pack channels more densely into their capacity. This clearly is a significant loss of channel choice, which is a critical dimension for consumer choice of platform. In future this limited platform would be unable easily to improve and enhance its service proposition as technology changes, for example to introduce ultra HD services. All of these developments would be available on competing platforms. DTT’s competitive impact on Sky, Virgin and others would therefore be much reduced. In effect, a weak DTT could essentially lead to similar consequences to no DTT.

**Social objectives**

A limited PSB platform would address some of the risks to universality outlined above. But the danger is that households remaining on the DTT platform would be seen as ‘second class’ citizens, excluded from the wider range of content available on other platforms and from most future technical developments. The PSBs would incur higher transmission costs (as fixed costs would be spread among fewer broadcasters) for a platform which over time would appear increasingly marginal.

**Transition costs**

Thus this limited DTT platform would be vulnerable and likely to create far less value than today’s DTT. Moreover, there would be significant transition costs even to reach this unattractive scenario. As we have noted, spectrum replanning involves substantial costs, and the release of one-third of DTT’s spectrum would be a major undertaking.

**Conclusion**

A ‘limited DTT’ scenario is, if anything, even less attractive than a ‘no DTT’ scenario. While limited spectrum would be released (given the practicalities of sustaining wide coverage for the PSB muxes), most of the adverse consequences of the ‘no DTT’ scenario would still result, and costs incurred by the remaining PSB users would be higher. In the longer run, this would likely force an inevitable transition to a no-DTT world.

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135 In part because all the channels on the COM muxes are SD
136 For those households with YouView or other hybrid equipment, channel choice could be supplemented with IPTV-delivered channels. However, as discussed above there are many practical constraints on IPTV for the foreseeable future
8. Conclusions

It is sometimes argued that DTT’s case for spectrum depends on PSB ‘special pleading’. In this view, the only possible justification for allocating spectrum to DTT is to support PSB, and given a claimed diminution of PSB content, that justification is growing ever weaker.

As we have seen, there is no question that the DTT platform is a powerful supporter of the PSB ecosystem. However, it would be very wrong to argue that the case for DTT spectrum depends on that. In fact, DTT’s case for spectrum can be made purely on the consumer and producer surpluses it creates from the use of spectrum.

Moreover, it creates other purely economic externalities (quite separate from any social benefits derived from PSB). In particular, it is a critical component of TV platform competition, and is much better placed than Freesat to provide robust competition to pay operators, as well as providing critical competition within that segment of the market that will always seek FTA TV.

By rapidly replicating the innovations of pay operators (such as PVRs and HD channels), DTT requires those operators to constantly raise their game in order to justify their substantial price premium. This encourages pay TV innovation and investment in both content and platforms. Thus DTT benefits not just its own customers, but those of all platforms.

Against this background, securing sufficient spectrum to enable DTT to continue its role as a robust competitor is essential.
9. **Annex: The direct economic contribution made by DTT**

Chapter 2 briefly set out some of DTT’s contribution to economic activity, including value added, employment and investment. In this annex we discuss these issues in more detail.

**DTT’s direct contribution to overall economic activity**

DTT’s economic contribution can be assessed in two parts:
- The output and employment from the platform itself.
- The economic value generated by the TV services it delivers.

The first of these, by the nature of the activity, will be relatively modest. The second, involving broadcast of popular, high-value TV content to large audiences throughout the UK, will be much greater in value. We now examine each in turn.

**The DTT platform**

The DTT platform comprises a number of stages in delivering TV content from the broadcaster to the end viewer: content play-out, multiplexing, distribution of the signal to the transmitter masts, and then transmission itself.

![Figure 27: UK Terrestrial Broadcasting Infrastructure](image-url)
Estimating the total economic value generated per year by the platform is not straightforward because some parts of it are operated commercially, some purely as cost centres. If revenues from the commercial businesses are added to the operating costs of the non-commercial activities, we estimate that the DTT operation itself is responsible for around £440m of economic output a year\textsuperscript{138}. The platform is estimated to employ around 1,000 people directly in TV-related activities (operating and maintaining transmitters, managing multiplexes and distribution and so on).

Further, in the run-up to digital switchover, TV-related capital expenditure on the platform reached £630m, and is now running at around £50m a year\textsuperscript{139}.

**The television services carried by DTT**

The direct economic footprint of the DTT platform tells only a small part of the story. More important is the contribution it makes to the audiences and revenues of the services it carries – and in turn, to the levels of original UK content investment that they can sustain. In particular, as noted earlier, DTT supports the BBC and commercial PSBs in reaching the widest possible audiences across the UK with their free-to-air channels.

In this section, we estimate the contribution made by DTT and the services it carries in terms of output, value-added, and employment. We then examine DTT’s overall impact on UK original content production. Of course DTT accounts for only part of the UK-wide consumption of the channels it delivers. To obtain DTT’s contribution to those channels’ total economic activity, we have taken DTT’s share of viewing as a proxy for its relative contribution, and adjusted the total channel economic activity accordingly.

**Output**

Economic output of a sector is, in simple terms, comprised of the cost of employees, costs of inputs from suppliers, and profit for the businesses involved. As a proxy measure for the value of economic output associated with DTT, we can take the total flow of funds (turnover) that DTT generates for the services it carries.

\textsuperscript{138} Calculated by adding estimated turnover of commercial transmission and multiplexing businesses to the operating costs of the PSB muxes, based on data from annual reports and published group information from Arqiva

\textsuperscript{139} Communications Chambers estimates, based on published group information from Arqiva
One way of estimating that contribution is to calculate the share of total viewing that DTT currently delivers to the channels it carries, and apply this share to the revenues generated by those channels.

In 2012, DTT accounted for 44% of total UK viewing and 51% of viewing to the five main PSB channels. Overall, we estimate that 53% of viewing of all ‘free-to-air’ channels was accounted for by the DTT platform.141

This means that £2.95bn of revenue was supported by the platform (based on a pro rata share of licence fee income used for BBC TV and commercial revenues earned by the commercial broadcasters). DTT’s direct contribution to economic output, on this basis, is around £3bn a year in broad terms.

**Gross value added**

Another commonly used approach to measuring economic activity is to assess ‘gross value added’ (GVA). This is the measure of the value produced by a sector or group of businesses, less the costs of the inputs used from other (‘intermediate’) suppliers. While output measures total activity, including all supplier costs, GVA tells us how much additional economic value is generated. GVA, in broad terms, is the sum of employment costs, depreciation, amortisation and gross operating profits from a sector.

We have used data from the annual reports and accounts published by the main users of the DTT platform to derive its GVA contribution, supplemented by Communications Chambers estimates where data are incomplete. Using 2012 data, we estimate that DTT is associated with a direct GVA of £925m.142

Direct GVA is only one component of value added. A substantial part of the total output of the broadcasters using DTT is accounted for by third-party suppliers, in particular the independent production sector. It is also important, therefore, to take into account the multiplier effect of the sector’s direct GVA. Multiplier analysis

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140 Ofcom, *Communications Market Report 2013*, 1 August 2013 and BARB viewing data, calendar year 2012. This is based on DTT SoV for BBC of 51%; commercial PSBs 53%; commercial MCs 16%

141 BARB viewing data, calendar year 2012. ‘Free to air’ channels include all those available on either Freeview or Freesat

measures what are known as the ‘indirect’ and ‘induced’ effects. Indirect effects describe the value added by intermediate suppliers to the services using DTT, while induced effects describe the impact of expenditure in the economy by the employees of the services using DTT and employees of their intermediate suppliers.

We have not carried out our own analysis of the multipliers that apply specifically to the broadcast activities supported by DTT. However, a number of recent studies have estimated multipliers for similar types of economic activity. The most recent we have seen is a report for Arts Council England by the Centre for Economics and Business Research (CEBR)\(^\text{143}\), which suggests that the GVA multiplier for the arts and culture industry is 2.43. That is, for every £1 of direct GVA in the sector, a further £0.92 is generated in indirect impacts, and £0.50 is generated in induced impacts\(^\text{144}\).

If this is applied to our estimate for DTT’s direct GVA of £925m (above), we obtain a total of £2,249m as an indication of the GVA created by DTT both in the activities it directly supports and in the wider economy.

**Employment**

This level of activity supports creative sector employment on a significant scale. According to Skillset, using ONS Labour Force Survey data, some 16,600 people were employed directly in 2012 by terrestrial TV broadcasters in the UK. A further 21,600 were employed in the independent TV production sector, and a further 34,000 work in activities closely related to the film and TV sectors, such as studio hire and post-production.

Using a similar approach to that set out above, this suggests that in the order of 15,000\(^\text{145}\) jobs in terrestrial TV broadcasting and the independent TV production sector are dependent on the funding and investment associated with DTT. DTT-supported broadcasting will also help fund a substantial share of the additional 34,000 jobs referred to above, although, given the breadth of the sector, it is not possible to estimate the precise scale of this support.

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\(^{143}\) CEBR, *The contribution of the Arts and Culture to the National Economy, for Arts Council England and the National Museum Directors’ Council*, May 2013

\(^{144}\) This multiplier is also reasonably consistent with results of other studies – for example those carried out for the BBC by Deloitte, and for the UK film industry by Oxford Economics. CEBR in its report notes that a slightly higher multiplier of 2.51 is associated with the creative arts and entertainment segment of the sector

\(^{145}\) Assumes 44% of total terrestrial broadcaster employees, an adjusted total for independent producer employees to reflect the proportion of their activity driven by PSB commissions and an allowance for jobs supported directly by the platform itself
**Content investment**

A key result of the level of activity generated by DTT is the support it provides for original UK content investment. Revenues attributable to DTT help fund a large share of broadcaster investment in original UK content – either directly by the broadcasters, or indirectly by the independent production sector. We estimate that total investment in first run original UK content in 2012 was approximately £3.4bn\(^{146}\), with a majority (85%) provided by the main PSBs and their portfolio channels. Applying the DTT viewing data used above, around £1.5bn of this total content investment can be attributed to the support of the DTT platform.

In some ways, this arithmetical calculation understates the wider role that DTT plays in the UK content sector.

**Other effects**

The infrastructure and expertise in place for DTT also creates a number of additional effects in the rest of the economy.

**Consumer equipment**

Importantly, it encourages demand for and innovation in the consumer equipment market, as households acquire new TV receivers and set-top boxes for digital and HD content, and set-top boxes for hybrid broadcast and internet-based services.

While it is difficult to estimate precisely how many new receivers have been sold to DTT households, the total retail market is significant. For example, 44 million new DTT-enabled TV receivers and 15m DTT set-top boxes were sold in the UK over the period Jan 2008 – Dec 2012. Sales were accelerated in this period by digital switchover, but continue to be robust.

In the first seven months of 2013, 27% of 3.8 million DTT receiver sales were smart or connected TVs, which enable households to view a combination of broadcast and on-demand TV content.

**Broadband**

DTT, through its hybrid TV/internet proposition, has also played a role in encouraging households to demand and use high-speed

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\(^{147}\) Based on the above sources and BARB viewing data, calendar year 2012
broadband, with consequent knock-on benefits for broadband providers and also for the many service providers who have benefited from an increase in internet usage as a result.

Radio

Radio is supported by DTT in two ways. First, some radio is consumed via DTT broadcasts and receivers. Second, radio also depends to an extent on the infrastructure put in place to deliver DTT.

According to research conducted in 2013\textsuperscript{149}, approximately one-third of UK adults listen to the radio through their TV set. Listening via digital TV platforms accounts for 5.3\% of all radio listening and we estimate 40\% of this is via DTT. Applying this to total industry revenue (BBC radio expenditure and commercial radio station revenue) of £1.2bn, we therefore attribute approximately £25m of radio industry revenue to the DTT platform. This likely represents a significant percentage of total radio industry profits.

Radio broadcasts more generally also use some of the masts and sites put in place for DTT. Although using different radio spectrum allocations to that needed for TV, broadcast radio is facilitated by access to and use of many of the transmitter masts which have been built for digital TV coverage. For example, we understand that most of the 80 main transmitter masts used for TV are also used for radio broadcasts. In the absence of DTT, the shared costs of these masts and other shared infrastructure and services would ultimately fall on the radio sector, and on other services using the same masts (including dedicated communications networks and mobile operators).\textsuperscript{150} In the year to June 2012, Arqiva charged its TV customers £166m for network access and managed transmission services, compared to (for example) the £67m radio was charged for those services.\textsuperscript{151} For at least some users, the reallocation of the £166m currently charged to DTT could have implications for their sustainability.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{radio-industry-share-of-revenue-attributable-to-dtt.png}
\caption{Radio industry: share of revenue attributable to DTT\textsuperscript{148}}
\end{figure}

\begin{itemize}
\item 148 RAJAR data and industry revenue as reported in Ofcom, \textit{Communications Market Report 2013}, 1 August 2013 and Communications Chambers
\item 149 YouGov research, May 2013, reported in Ofcom, \textit{Communications Market Report 2013}, 1 August 2013
\item 150 Though note that prices are not set on a simple ‘share of costs’ basis
\item 151 Arqiva Broadcast Holdings Ltd, \textit{Regulatory Accounts for the year ended 30 June 2012}, 23 October 2012
\end{itemize}