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Introduction

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The bigger picture

Our second annual survey once again sets out to research and distil what top executives are thinking about all the key topic areas discussed at conferences and trade events.

The survey is based on the responses of over 380 industry executives from 42 countries to a series of questions on six hot topics.

In addition to assessing views on the overall digital TV landscape – including the overall prospects of the pay TV business, the advent of OTT TV and changing patterns of consumer behaviour – we drill down to look in detail at the industry's view of virtual reality and 360° video, Ultra HD, OTT TV, big data and next-generation video delivery technology. The impact of OTT TV services and technology is one of the principal overarching themes of this year's survey.

First, virtual reality has been a hot topic for the past year, and we look at how VR and 360° video could have an impact on the entertainment business, assessing the appeal of the format to consumers and the kind of content that could succeed in the market.

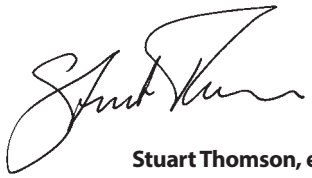
Next, we focus on the industry's views on Ultra HD TV and HDR, assessing likely factors for success and how important HDR will be to the overall Ultra HD TV experience.

Third, we look at trends in OTT TV, including the growing importance of live streaming and Quality of Experience.

We also assess the potential of big data to shape the OTT TV experience and deliver additional revenues and new business models for service providers.

Finally, we look at the migration of video to IP and assess the impact of adaptive bit-rate (ABR) encoding and the emergence of OTT as a mainstream video delivery technology.

The survey results, presented here in full, give a fascinating snapshot of how the industry views its own present state and future prospects.



Stuart Thomson, editor

Contents

The Digital TV landscape

Introduction

Digital media is entering a phase of accelerated disruption. With the rapid development of global OTT TV players, the emergence of internet giant such as Google and Facebook as potential players in media, and the changing habits of consumers, traditional media players are challenged as never before.

In Digital TV Europe's second annual survey, we asked our readers to give their views on some of the key technologies and services that are at the forefront of driving change, including virtual reality and UHD TV, the evolution of OTT TV and the migration of content delivery to IP, big data, content discovery and the user experience.

To kick off, however, we asked our respondents to identify and express their views on the future of pay TV and the key drivers of disruption.

The results show a slight growth in scepticism about the future prospects of traditional TV, strong faith in the prospects for subscription video-on-demand, and a sense that multi-play offerings will remain resilient even if pay TV suffers.

They also show that industry respondents believe, on the whole, that internet giants – Google, Facebook, Netflix, Amazon – will have a greater impact on digital media than traditional broadcast and content players, that providing connectivity will remain a solid business, and that the jury is still out on advanced entertainment formats such as virtual reality.

The Digital TV landscape

Prospects for pay TV

Respondents to our survey are split in their view of the prospects for the pay TV business overall for the next two years. The results are comparable to those produced by last year's survey, with a moderate hardening of the consensus that pay TV faces significant challenges.

Only a small minority – 13% – of respondents were highly optimistic about the future of pay TV, endorsing the view that the business is set for continued strong growth over the next two years, experiencing little negative impact from competitive pressures such as OTT and price erosion.

A solid 41% – the biggest single group – support the notion that pay TV is set for continued moderate growth with some modest negative impact from such competitive pressures. However almost a third of respondents take the more pessimistic view that pay TV is for very modest or zero growth, as those same competitive pressures start to have a significant impact.

Some 15% of respondents, meanwhile, are of the view that pay TV is set for negative growth as OTT and price competition challenge or even undermine the model (**fig.1**).

The note of pessimism evident in the set of responses is amplified by survey respondents' views of the prospects for the kind of services in which pay TV providers have traditionally specialised – especially the linear pay TV channel bundle.

Asked to rate the prospects for growth of a range of types of service offering over the same two-year time-span, linear channels scored lowest on average, with fewer than 5% believing they have very strong growth prospects and only 24% believing they have moderately strong growth prospects. On the other hand, 46% believe linear TV channels have modest or neutral growth prospects and over a quarter believe that linear pay TV channels are unlikely to record any significant growth.

By way of contrast, what might be described as the Netflix model – subscription video-on-demand – scores highest, with over 39% of respondents believing SVOD has very strong growth prospects and a further 49% believing this model has moderately strong growth prospects. Only 11% believe SVOD has modest or neutral prospects, and no respondents at all thought it was unlikely to record any significant growth.

In between, the business models adopted by advanced digital platforms also trump traditional broadcast TV models. Advertising-supported VOD came second overall in the ranking, with a combined 76% believing it has either very strong or moderately strong prospects. This contrasts with advertising-supported free-to-air linear channels, a model that is seen as having very or moderately strong growth prospects by only 31%, with 23% taking the view that advertising-supported linear channels are unlikely to record any significant growth.

On a more positive for pay TV providers, bundling pay TV services with broadband, telephony and mobile offerings is rated relatively highly by respondents. Over 27% believe triple- and quad-play bundled offerings have very strong growth prospects, while a further 42% believe they have moderately strong prospects.

For free-to-air broadcasters, the implied advice of our respondents would seem to be to invest in multichannel networks. Some 68% of respondents believe that advertising-supported YouTube multichannel networks have very or moderately strong growth prospects.

Transactional digital service models fare less well than SVOD but support for them is still significant. The download-to-own/electronic sell-through model fares somewhat less well than transactional VOD in terms of support, with 55% believing DTO/EST has very or moderately strong prospects, against over 65% for TVOD (**fig.2**).

Fig. 1

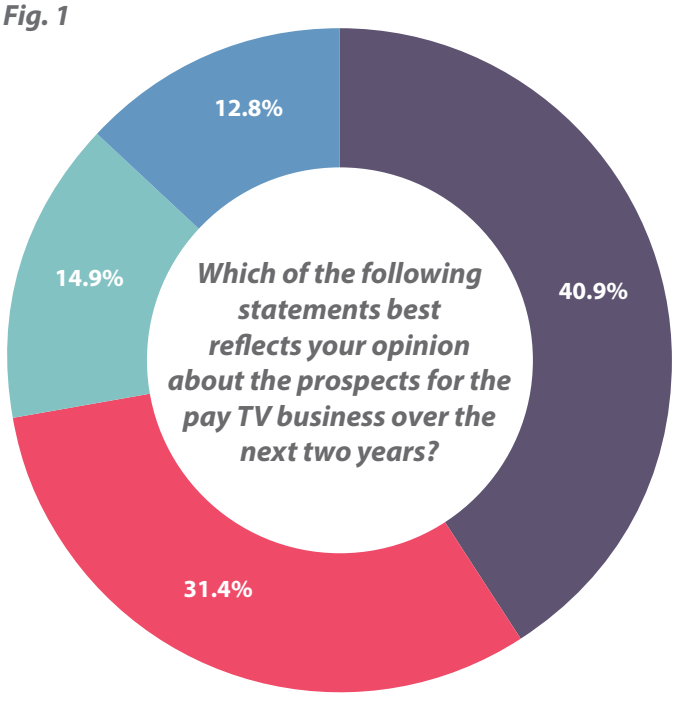
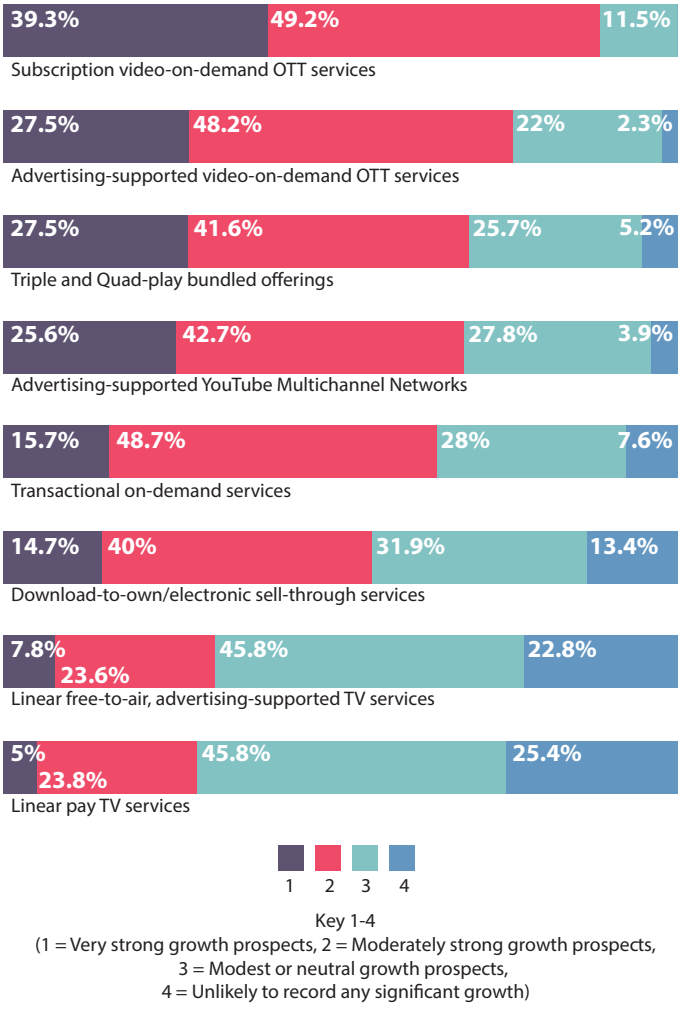
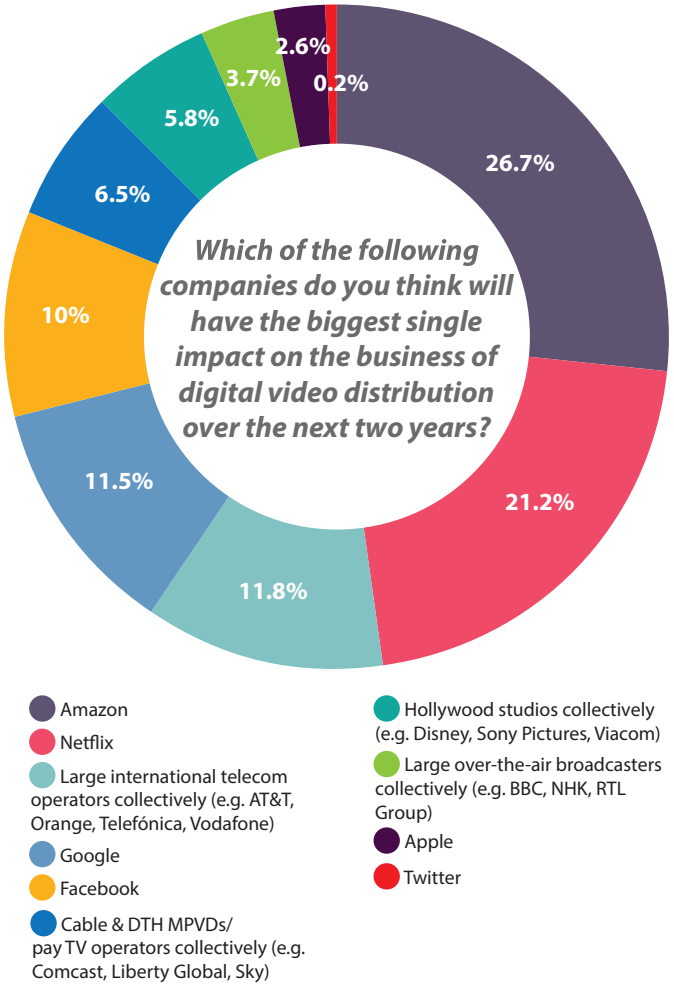


Fig. 2 How would you rate the prospects for growth of the following technologies and services over the next two years?



Key 1-4
(1 = Very strong growth prospects, 2 = Moderately strong growth prospects,
3 = Modest or neutral growth prospects,
4 = Unlikely to record any significant growth)

Fig. 3



The effects of disruption

The mixed views of respondents on the future of what might be termed traditional pay TV reflects the growing impact of disruptive service providers and technologies and changes in consumer behaviour that show little sign of slowing down.

Asked which of a group of new media entrants and more traditional players would have the biggest single impact on the digital video distribution business over the next two years, our respondents overwhelmingly chose Amazon and Netflix, with Facebook and Google also garnering respectable scores.

The breakdown of votes is instructive, with a few surprising choices. Amazon is rated as more likely to have the biggest impact than Netflix, with the former taking 27% of the votes cast compared with Netflix's 21%. Google scored just under 12%, while Facebook attracted just under 10%.

Among global digital media and technology players, Apple's score was – perhaps surprisingly – negligible, with under 3% of respondents rating the company behind iTunes and the iPhone as likely to have the biggest impact. Twitter, the other player listed, barely registered at all.

Among more traditional pay TV players – which are considered under category groupings rather than as individual companies – large international telecom operators with multi-play offerings (such as AT&T, Orange, Telefónica and Vodafone) attracted the highest score – 12%. Cable and DTH MPVDs and pay TV operators, taken as a single separate category, scored under 7%.

Companies specifically focusing on content fared somewhat less well. Hollywood studios collectively were judged likely to have the biggest impact by only just under 6% of respondents, while the other category considered – large over-the-air broadcasters such as the BBC, NHK or RTL Group – are clearly seen as out of step with the march of progress, attracting under 4% of votes (**fig.3**).

27%

of respondents think Amazon is the company that will have the biggest single impact on the digital video distribution business in the next two years.

In addition to identifying the key companies driving change, our survey respondents were asked to rank a number of technologies trends in order of their perceived importance to the future of the digital video business over the next two-year period.

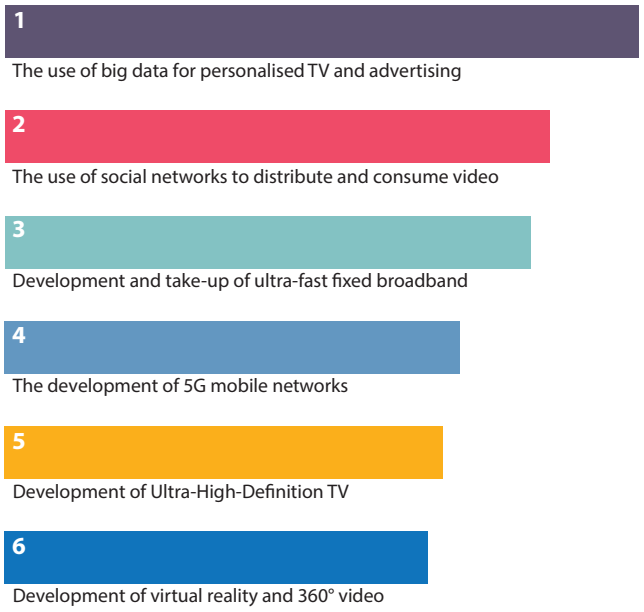
The pattern of votes neatly splits the six key trends considered into pairs.

The use of big data for personalised TV and advertising is judged likely to have the biggest impact based on a weighted average of scores, followed by the use of social networks to distribute and consume video. In short, global internet giants are once again voted most likely to make the running.

Third place goes to the development and take-up of ultra-fast fixed broadband – a choice that favours telecom and cable players – while coming in fourth is the development of 5G virtual networks. Connectivity is important, but takes second place, at least in our respondents' view to data and social.

Finally, trailing in fifth and sixth place respectively are the development of Ultra HD TV, and the development of virtual reality and 360° video – technologies that are of key importance to consumer electronics giants and broadcasters. (**fig.4**)

Fig. 4 How big an impact do you think the following technologies and trends will have on the digital video business over the next two years?



Conclusion

The traditional pay TV business faces a number of challenges driven by the growth of OTT TV services and price competition fed by multi-play bundling. The broad consensus of our survey respondents believe that pay TV will continue to grow modestly, but with a sizeable minority believing it is set for modest or even negative growth in the face of these headwinds.

Subscription video-on-demand is the business model with the greatest potential for growth, according to survey respondents, with advertising-supported VOD also scoring strongly. By comparison, the prospects for linear TV channels – whether pay or free – are relatively poor.

Respondents also believe that multi-play bundling of TV with broadband and mobile services has strong growth prospects.

In line with their preference for SVOD, our survey respondents believe overwhelmingly that Amazon and Netflix will have the biggest impact on the video distribution business over the next two years – with Amazon edging ahead of Netflix. Google and Facebook will also have a big impact.

Of more traditional businesses, the multi-play capability and scale of international telecom groups means they will have a strong impact. However, mainstream broadcasters are less likely to influence the direction of travel in the view of our survey sample.

In terms of overall trends that will have a big impact on the TV business, the use of big data to deliver targeted or personalised advertising tops the list in the view of our survey respondents, followed by the impact of social networks as distribution channels. Take-up of ultra-fast broadband is also important in influencing the future of digital video.

The overall conclusion would seem to be that internet giants and the technologies that drive their success – the power of data and social networking – are perceived to be key to the future. Physical connectivity is of key importance in delivering the services offered by this group of players, but its providers are less likely to shape the future of video than the internet giants themselves. Finally, the overall impact of innovation from traditional media groups such as broadcasters – along with consumer electronics firms – is likely to be less significant in shaping the near future of video distribution. ●

Virtual reality and 360° video

Introduction

Interest in 360° video and – slightly further down the line – virtual reality as an entertainment experience is growing in the media sector, with companies and organisations experimenting in a number of different ways.

These experiments are, for the most part, still at an early stage. VR covers a broad range of activities ranging from medical and scientific applications through to gaming and interactive video experiences. But with the likes of Fox creating a dedicated VR unit and BBC Earth teaming up with Oculus to create natural history experiences, media companies clearly believe there is a future in VR as a format for audiovisual entertainment.

There remains a degree of uncertainty, however, not only about the extent of the appeal of VR – particularly in light of the fate of that other headgear-requiring entertainment format, 3D TV – but about what the terminology actually means. While 360° video, enabling viewers to pan through the scene in front of their eyes, is a fairly straightforward proposition and only requires a modern smartphone, there is confusion about the distinction between 360° video and virtual reality, and the distinction between virtual, augmented, hybrid and mixed reality.

While virtual reality refers to the computer-generated replication of a real or imaginary environment, augmented reality is an audiovisual representations of reality overlaid with virtual images such as graphics and other elements. Mixed or hybrid reality is when real and virtual worlds are merged together to produce new environments that include both physical and digital objects co-existing and interacting in real time.

We asked our survey respondents to share their views about the viability of these formats as vehicles for entertainment and to identify the challenges and opportunities that lie in their path.

Virtual reality and 360° video

First steps

Awareness of the terms 360° video, virtual reality, augmented reality or mixed/hybrid reality services is generally high among our survey respondents. Virtual reality scored highest, with three in four respondents saying that they are very familiar with the term, followed by 360° video, with 65% saying they were very familiar with the format. Augmented reality also scored highly, with 63% saying they were very familiar with this term.

Respondents were on the other hand much less familiar with mixed or hybrid reality, with only three in 10 saying they were very familiar with this term and about a third saying they either were not sure what it means or had no idea what it means. (**fig.5**)

Awareness of the technology may be relatively high, but service launches so far are thin on the ground. Of survey respondents who consider the question to be relevant to their business, only a minority have launched 360° video, virtual reality, augmented reality or mixed/hybrid reality services.

Unsurprisingly, 360° video – the most straightforward format and a relatively simple extension of existing content creation activity – came out top among the four technologies here, with over 11% of those for whom the question is relevant saying they have launched a service and a further 22% saying they had a service in a trial or test phase.

Virtual reality came next, with 9% of those for whom the question was relevant saying they have launched a service and a further 20% with a service in a trial phase.

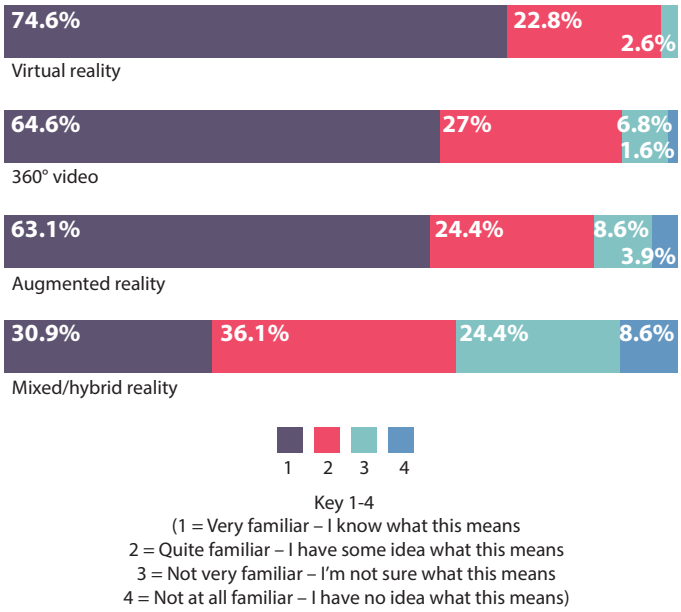
Augmented reality and mixed/hybrid reality have attracted less interest. Fewer respondents were aware of these formats and of those that were aware, fewer have either launched a service or plan to do so. Only 6% of respondents for whom the question was relevant have launched augmented reality, with a further 13% having something in a trial or test phase. Regarding mixed/hybrid reality, only 5% have launched something and only 8% had a trial or test up and running. (**fig.6**).

VR as an entertainment experience

While 360° video, virtual, augmented and mixed reality experiences are understood to have a wide range of uses, ranging from enterprise applications and e-medicine to video gaming and news coverage, whether they have mass appeal as a pure entertainment tool is very much subject to debate.

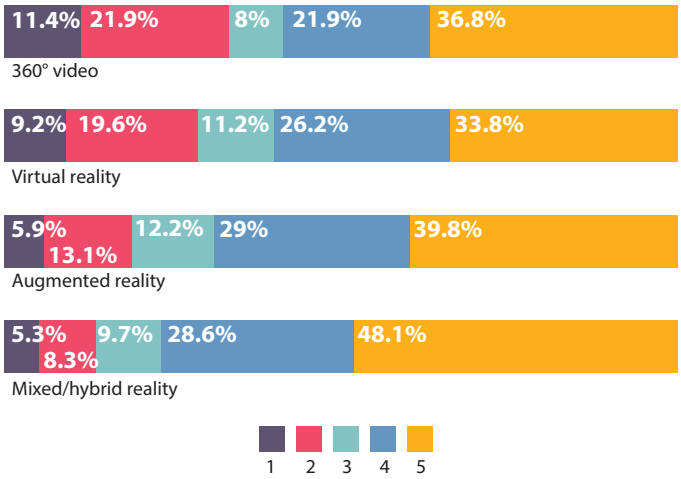
Asked to express a view of the potential of 360° video and VR as entertainment experiences, our survey respondents are actually broadly positive, with a division of opinion over whether VR and 360° entertainment would find their strength as a regular activity for a minority audience or an occasional pleasure for a majority.

Fig. 5 How familiar are you with the following terms?



Key 1-4
(1 = Very familiar – I know what this means
2 = Quite familiar – I have some idea what this means
3 = Not very familiar – I'm not sure what this means
4 = Not at all familiar – I have no idea what this means)

Fig. 6 Has your organisation produced or distributed content in these formats?



Key 1-5
(1 = Have already launched a service, 2 = In a trial/test phase,
3 = Plan to launch something within one year,
4 = Plan to launch at some point, 5 = Do not plan to launch)

Some 37% of respondents – the largest single segment, endorse the view that in the future 360° and VR entertainment will be enjoyed regularly, but only by a minority of consumers, while a smaller but still significant number – 30% – believe that 360° video and VR will be enjoyed on an occasional basis by a majority of consumers.

A smaller number took the more enthusiastic view that 360° video and VR entertainment will be enjoyed regularly by the majority of consumers.

Among the more pessimistic segment of respondents, 19% of the total take the view that 360° video and VR will be enjoyed only occasionally and only by a minority. However only 1% believe these formats will ultimately not be accepted as entertainment experiences even by a minority (**fig.7**).

Our industry experts also have a clear view of which content genres are most likely to deliver results. Asked to rate a number of entertainment genres for their potential as 360° video or VR experiences, coverage of sports and other events are by far the most favoured content types for 360° video, while games are far ahead of any other genre of content in the line-up of VR genres.

Close to four out of five respondents believe that 360° live coverage of

Fig. 7

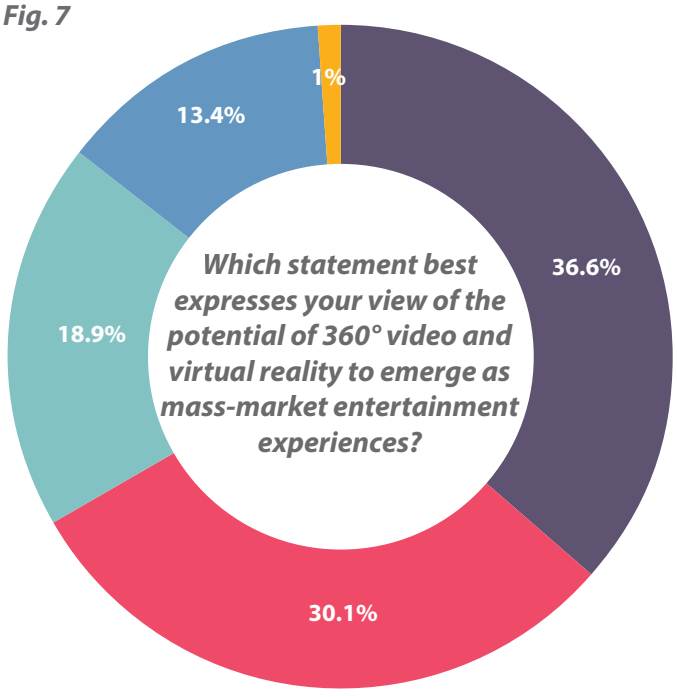
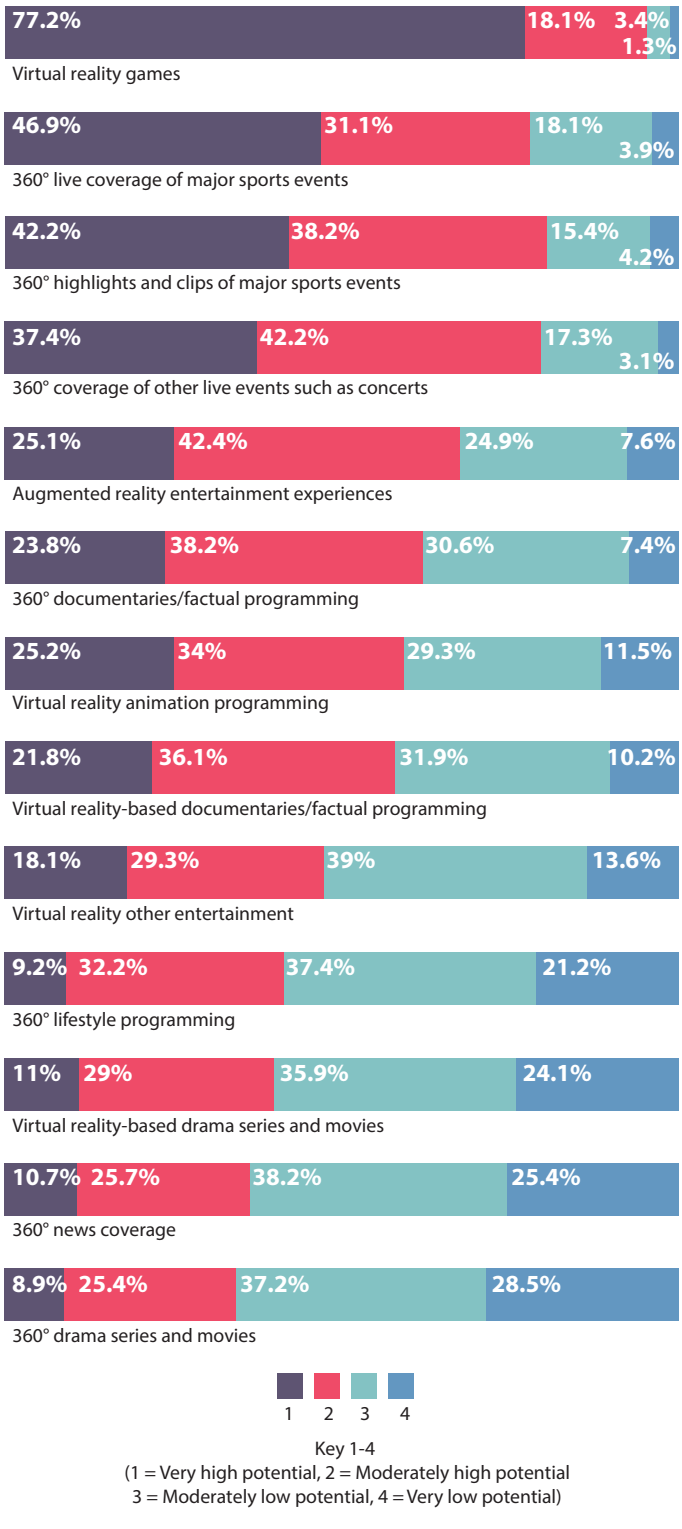
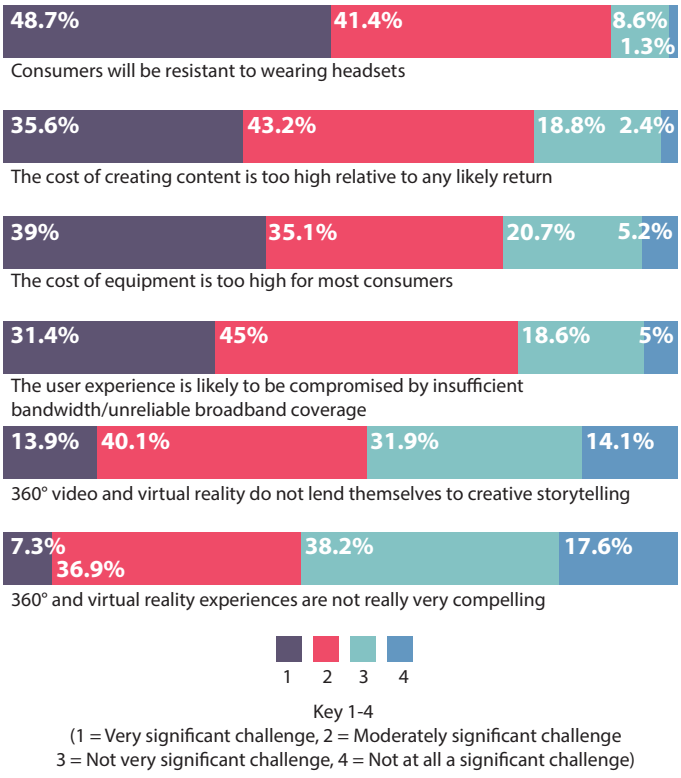


Fig. 8 Which of the following entertainment genres have the most potential to emerge as 360° video and/or virtual reality entertainment experiences



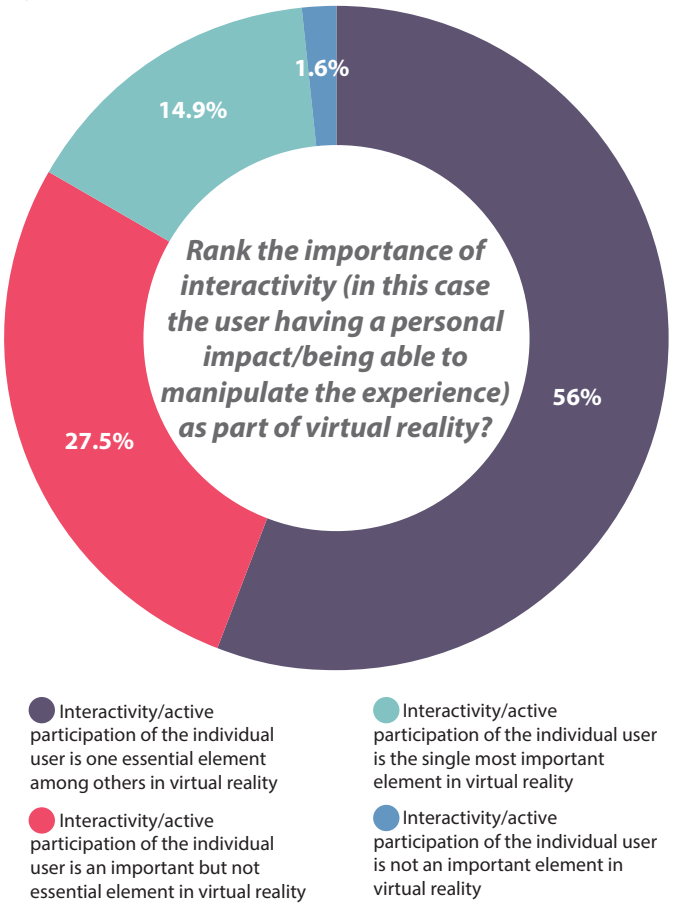
Key 1-4
(1 = Very high potential, 2 = Moderately high potential
3 = Moderately low potential, 4 = Very low potential)

Fig. 9 What are the major hurdles that stand in the way of 360° video and virtual reality underpinning entertainment experiences with broad consumer appeal?



Key 1-4
(1 = Very significant challenge, 2 = Moderately significant challenge
3 = Not very significant challenge, 4 = Not at all a significant challenge)

Fig.10



major sports events will have very high or moderately high potential, with a similar proportion believing that 360° highlights will have potential.

Similarly, four in five respondents believe that 360° coverage of live events such as concerts will have potential, with a slightly greater number believing this will have moderately high potential rather than very high potential.

Among other thematic programming genres, documentaries scored highest for very high or moderately high potential. 360° lifestyle programming and news have less appeal, while 360° drama series and movies are believed to be of minority interest only.

As far as virtual reality is concerned, games predictably is the standout 'entertainment genre', with 77% believing it has very high potential and a further 18% believing it has moderately high potential.

Among pure programming genres, animation is the top-rated format, with close to three in five believing it will have very high or moderately high potential (**fig.8**).

Answers to a question about the major challenges to 360° video and VR underpinning mass-market entertainment experiences give rise to the suspicion that the terrible fate of 3D TV still casts a long shadow. Asked to rate six key challenges for importance, potential resistance on the part of consumers to wearing VR headsets comes out on top, with half rating it a very significant challenge and almost everyone else rating it as a moderately significant challenge.

The other standout challenges are cost-related – namely, the cost of creating content and the cost of those headsets. Almost four in five respondents believe that the cost of creating content being too high relative to the likely return is a very or moderately significant challenge. A slightly lower number – three in four respondents – believe that the high cost of consumer equipment is a very or moderately significant challenge.

There is also some concern about the possibility of insufficient or unreliable bandwidth hobbling the consumer experience, with three in four also rating this as a very or moderately significant concern.

On the bright side, there is relatively little concern about 360° video and VR not offering a compelling experience. Only 7% believe this is a very significant challenge, with 35% believing it is a moderately significant challenge (**fig.9**).

VR and interactivity

Virtual reality as a video entertainment format is still at a very early stage of development, and exactly what constitutes a compelling user experience remains anybody's guess. Few, on the other hand, doubt the appeal of VR gaming – and that, in the case of gaming, interacting with the content and with other participants is key to that appeal.

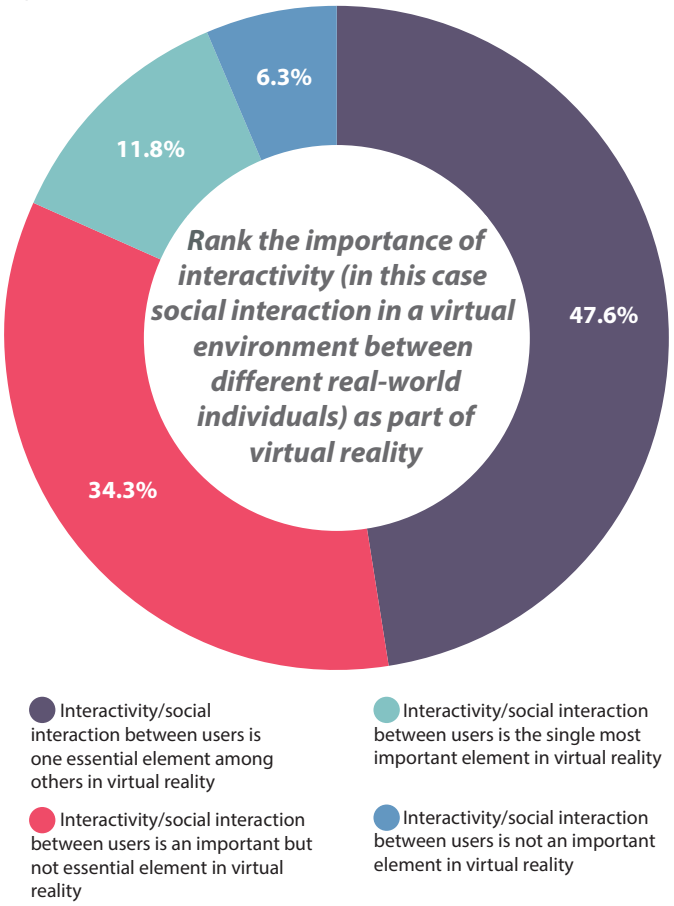
Whether interaction – either with the content or with other users of

the content – will be key to the success of VR as a video entertainment format is less clear. However, the broad consensus among our survey respondents is that interaction in general – and interaction with the content in particular – will be an essential element of VR, if not the most essential element.

In relation to interacting with content – meaning the user having a personal impact on or being able to manipulate the experience – 56% of respondents take the view that this will be one essential element among others, while 15% rate it as the single most important element. Only a minority believe interaction will not be essential, and only a tiny minority believe it will not be important (**fig.10**).

Interaction can also mean interacting with fellow users – something that is obviously key to the appeal of VR gaming but which could also play a role in the evolution of new forms of entertainment content. Asked to rate the importance of social interaction in a virtual environment between real-world individuals as an element in VR, survey respondents gave a similar range of results, with 48% endorsing the view that it is one essential element among others and 12% holding the stronger view that it the single most important element in VR. (**fig.11**)

Fig.11



Conclusion

Our survey shows that there is generally high awareness among industry executives of 360° video, virtual reality and augmented reality, and somewhat less awareness of mixed or hybrid reality.

Respondents were also positive about the opportunity to deploy 360° video and VR as vehicles for entertainment experiences, and a significant number of survey respondents have either already launched services, are trialing services, or have plans to launch something in the future.

However, there is considerably less clarity about the extent of their mass appeal, with a division of opinion over whether these are likely to be mainstream formats regularly accessed by a mainstream audience or the basis of experiences that are accessed extensively, but only by a dedicated minority of fans.

Our survey sample also believes that interaction with be an important element of the VR experience, although not necessarily the single most important element. The ability to interact with and manipulate the experience itself is seen as particularly important, with social interaction also highly valued, but slightly less important. ●

SPONSOR'S COMMENT

Khurram Rafique, global head of marketing, Nokia Technologies

Virtual Reality is in its early days. In 2016, we witnessed many players in the VR space taking different positions in the value chain as well as rolling out their visions of the technology. It is however clear that before VR becomes mainstream, many questions need to be answered.

At the beginning of 2016, one important question was how to tell stories in this new medium. Over decades, storytellers have developed specific methods and techniques to portray their characters and plots. With the arrival of VR, many of the conventional screenplay techniques came into question.

Another important question has been around the usage of Head-Mounted Displays (HMDs). Will users want to use today's HMDs over longer periods of time for uninterrupted sessions.

This survey sheds some light on the above two questions and we are not surprised to see the responses. The survey shows that the awareness for VR is very high. Storytelling needs to catch up, but the medium offers new and exciting opportunities. The survey also shows that the HMD usage is a concern, but we believe that the technology will take its due evolutionary path to resolution.

At Nokia Technologies, we are driven by our vision to make technology more human. Our eyes or on the eventual state, when virtual reality will bring true immersion and interactivity. This will allow for the empathy and human connection at an unprecedented level. Nokia OZO has received critical acclaim for its design, functionality, and ingenuity. Nokia is committed to innovating in the virtual reality space and making the VR promise a reality.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Ultra HD TV & HDR TV

Introduction

Ultra HD TV is widely seen as *the* key technical innovation to drive growth in TV reception equipment sales and renew and enhance the TV viewing experience in the next few years. This growth is likely to follow the same trajectory as HD TV, which began to transform the TV experience a decade ago.

Today there is wide industry consensus that Ultra HD TV services are on the way. TV manufacturers have already successfully marketed display devices to consumers. Unlike HD TV, the Ultra HD TV experience relies on a number of different technical improvements to satisfy the viewing experience. There is a general consensus that the next generation of TV services will be in 4K resolution. Some industry participants believe 8K would deliver a more substantial improvement and could be worth the wait. There is also consensus that the full Ultra HD TV experience will encompass a variety of elements beyond higher resolution. Among survey respondents, there is disagreement over which of these elements are important and which technical variations should be supported.

We asked our survey respondents to assess factors that would determine the wide adoption of Ultra HD TV and to offer views on how the most widely discussed additional element of the experience – High Dynamic Range – will evolve.

Ultra HD TV & HDR TV

Success factors for Ultra HD TV

Media companies are overwhelmingly looking to launch Ultra HD TV services as the next stage of their technical development. Of respondents for whom the question is applicable, fully 31% say they already provide an Ultra HD TV service of some kind. A further 16% say they will launch a service this year, while 7% say they will launch next year.

Of the remainder, some 28% of the total for whom the question is applicable say they will launch Ultra HD TV but have not yet set a deadline. Only 18% say they have no plans to offer Ultra HD TV. (**fig.12**).

The need to have a plan in place for migration to Ultra HD TV is clear among the majority of our respondents, and there is also a clear consensus about the type of content that is most likely to drive adoption of the format. Live sports events are by far the most favoured content genre in Ultra HD appeal, with over 80% of respondents rating this as very important to driving adoption. Live sport is far ahead of the next most important content category in this respect – movies and drama series. The latter is categorised as very important by 56% of respondents.

Factual and cultural programming comes next in the list of most favoured genres. Documentary programming is classed as very important to Ultra HD adoption by 39% of respondents, and as moderately important by 41%. Some 34% of respondents class live culture events as very important, with 45% categorising these as moderately important.

The other content genres considered have considerably less appeal as Ultra HD TV drivers, at least in the view of our survey respondents. Some 47% apiece believe that kids programming and news are not very important for the future of Ultra HD TV. The least important content genre of all in our list is (rights-cleared) user-generated content, with some 23% believing this is not at all important in driving uptake of Ultra HD TV, and a further 43% believing it is not very important. (**fig.13**)

Fig. 12

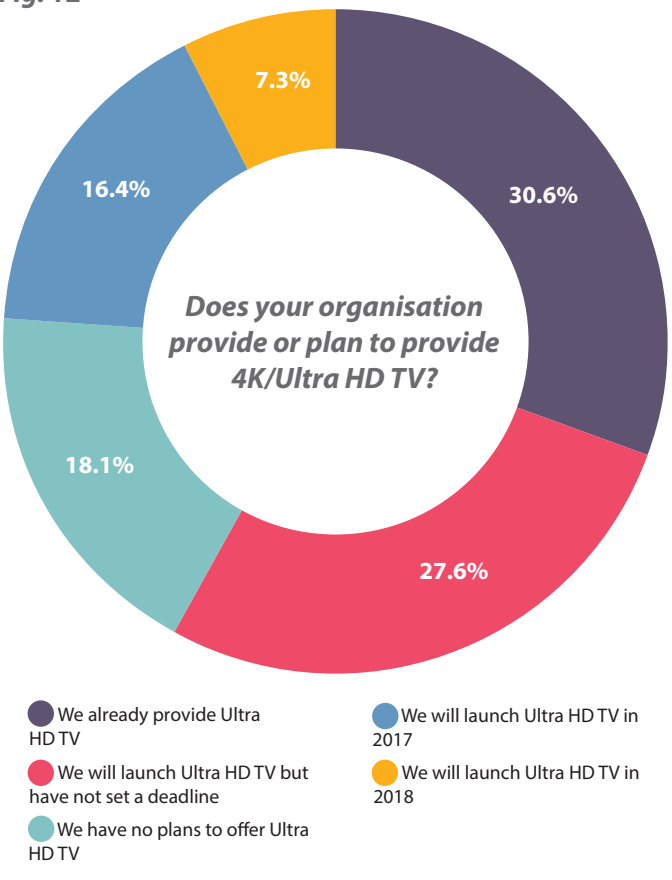
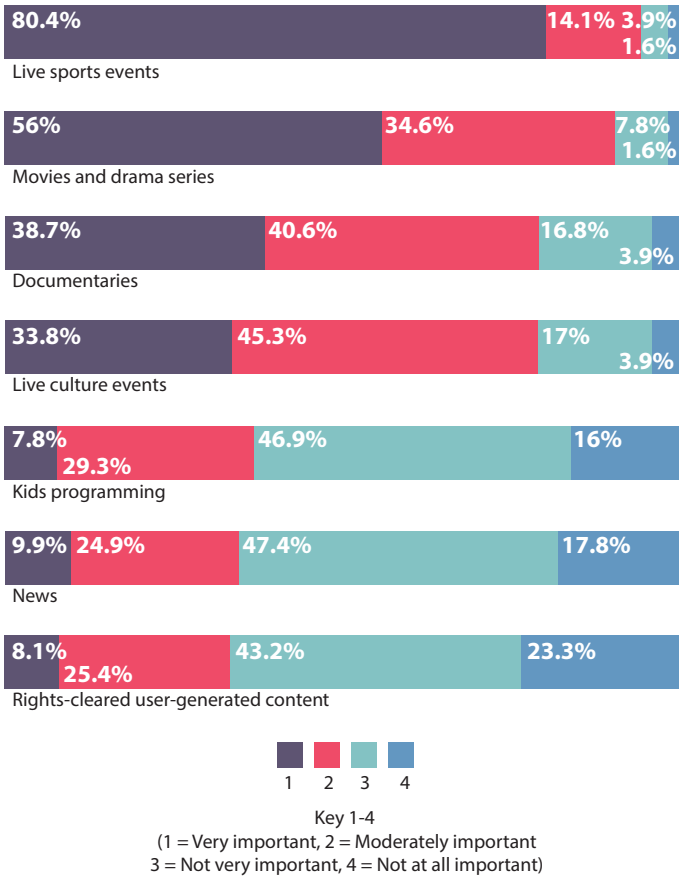


Fig. 13 How important will the following content genres be to driving 4K Ultra HD TV adoption?



Key 1-4
(1 = Very important, 2 = Moderately important
3 = Not very important, 4 = Not at all important)

Fig. 14 How important do you think the following features of next-generation TV are for the success of services?

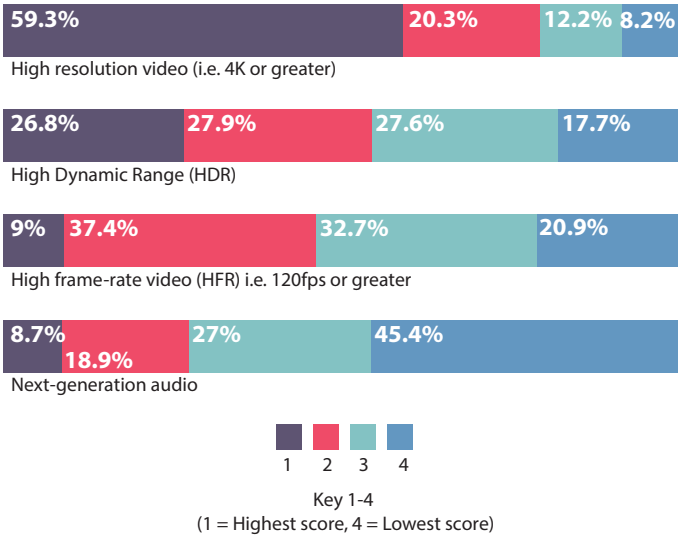
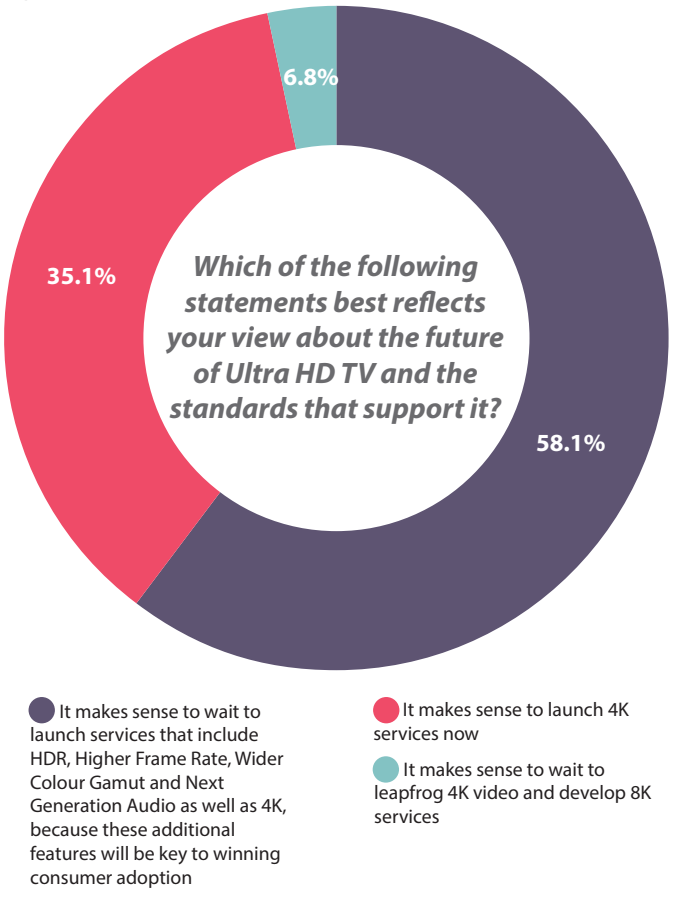


Fig. 15



The choice of content is one factor that will have an impact on how attractive Ultra HD TV is to consumers. But the technology itself encompasses a range of different elements. Much attention has been focused on 4K resolution – driven to some extent by marketers of TV displays. Other elements critical to the Ultra HD TV experience include: high frame rates (HFR) or the number of frames per second displayed on screen; High Dynamic Range (HDR) meaning greater vibrancy and contrast of colours displayed; and next-generation audio (NGA), which encompasses object-based and multichannel sound.

Asked to rate all of these elements for importance in determining the success of next-generation TV, our survey respondents still give priority to resolution above other factors, with 59% giving it the highest importance on a scale of one to four. However, respondents also rate HDR as very important – if not quite as important as higher resolution – with 27% rating it as the most important factor and 28% rating it as the second most important.

Respondents see HFR as being of middling importance, with only 9% rating it as the number one factor, 37% rating it as the second most important factor and 32% placing it third.

Audio is seen as much less important. Some 45% rate it last in the field of four – although 9%, the same proportion as for HFR – rate it the number one factor. (**fig.14**)

Taking the Ultra HD TV experience in the round, our survey respondents are divided in their view of whether it makes sense to launch services with the element that is already in place and fully standardised – namely 4K resolution – or to wait until all the elements, including HDR, HFR, WCG and NGA are in place, although a clear majority prefer to wait. Some 58% of respondents say that it makes sense to wait to launch services that include all the other elements, because these will be key to winning consumer adoption. This compares with 35% who say it makes sense to launch 4K services now.

A further 7% say it makes sense to leapfrog 4K resolution and develop 8K services instead. (**fig.15**)

58% of those surveyed believe it makes sense to wait for all the elements that comprise Ultra HD TV to be in place before launching a service

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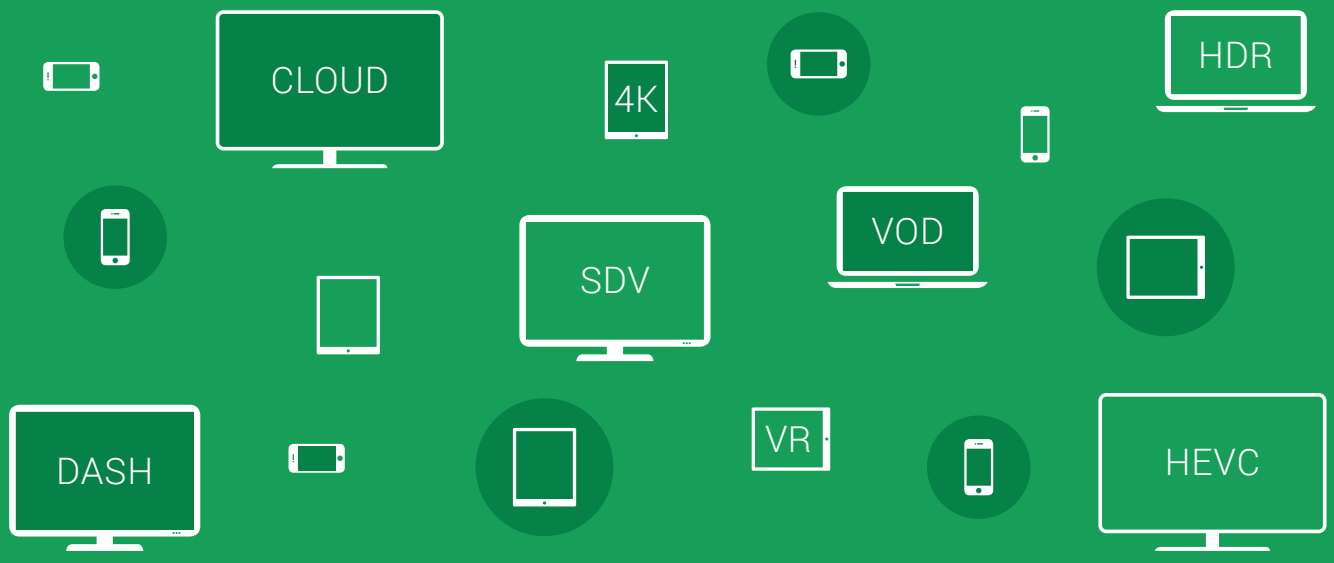
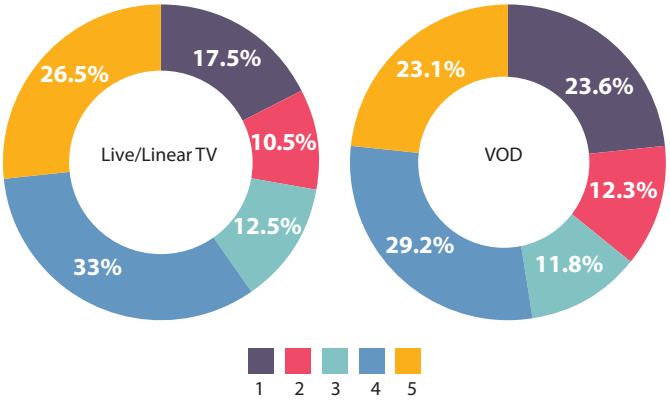
Perfecting the Media Experience



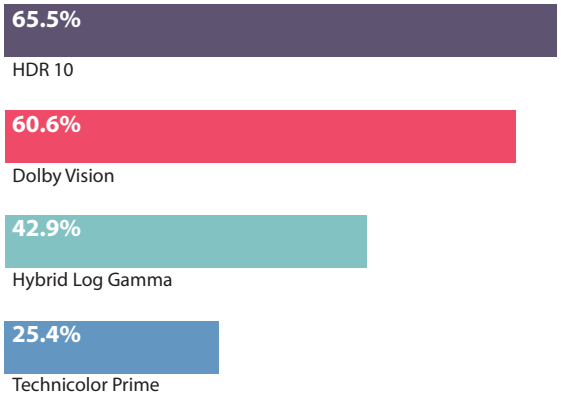
Software-defined video solutions from Elemental empower media companies to deliver premium video experiences to consumers. Pay TV operators, content programmers, broadcasters and enterprise customers around the world rely on Elemental products to quickly and easily scale workflows that deliver video content to any screen, any time – all at once.

Fig. 16 Does your organisation provide or plan to provide HDR TV services?



Key 1-5
(1 = Already launched, 2 = Will launch in 2017
3 = Will launch in 2018, 4 = Will launch but have not set a deadline
5 = Have no plans to offer services)

Fig. 17 Which of the following HDR technologies will you use/are considering using?



HDR technology

HDR has been a major – probably the major – focus of industry debate around the Ultra HD TV experience for some time, driven in part by the presence of a number of HDR technologies vying for supremacy and a degree of uncertainty about the dangers of fragmentation of the market.

Uncertainty about which HDR format or formats to back may contribute to the fact that comparatively few of our respondents have launched HDR services or have immediate plans to do so. In contrast to the level of activity around Ultra HD TV more broadly defined, where 31% of relevant respondents said they have launched a service of some kind, only 17.5% of respondents for whom the question is relevant say they have launched a live linear HDR TV service. However, a slightly higher proportion – 23% – say they have launched an HDR video-on-demand service.

Some 10.5% say they will launch a live HDR TV service this year, and 12.5% say they will launch in 2018. The numbers are comparable for VOD, with 12% saying they will launch this year and the same proportion promising a service in 2018.

Notably, fully one third of respondents say they will launch a live HDR service but have not set a deadline, with 29% saying the same for VOD. Some 26% say they have no plans to launch a live service, and a similar proportion – 23% – say they have no plans for an on-demand HDR service. (**fig.16**)

70% of those surveyed believe support for many device types is the most important reason for the success of HDR

The main HDR technology options facing the industry and standards bodies are Hybrid Log Gamma (HLG), the technology developed by the BBC and NHK, HDR10, the standards-based technology supported by a number of TV manufacturers, and two technology company-driven variants, Dolby Vision and Technicolor Prime.

Uncertainty about the technology choices available and the relative merits may in part be the reason that only under half of our survey respondents felt qualified to offer an opinion on which HDR technology or technologies they are either using or considering using. Of those that are using or are considering using one of the four technology options considered, HDR10 and Dolby Vision are out in front, with 65% using or considering using HDR10 and 60% using or considering using Dolby Vision. HLG is being used or considered by 42% of respondents, while Technicolor Prime is trailing behind somewhat with 25%. (**fig.17**)

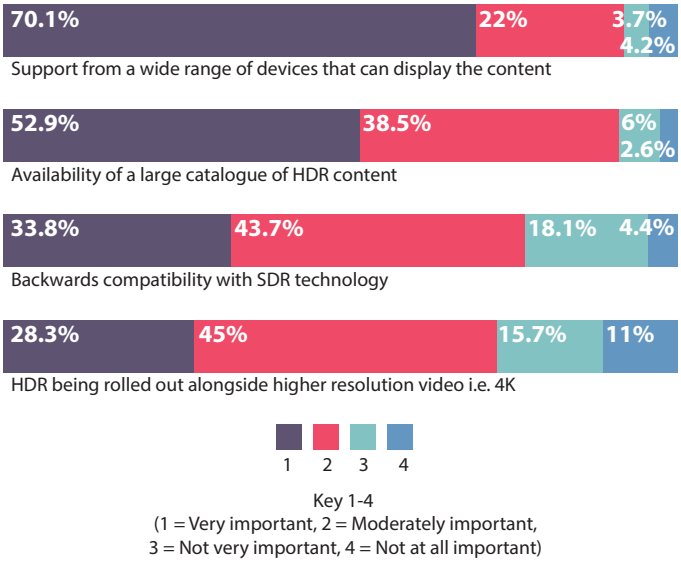
Success factors for HDR

The popularity of HDR10 may be related to the elements or qualities of the technology that respondents believe will be important to ensuring its success.

We asked respondents to rate four different elements for importance – support from a wide range of display devices, availability of a large catalogue of HDR content, backwards compatibility with Standard Dynamic Range (SDR) technology and HDR being rolled out alongside or at the same time as higher resolution video.

By far the most important element in the view of our survey sample is support from a wide range of devices that can display the content. Seven in 10 respondents rate this as very important, with a

Fig. 18 Which of the following elements/qualities of HDR are important to ensuring its success?



further 22% rating it as moderately important.

The next most important element in the view of our survey respondents is the availability of a large catalogue of HDR content, rated very important by 53% and moderately important by 38%.

Of less importance in relative terms is backwards compatibility with SDR technology – voted very important by a third of respondents and moderately important by 44% – and HDR being rolled out alongside 4K, which was rated very important by only 28%. (**fig.18**)

The importance given by our survey respondents to supporting a large range of devices ties in neatly with the preference for HDR10, given that this open source technology is the preferred variant of TV manufacturers such as LG.

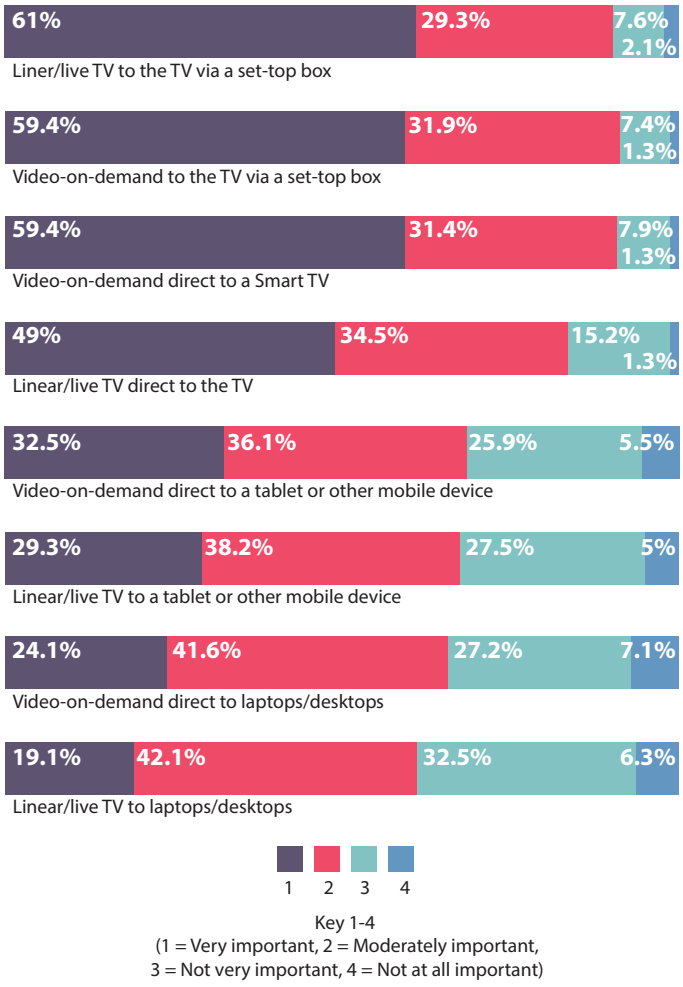
We asked our survey respondents to assess how important it is to support various specific types of device as well as various specific types of service – on-demand and linear live TV – in order to drive uptake of Ultra HD TV, including HDR.

Given the nature of Ultra HD TV, it is no surprise that the big screen in the living room is seen as the key device. In the view of our sample, three combinations of service type/device are more or less equally important in this regard – live/linear TV delivered to TV sets via a set-top box, video-on-demand delivered to TV sets via a set-top box and video-on-demand delivered direct to smart TVs. All are rated very important by about three out of five respondents, and moderately important by a further three in 10.

Linear/live TV delivered direct to the TV was also seen as key, with just under half of respondents rating this as very important.

Tablets and mobile phones are seen a the next most important category of device, with just under a third of respondents rating the delivery of VOD to a tablet or other mobile device as very important and a further 36% rating it as moderately important. Linear/live

Fig. 19 How important is it to support the following devices and/or types of service with a full Ultra HD experience including HDR?



TV to tablets and mobiles is seen as very important by three in 10 respondents and as moderately important by a further 38%.

Trailing other device categories somewhat is the laptop and desktop. Delivering VOD to laptops and desktops is seen as very important by 24% and moderately important by 42%, but is also seen as not very important by 27%. At the very back of the line in order of importance is linear/live TV to the laptop or desktop, rated very important by only 19% of respondents and as not very important by almost a third of the sample. (**fig.19**)

Conclusion

From the responses given by our survey sample, it is clear that there is widespread enthusiasm for Ultra HD TV and a drive to launch services.

It is equally clear that, in the opinion of the industry figures we surveyed, live sports will be the big content driver for Ultra HD TV, way ahead of the next most important type of content – movies and series. Behind these, factual and cultural programming will also be important, with other genres such as news, kids content and user-generated content much less important.

Adoption of Ultra HD TV will also be driven by the technical features that lift the experience of viewing it above what is currently available from HD TV. While the improved resolution offered by 4K video is still the key element, HDR will also be of key importance in delivering consumer adoption, according to our survey sample. A majority of respondents believe it is better for those planning to launch Ultra HD TV services to wait until all the key elements, including HDR, are in place rather than provide a 4K-only offering that may disappoint viewers.

While HDR is seen as of prime importance among the other main elements that comprise the Ultra HD TV experience, there is a division of opinion on which of the rival emerging HDR technologies it makes sense to support. However, HDR10 is the leading candidate, reflecting the importance our survey sample gives to making services available on as many devices as possible.

Providing a service that can be viewed on a broad range of large TV displays would seem to be the main ingredient that our survey sample believes will deliver success. In the view of our respondents, the TV in the living room will be the device of choice for viewing Ultra HD content, which will have a clear impact on the choice that content providers make.

SPONSOR'S COMMENT

John Nemeth, VP Field Operations EMEA, Elemental Technologies, an Amazon Web Services Company

There is real interest in delivering UHD to an eager consumer market. As this study illustrates, the industry has seen strong growth in sales of 4K television receivers and screens, and increased availability of live and on-demand 4K content from broadcasters and pay TV operators. Many of these media leaders – such as BT, Globosat and Tata Sky – rely on Elemental to launch their offerings. Dozens of other companies are following suit, taking advantage of the proven, scalable, software-defined video solutions from Elemental to maintain operational efficiency while assuring the highest quality 4K viewing experience and to provide a unified experience for UHD along with other services across multiple delivery platforms.

It comes as little surprise that live sports is seen as being an ideal content genre for 4K, with the ability for higher frame rate (HFR) technology to add remarkable clarity, particularly in fast-moving images. But 4K screen resolution is just one element of UHD, and this study clearly shows that widespread rollout of UHD is dependent on other factors. Close to six in 10 respondents say that it makes sense to wait until all of the pieces fall into place, including standardization as well as ready availability of HDR (high dynamic range with associated extended colour gamut) and NGA (next generation audio, including object-oriented sound giving consumers the chance to create their perfect mix). They see these additional features as key to achieving a compelling proposition and driving consumer upgrades.

HDR, HFR and NGA are all at different stages of development and standardisation. Fortunately, cloud-ready, software-defined video solutions from Elemental allow content providers to take a stepwise approach to readying video infrastructures for 4K service deployment. For example, 4K channels can be on air today, with HDR added when a business decision is taken on the delivery format. HDR can also be added to traditional HD television, too. As HDR, HFR and NGA technologies and standards coalesce, Elemental software can help content providers keep pace – and to elastically and flexibly scale with Amazon Web Services cloud services providing the additional storage capacity and processing power as needed.

ELEMENTAL
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Elemental Technologies, an Amazon Web Services (AWS) company, empowers media companies to deliver premium video experiences to consumers. Founded in 2006, the company pioneered the use of software-based video processing to distribute and monetize video over the internet. As the leader in software-defined video solutions, Elemental powers video infrastructure for top-tier media franchises worldwide and helps pay TV operators, content programmers, broadcasters and enterprise customers bring video content to any screen, anytime – all at once. Elemental solutions are deeply integrated with AWS services, giving video providers the ability to quickly, easily and economically scale workflows on-premises or in the cloud. **www.elemental.com**

OTT, live streaming and Quality of Experience

Introduction

OTT TV is fast becoming a mainstream distribution technology to rival broadcast. While the perception still exists that OTT means video-on-demand, the development of new technologies to enable the streaming of linear channels and coverage of events over the web means that live streaming is also an increasingly important part of the OTT TV mix.

Allied to the growing demand for live is a renewed emphasis on Quality of Experience. The delivery of high-profile sports and other mass-audience events over unmanaged networks remains challenging, but the increasing popularity of streaming and subscription OTT TV in general means that service providers increasingly see investment in platforms that deliver consistent – and consistently high – levels of quality as an essential element for the future of the business.

These elements taken together are having a significant impact on the choices service providers make when they build their OTT TV platforms. Notably, competition is creating growing pressure to outsource the technology part of service creation – and sometimes content aggregation as well – to well-resourced and reliable partners.

OTT, live streaming and Quality of Experience

Live streaming as part of an OTT TV service

While most standalone OTT TV efforts, following the template set by services such as Netflix, have focused on video-on-demand to date, a growing number of services offer live TV as part of the experience. This reflects the belief that live TV remains an important part of the overall viewing experience and that OTT services need to embrace this to compete with or complement traditional TV services.

In the view of our survey sample at least, the ability to live-stream sports and other time-sensitive content offers a very strong way to differentiate an OTT TV offering from its peers. Asked to rate nine ways to differentiate services, the ability to live-stream such events was rated the strongest differentiator, with seven in 10 respondents saying it is a strong differentiator and a further 25% classifying it as a moderate differentiator.

Live streaming rates higher than other elements considered, possibly because many of them are already considered standard features within the OTT TV universe.

However, Quality of Experience also rates very highly as a differentiator, with over two thirds of respondents rating the ability to deliver a service that is free from buffering, freezing and other quality problems as a very important element in differentiating a service from that of rival offerings.

Next up on the list of service differentiators preferred by our sample is offering a wide range of popular content. This suggests that broad-based services have greater appeal than niche offerings. In fact, providing an offering targeted at an underserved niche is rated as the weakest service differentiator among those evaluated by our sample.

The survey sample also rates price as a moderately important differentiator, with half of respondents rating the ability to offer a service at a lower cost than pay TV rivals as 'strong' in terms of its differentiating potential.

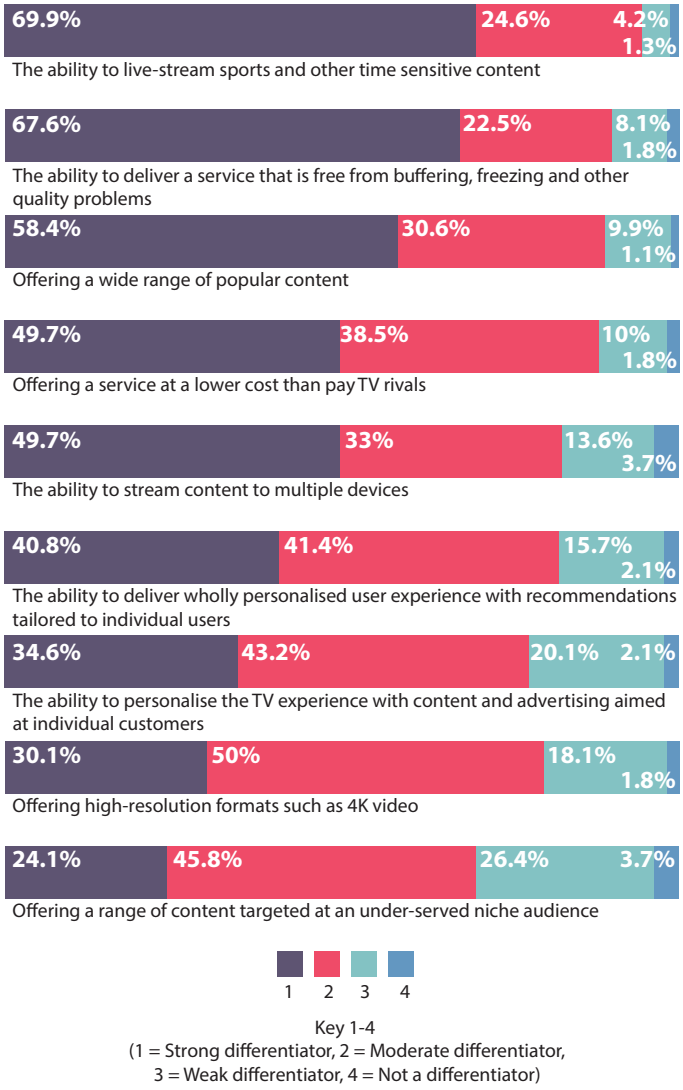
Respondents also rate the ability to stream content to multiple devices as an important differentiator, with half of them rating this as 'strong' and a further third rating it as 'moderate'.

Next on the list is the ability to deliver a personalised user experience, including individually tailored recommendations, rated strong by just over four in 10 and moderate by the same proportion.

Of somewhat less significance as a differentiator is the ability to deliver personalised advertising and other content, along with the ability to offer 4K video. As has been seen in the previous section, our survey respondents believe that Ultra HD TV is a format better suited to the big screen in the living room (**fig.20**).

The substantial and growing importance of live streaming as part of the OTT TV offering was reiterated when we specifically asked respondents to express their opinion about the promise of live streaming of sports and other events as part of an OTT TV service offering.

Fig. 20 Which of the following services are most likely to provide a way for operators to differentiate their OTT TV services from those of rival providers?

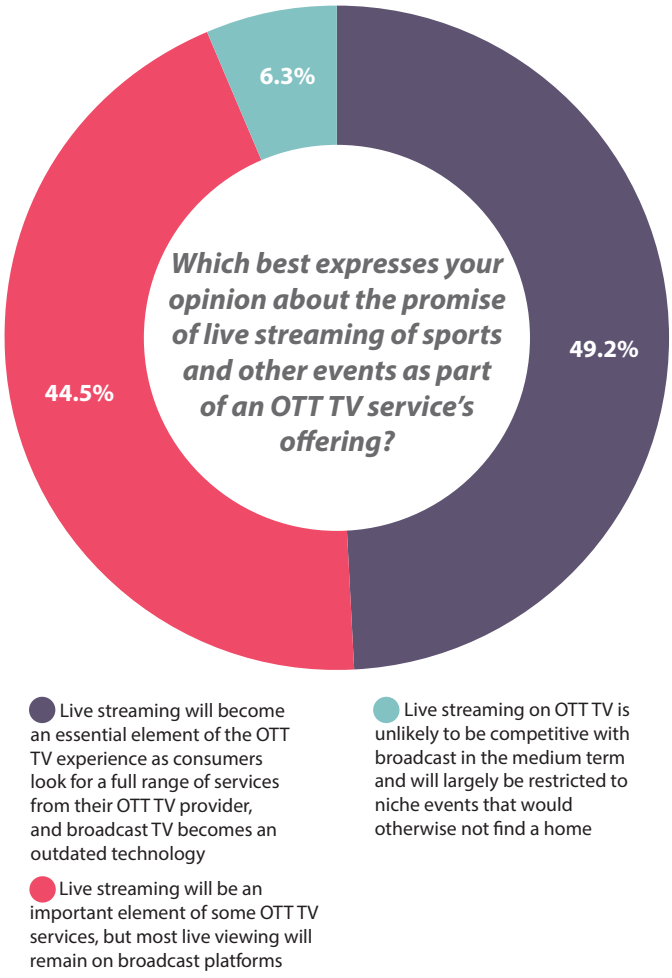


Key 1-4
(1 = Strong differentiator, 2 = Moderate differentiator, 3 = Weak differentiator, 4 = Not a differentiator)

Almost half of respondents gave the strongest possible endorsement to the importance of live, agreeing with the view that live streaming will become an essential element of the OTT TV experience as consumer look more for a full range of services from OTT and broadcast becomes an outdated technology.

A further 44% endorse the idea that live streaming will be an important element of the mix, while holding to the view that most live viewing will remain on broadcast platforms. Only 6% of respondents

Fig. 21



endorse the more sceptical view that live streaming on OTT TV is unlikely to be competitive with broadcast in the medium term and will largely be restricted to niche events (**fig.21**).

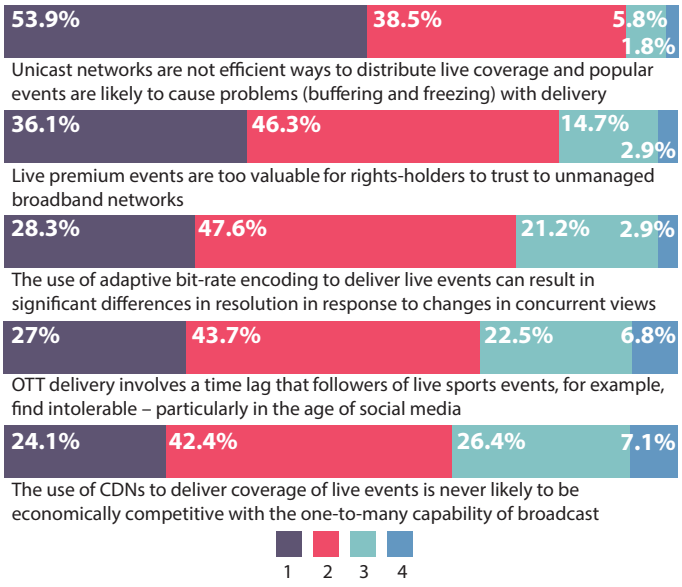
OTT TV and Quality of Experience

Live streaming and Quality of Experience topped the list of important differentiators for OTT TV services among our survey respondents and the two are clearly closely linked, with QoE a vital ingredient in delivering a compelling live experience – particularly for time-sensitive, emotionally engaging content such as live sports.

Live video is also technically challenging. For our survey respondents, the biggest challenge facing OTT TV providers in delivering live streamed events is the fact that unicast networks are not designed to distribute live event coverage to large numbers of people concurrently. Over half of respondents – 54% – feel that popular events causing problems such as buffering or freezing is a very significant challenge, with a further 39% believing it is a moderately significant challenge.

The technical hurdle of delivering live events over unicast networks

Fig. 22 Which of the following statements best reflects your view about the future of Ultra HD TV and the standards that support it?



Key 1-4
(1 = Very significant challenge, 2 = Moderately significant challenge, 3 = Not very significant challenge, 4 = Not at all significant challenge)

is seen as a considerably greater issue than the other challenges considered.

Of the others, some 36% of respondents feel that rights to live premium events being too valuable to trust to unmanaged broadband networks is a very significant challenge, with 46% believing it to be a moderately significant challenge.

Another technical problem – the use of adaptive bit-rate encoding of live events resulting in big difference in resolution when the number of concurrent views shifts – is seen as a very significant challenge by 28% of respondents and as a moderately significant challenge by 48%.

Other challenges are seen as relatively less significant, though they still raise concerns. OTT delivery involving a time lag that followers of live sports events may find intolerable is seen as a very significant challenge by 27% and as moderately significant by 42%. CDNs not being economically competitive against the one-to-many advantage of broadcast is seen as a very significant challenge by 24% of respondents and moderately significant by 42%. (**fig,22**)

Apart from the specific issues related to live, delivering a seamless OTT video experience to multiple devices simultaneously carries its own challenges, and we also asked our survey respondents to express their views on these.

Delivering a consistent experience across multiple devices with different characteristics is seen as a very significant challenge by 42% and a moderately significant challenge by 43%.

The complexity of managing a patchwork of content rights to deliver content to multiple devices with different use cases is seen as

52% of survey respondents believe that investing in video QoE is crucial to delivering a compelling OTT TV proposition.

a very significant challenge by 42% of surevey respondents and as a moderately significant challenge by 43%.

The next most significant challenge in multiscreen delivery is related to the disconnection between service providers and the consumer electronics devices they rely on for playback. Some 37% of respondents consider the risks of delivering to CE devices, over which publishers have no control, to be very significant, with a further 48% considering this to be a moderately significant challenge.

Also problematic – but relatively less so – is the issue of delivering video reliably over third-party CDNs over which publishers have no control. Some 28% of respondents consider this to be very significant and 53% consider it to be moderately significant (**fig.23**).

OTT TV service creation

The very high degree of importance that our survey respondents give to Quality of Experience feeds into the things they believe OTT operators need to prioritise when building and launching services.

Asked to express their view of the importance of investing in QoE technology as part of an OTT TV service, over half – 52% – of respondents endorse the view that investing in video QoE technology is absolutely crucial to delivering a compelling OTT TV proposition. A further 40% say that investing in QoE technology is important but not critical to delivering a compelling proposition.

Fewer than 7% believe that investing in QoE is only moderately important to the success of OTT TV and barely 1% believe that investing in QoE is not at all important (**fig.24**).

To provide a service with an acceptable Quality of Experience to appeal to and retain viewers, OTT TV operators face a number of technology choices. The biggest single one is probably whether to design and build their own service or contract the work out to a trusted technology vendor. We asked our survey sample which of four alternative approaches they would take to build an OTT TV service from scratch. Among respondents for which the question was relevant, a clear majority – about 62% –selected options that involve the use of a single trusted supplier – whether that is a system integrator that

Fig. 23 Which of the following services are most likely to provide a way for operators to differentiate their OTT TV services from those of rival providers?

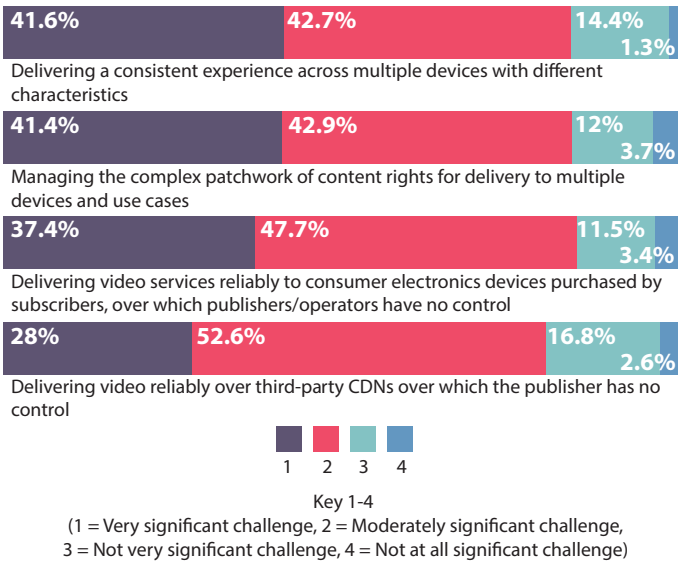
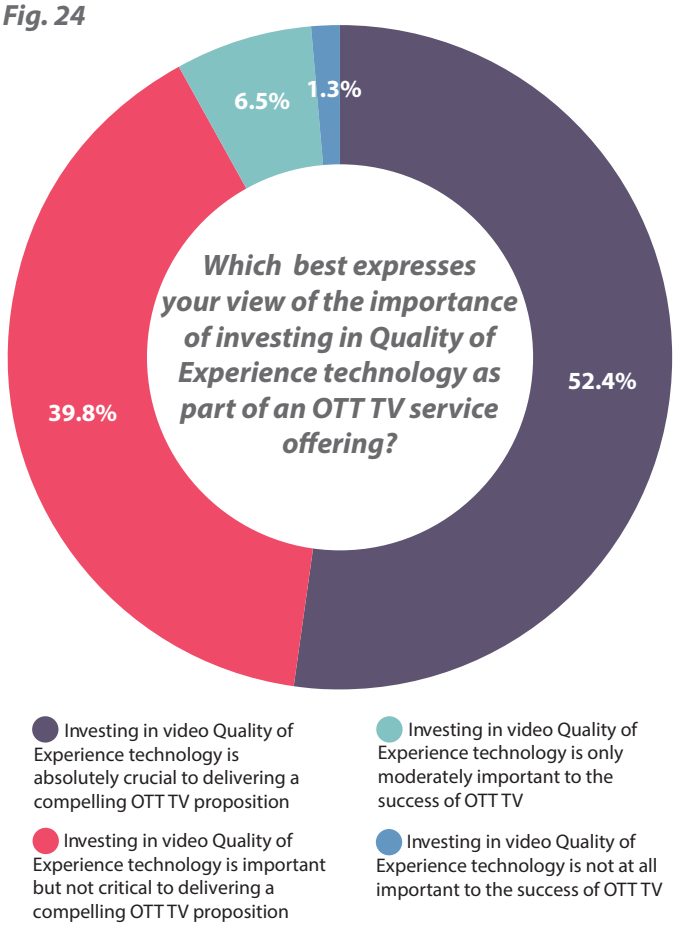


Fig. 24



Personalisation services consist of tailoring an OTT or TV Everywhere service to accommodate specific subscribers and segments of viewers. As these services gain momentum in the marketplace, marketing efforts to drive new subscriber activations and churn reduction are becoming a priority for content owners.

The NeuLion Digital Platform now offers its customers a wide variety of personalisation features to improve customer satisfaction, digital sales conversion, marketing results, branding and advertising to better support their OTT and TV Everywhere services.

NeuLion's technology implementation has taken a different path from its competition. Rather than traditional rules-based personalisation used by other services, the NeuLion Digital Platform applies machine learning and statistical analysis to visitor behaviour and viewer "watch data" to tailor category and video content pages without the need for rules configuration; making targeting effortless.

With personalisation being a key element in social media, targeting and measuring each video subscribers true life time value, the NeuLion Digital Platform now offers:

- The ability for viewers to personalise their experience based on advanced customisation to deliver curated social content, custom schedules, videos and news related content based on their selections
- Personalised video content delivery based on real-time data, without setting up a single targeting rule
- Monetization and merchandising of video content packages using aggregated behavioural data (those that viewed this, also viewed that) and personal previously bought this and might like that)

Visit neulion.com/ottwebinar/dtve to watch NeuLion, UFC & Plush Digital as they discuss these personalisation features that are driving activations and engagement, and helping to create successful OTT and TV Everywhere services.

Drive New Activations | Reduce Churn | Improve Marketing Results | Increase ROI

We are NeuLion and we power digital experiences for the world's largest brands.

For more information: Email: sales@neulion.com or visit neulion.com

Fig. 25

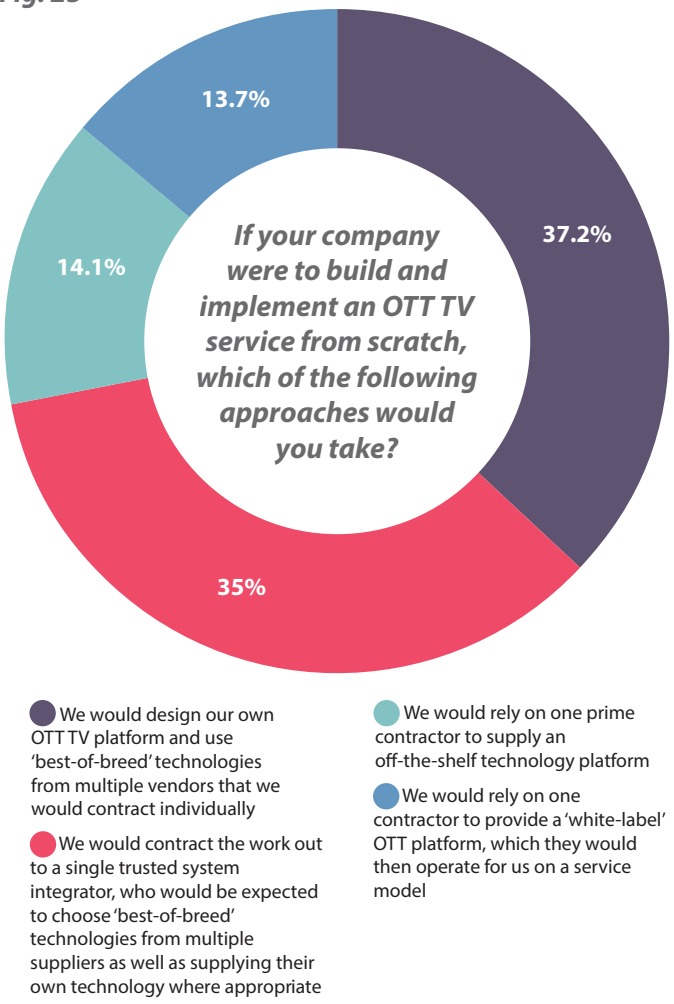
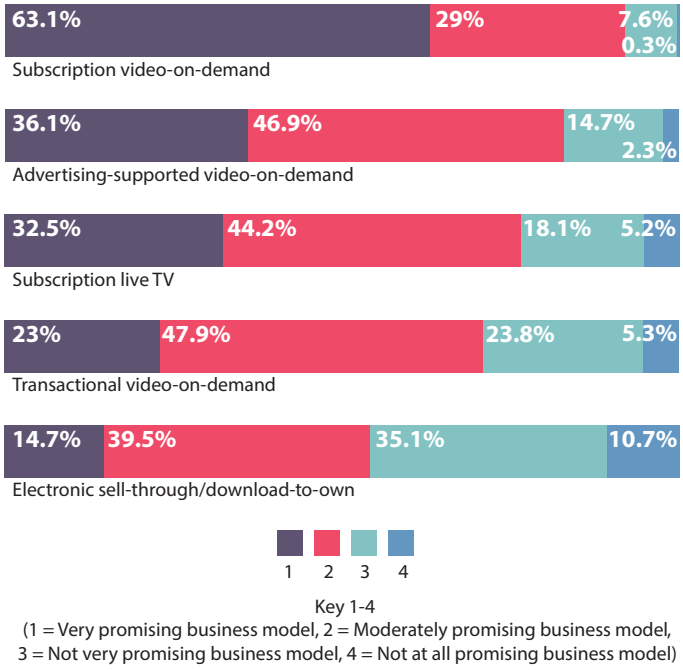


Fig. 26 Which of the following business models for OTT TV makes sense?



selects best-of-breed products, a prime contractor with an off-the-shelf platform or a white label OTT platform provided on a service model. The remainder said they would design their own OTT TV platform and use best-of-breed technologies from multiple vendors that they would contract individually.

Overall, 35% of respondents for whom the question is relevant said they would contract the work of building an OTT TV service out to a single trusted system integrator, who would be expected to choose best-of-breed technologies from multiple suppliers as well as supplying their own technology where appropriate.

Some 14% said they would rely on one prime contractor to supply an off-the-shelf technology platform, while a similar proportion said they would rely on a single contractor to provide a white-label OTT platform that the contractor would operate for them on a service-based model (**fig.25**).

As well as delivering a consistently acceptable level of video quality, companies seeking to build OTT TV services must figure out which business model – subscription, advertising, transactional – makes the most sense.

Among our survey sample at least, subscription video-on-demand is the clear favourite, with 63% saying this model is very promising, and a further 29% saying it is moderately promising, placing it far ahead of the nearest rival, advertising-supported VOD. Some 36% believe AVOD is a very promising model, with 47% believing it is moderately promising.

Subscription live TV is quite well thought of as an OTT TV model, with 32% believing it is very promising and 44% believing it is moderately promising.

The other models considered are less well-regarded. Only 23% view transactional video-on-demand as very promising, with 48% viewing it as moderately promising and 29% viewing it as either not very promising or not at all promising.

As far as electronic sell-through/download-to-own is concerned, fewer than 15% view this as a very promising business model, with as many as 45% viewing it as either not very promising or not at all promising (**fig.26**).

63% of respondents believe SVOD is a very promising business model

Conclusion

OTT TV operators that have sufficient scale are now stepping out of the shadows to take on pay TV with a full range of services, including linear live TV as well as video-on-demand.

Live streaming is an increasingly important element in the OTT TV mix, with OTT operators looking to a variety of technologies to overcome the challenges of delivering live TV and live events to big audiences over unicast networks. According to the results of our survey, live streaming is increasingly seen as a key differentiator for OTT TV providers.

While live TV is an important service differentiator, our survey respondents also believe that providing a high level of Quality of Experience represents an important way for service providers to stand out.

Investing in Quality of Experience is also highly relevant to those operators seeking to deliver live-streamed mass-audience programming – particularly given the challenges of delivering live over un-managed networks. Our survey sample believes that the fact that unicast networks are not designed for live is the biggest single challenge facing service providers.

The high degree of importance given by our respondents to Quality of Experience has a significant impact on the list of things they think service providers should prioritise. In the view of our survey sample, investing in Quality of Experience technology is crucial for providers.

The growing importance of getting delivery rights also means that service providers need to take care when building their OTT TV delivery platforms. In the view of our survey respondents, the best way to progress is to rely on a single trusted technology partner to either provide a complete white label offering or to take charge of putting all the elements in place, leaving the service provider to focus on marketing its offering.

Finally, in terms of the optimal OTT TV business model, subscription VOD is still king – it is by far the preferred model, in the view of our respondents. Paying for the service is the key element, however, as subscription live TV is also thought to be a highly viable proposition.

SPONSOR'S COMMENT

Chris Wagner, executive vice-president, NeuLion

As more and more OTT and TVE services enter the marketplace, it is vital to provide users with a unique, individual experience that increases subscriber activations and engagement. These are not nice-to-haves; they are business essentials. The stakes are indeed hugely high, but the tools and technologies are there to play a winning hand. It's clear from this survey that live streaming and Quality of Experience are the two key differentiators to make that happen.

The beauty of a good OTT solution is it can now be better than traditional TV. Not only is the video quality better – with 4K live streaming you can get four times the quality of HD streamed to any connected device – but the viewer experience is way beyond what can be achieved with a traditional TV service. It's possible now to deliver highly customised, personalised and interactive experiences.

But an OTT service is only as strong as the quality of that experience, so it's crucial for service providers to invest in tools and technologies that can monitor, in real time, every viewer's quality of experience for live and VOD content. This will empower them to make fully informed business decisions to enhance content offerings, attract new customers, and retain existing customers. All the while driving more revenue for their OTT or TVE services.

Service providers have one chance to reach viewers and give them the experience they obviously demand. The best approach is to engage an expert with a lot of experience and advanced technology to help get an OTT service on the right track.

OTT TV and big data

Introduction

Big data has long been seen as the next frontier for consumer-facing businesses in general, and the ongoing migration of audiovisual content to IP networks has enabled service providers to gather unprecedented amounts of data about how content is consumed and what factors have an impact on that consumption.

What needs to be done to ensure that data can be profitably used by content rights-holders and distributors remains a subject of debate, however. There is a wide range of possibilities.

User behaviour data could feed into proactive monitoring of network performance to ensure more consistent quality of delivery.

Data about content consumption could be used by service providers to decide how to package and market services, and could also be used to deliver higher-quality content recommendations to increase the stickiness of services.

Furthermore, data could be used to personalise TV services and, in particular, to deliver more granularly targeted advertising to end-users.

Finally, data could potentially also be used to decide what content to commission or create in the first place.
We asked our survey respondents to consider how big the impact of big data on the TV experience will be and to give their views on where that impact will be primarily felt.

OTT TV and big data

The impact of big data

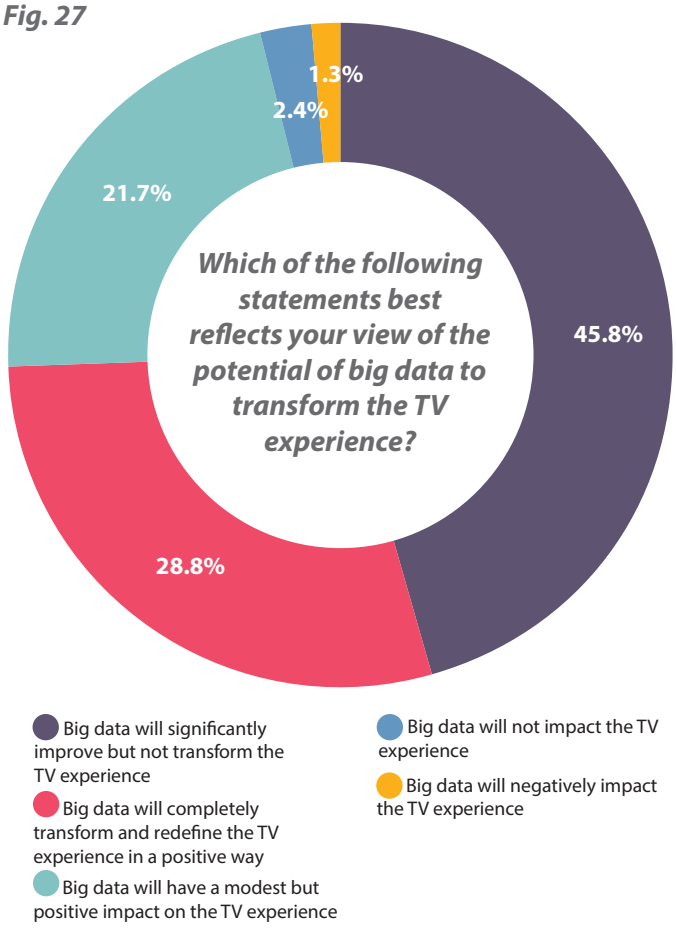
In the view of our survey respondents, the collection and use of big data will have a significant impact on the TV experience, with an overwhelming majority of our survey sample believing that data will either completely transform or significantly improve the TV experience.

Within that broad consensus, there is however a split between those who believe big data will have a transformational impact and those who think it will significantly improve but not 'transform' the TV experience, with 29% taking the view that the impact will be transformational and a larger group – 46% – endorsing the view that the impact will be significant but fall short of transformational.

A smaller group of respondents – 22% – take the view that big data will have a modest but positive impact on the TV experience.

Only just over 2% of respondents believe that big data will not have an impact on the TV experience. Finally, just over 1% believe that big data will have a negative impact on the TV experience (**fig.27**).

Fig. 27



Clearly, the industry expects big data to have a significant impact. But just what that impact will be is less clear.

There is a general consensus that the most important use of data will be in content recommendation. Over half of our survey sample – 54% – think that big data will have a very positive impact on delivering more relevant content recommendations to end consumers, with a further 37% believing it will have a moderately positive impact.

54% think big data's ability to deliver content recommendations will have a very positive impact.

While content recommendation stands out in front, advertising is another area where our survey respondents believe it will have a significant impact, with 39% believing it will have a very positive impact and 50% believing it will have a moderately positive impact.

Our survey respondents also believe that big data will have a positive impact on improving Quality of Experience and Quality of Service by, for example, identifying service issues and enabling operators to take remedial action. Some 39% believe it will have a very positive impact here while 36% believe it will have a moderately positive impact.

Our sample believe that big data will have a positive impact on the ability of OTT TV providers to effectively market their services, with 37% believing it will have a very positive impact, by providing information that can be used to more effectively bundle, package and market services. A further 42% believe it will have a moderately positive impact in this area.

Bundling, packaging and marketing is one thing. But what about using data to decide what content to make or commission in the first place?

Our survey respondents are in fact broadly positive about using data to help determine what content is made. Some 37% believe that data will have a very positive impact by providing details about consumer habits that can be used to help determine what content is to be made.

Diving deeper into the relationship between data and content creation, we asked respondents to rate the impact of big data on providing deeper insights on content performance and the underlying variables that affect it. While just over 50% believe data will have a moderately positive impact on this, only 25% believe data will have a very positive impact.

There is more scepticism about using data to predict which content will be successful which will fail. Under 23% believe big data will have a very positive impact here, while 29% believe it will have no

Fig. 28 What impact do you think big data will have on the following elements of the TV experience for consumers and content publishers?

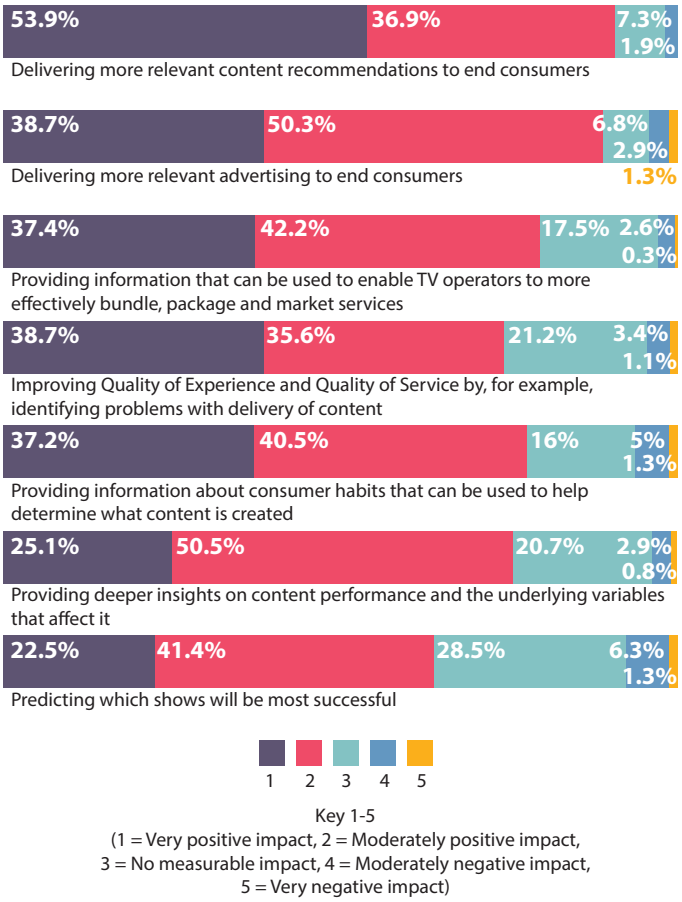
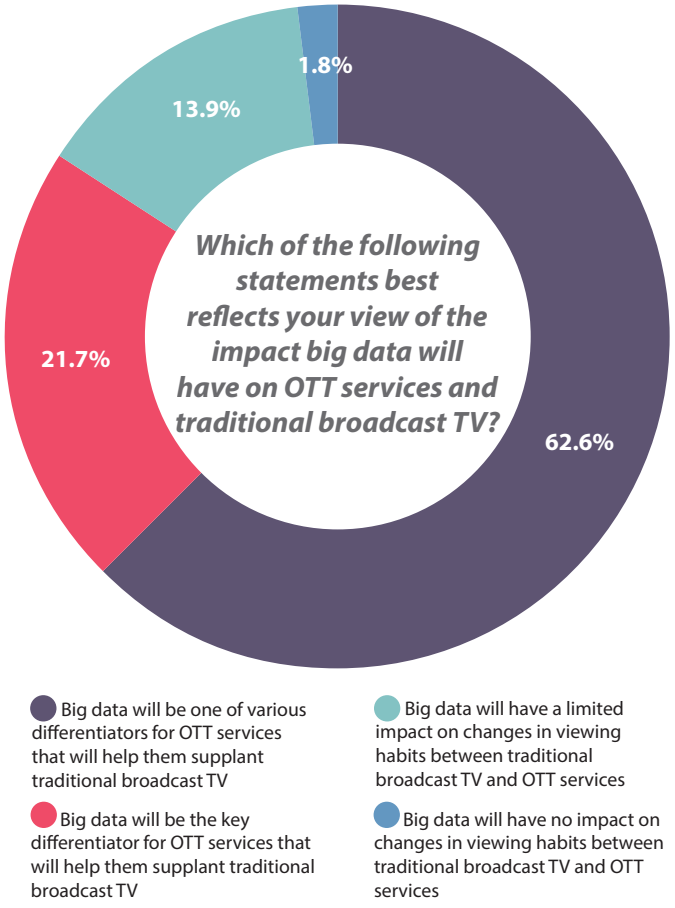


Fig. 29



measurable impact and close to 8% believe it will even have a negative impact (fig.28).

Our survey respondents nevertheless believe that the use of data could give OTT TV a clear advantage over traditional broadcast. Some 63% of respondents believe that big data will be one of the various differentiators that will help OTT TV services supplant traditional broadcast TV, while 22% take the even stronger view that data will be the key differentiator for OTT TV to help it supplant broadcast.

Only a minority – under 16% of respondents – believe that big data will have either a limited impact, or no impact on changes in viewing habits between traditional broadcast TV and OTT TV (fig.29).

Advertising, consumer loyalty and content

We asked our survey respondents to consider the impact of big data on specific activities of OTT TV operators and measures used to gauge success.

One of the key areas where the application of data analysis could have a measurable impact is advertising. We asked the sample to consider the potential impact of big data on advertising-based OTT TV services. Specifically we asked respondents to rate five ways in which advertising-supported service providers could use data to deliver additional revenues for both OTT service providers and content rights-holders.

The most appealing element in the view of our sample is the ability to build a database of individual users' personal details such as address, age and marital/family status – on an opt-in basis – to provide intelligent support for marketing campaigns. Some 40% of respondents feel data has a very high potential to deliver value in this area, with further 41% believing it has high potential.

Using data to deliver personalised or targeted advertising to live TV and on-demand TV viewers is also highly rated. Some 37% believe using data to deliver targeted advertising on live services has 'very high' potential, with a further 41% believing it has 'high' potential. A similar number – 36% and 39% respectively – believe it has a very high or high potential to deliver value for VOD viewers.

Respondents believe that giving feedback to advertisers through

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viewing/click-through rates can be a positive tool for advertisers' campaign planning. Some 34% believe data has very high potential to deliver additional revenues through this, with 42% believing it has high potential.

There is less enthusiasm – relatively speaking – for using data to implement programmatic or automated buying and selling of advertising inventory on OTT services. Only 26% believe this has very high potential, with a further 42% believing it has high potential. Some 25% believe it has moderate potential. (**fig.30**)

The use of data to deliver value in the form of subscriber loyalty of 'stickiness' is also highly regarded by our survey respondents. The key element, in the view of our sample, is using data to present relevant content recommendations based on previous viewing habits. Some 43% see this as having very high potential to increase or maintain viewers' loyalty to the OTT TV services they use. A further 42% believe it has high potential.

Using data to deliver better content recommendations is far ahead in its perceived impact of all the other elements the survey considered that could increase consumer loyalty.

The next most highly-regarded activity is using data to build a picture of how users navigate and find content to help decide how to structure the overall user experience. Some 33% of respondents see this as having very high potential to increase loyalty. It is seen as having high potential by a further 47%.

Using data to offer new original or licensed content based on previously viewing habits is also viewed favourably. Some 34% of respondents believe this has very high potential to deliver stickiness, while 41% believe it has high potential.

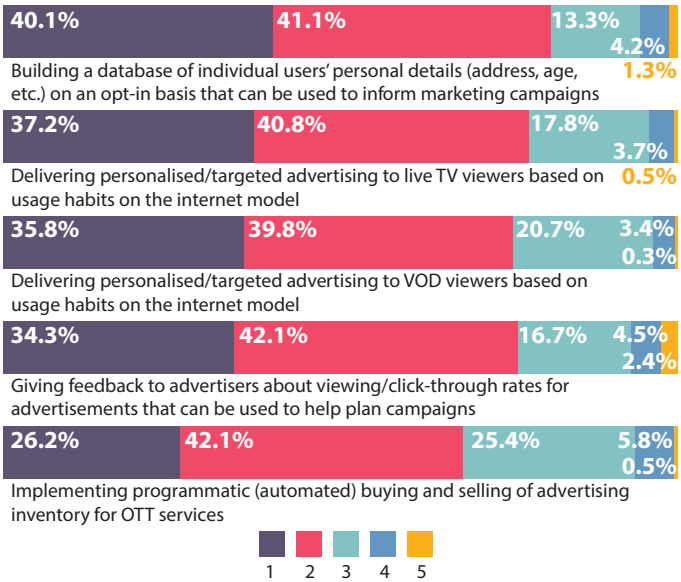
Other uses of data, while relatively less highly regarded than the above, are nevertheless viewed positively. Some 23% believe using data to set prices and bundle services based on previous usage patterns has very high potential to deliver stickiness, with a further 44% believing it has high potential. Some 24% believe data has very high potential to deliver relevant advertising that keeps users engaged, while 32% believe this has high potential and 35% believe it has moderate potential. (**fig.31**)

Survey respondents also believe that big data will have a significant impact on what content is actually created in the first place. Asked to give their opinion on how OTT operators and rights-holders could use data to decide which content to acquire or commission, close to four out of five respondents said they believed it would either transform or have a significant input into the way content is acquired and commissioned.

Of those with a broadly positive view of the impact of data collection on content creation decisions, 24% said big data could transform the way content is acquired and commissioned by providing a continuous feedback loop from consumers about what they like. A further 54% said data could have a significant input into the way content is acquired and commissioned alongside creative decision-making by editorial staff.

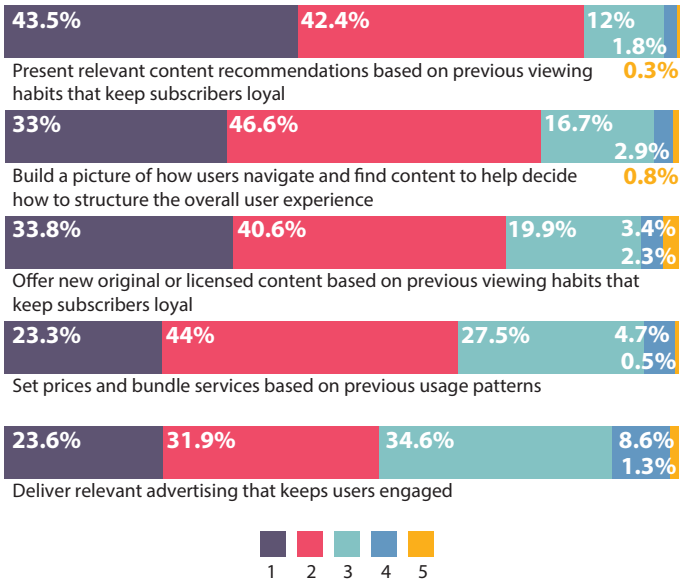
Only a relatively small minority dissented. About 19% said data could have a modest input into the way content is acquired and commissioned, but that data is not a substitute for creative decision-making. Only just over 3% said data should not have any role in the way content is acquired and commissioned because the best – and most popular – shows are designed by creative personnel and not by algorithms (**fig.32**).

Fig. 30 What is the potential impact of big data on advertising-based OTT services?



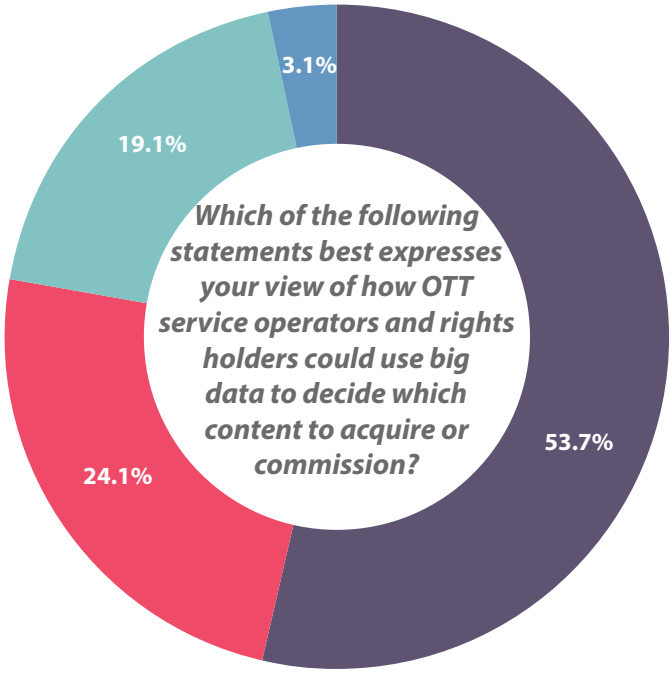
Key 1-5
(1 = Very high potential, 2 = High potential, 3 = Moderate potential, 4 = Poor potential, 5 = Very poor potential)

Fig. 31 What is the potential impact of big data on delivering 'stickiness' of OTT services?



Key 1-5
(1 = Very high potential, 2 = High potential, 3 = Moderate potential, 4 = Poor potential 5 = Very poor potential)

Fig. 32



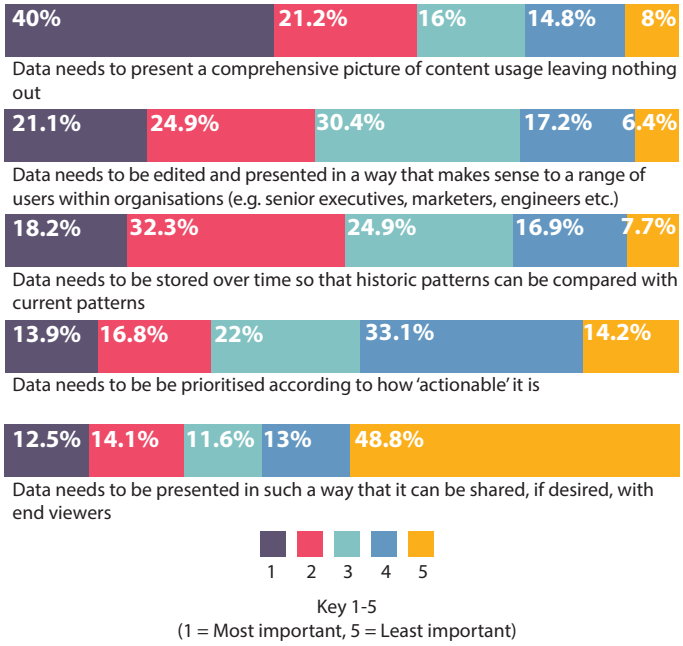
The quality of data

There is broad agreement that big data will have a big impact on the TV experience, shaping the nature of advertising, content search and recommendation and the creation of content itself. However, survey respondents have quite pronounced preferences about what needs to be done to make the data that is collected useful in the first place.

Asked to rate the most important requirements for data collection and presentation that can then deliver higher usage and revenues to OTT service providers, our survey strongly back the view that data should present a comprehensive picture of content usage, leaving nothing out, with 40% of respondents giving this the highest possible score on a scale of one to five.

40% believe data should present a comprehensive picture of content usage

Fig. 33 What are the most important requirements for data collection and presentation in order to deliver higher usage and revenues for OTT services?



There is also a general view that data should be edited and presented in a way that makes sense to a range of different users within organisations such as senior executives, marketers, engineering staff, customer services staff and so on, although opinions are more mixed about how important this is. The same is true over the need to store data over time so that historic patterns can be compared with current patterns.

In both cases, about one in five respondents give these elements the top score on a scale of one to five, but significant numbers of respondents also give them a lower score. Nevertheless, on the whole there is a general view that content being packaged for different classes of users and stored over time are both moderately important.

This is less true for a further requirement put before our sample – that data should be prioritised according to how 'actionable' it is. There is scepticism about the usefulness of this metric, with a third of respondents giving it a low score of four and 14% giving it the lowest possible score of five.

There is even less enthusiasm for data being presented in a way that means it can be shared, if desired, with end users. Almost half of all respondents give this the lowest possible score on our scale of one to five. (**fig.33**)

Conclusion

In the view of our survey sample, big data will have a big impact on TV, although opinions vary about how transformational that impact will be.

The area where data is believed to have the greatest potential to make a difference is content recommendation – by enabling operators to present their viewers with relevant recommendations, data can provide a highly useful tool to increase consumer loyalty and upsell customers to additional content and services.

Survey respondents believe that the use of data will have a positive impact on Quality of Experience. They also think that it will better enable service providers to package and market services.

Respondents believe data will be highly useful in delivering additional advertising revenue – especially if consumers can be incentivised to opt in to share personal information.

However, there is greater scepticism about the potential of automated or programmatic buying and selling of advertising inventory to deliver value.

Survey respondents also believe that data can profitably be used to help service providers decide what content to acquire or commission.

However, the content creation business is likely to remain one characterised by a high degree of unpredictability. Respondents also believe that data will be of very limited use in predicting which content will ultimately be successful once it is released.

Finally, it is important, in the view of our survey sample, that data must give a comprehensive picture of content usage if it is to be useful to service providers.

SPONSOR'S COMMENT

Gregor McElvogue, director, offering management, IBM Cloud Video

Without a doubt, big data will have a profound impact on the TV experience. It represents one of the greatest areas for innovation in the shift to IPTV, so naturally it has the industry abuzz. For viewers, TV operators and rights-holders alike, big data offers a multitude of potential benefits – from more personalised experiences and fewer irrelevant ads, to stickier services, reduced churn and deeper insights that can inform critical decision-making.

That's why IBM Cloud Video is investing heavily to combine the power of Watson and other IBM cognitive services with our best-of-breed technology for video preparation, delivery, and catalogue and subscriber management. With these new IBM cognitive capabilities, TV operators and rights-holders will finally be able to crack the intel hidden in their video data through live event analysis, video scene detection, audience insights and more.

Rather than just search metadata that's already been published, these new cognitive technologies can help you understand what's actually happening inside of a video, in real-time. Things like what people are saying, the actors that are in it, or even the tone and objects in a scene.

And when you have access to all of that data, it starts to get really interesting. For viewers, this enables highly personalised services that can change with their content preferences over time. For TV operators and rights-holders, the result is much more impactful: powerful new tools to continuously evolve and drive their video business.

In the emerging environment of big data and video, the potential for reward is huge. But so are the inherent risks. Failure to identify the right partner now can leave you playing catch up for years to come. You need a partner who understands the entire video ecosystem and has the technologies needed to fully tap the value in your data. IBM Cloud Video is here to help you get there.

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Next-generation TV delivery

Introduction

Internet Protocol is fast becoming the universal technology to enable the delivery of video. Broadcasters and TV operators face pressure to maximise operational efficiency, while consumers increasingly want to receive a seamless TV service across multiple mobile devices as well as the TV screen in the living room. The proliferation of OTT TV platforms and the rise of on-demand viewing also point to IP as the future of video.

Nevertheless, the question of how fast IP will extend from 'glass-to-glass' – from the point of content creation to the point of consumption – is open to debate. The presence of legacy technology platforms as well as the efficiency of one-to-many broadcast technology, particularly for live events and channels with large concurrent audiences, mitigates to some extent against a fast move to IP.

A move to adaptive bit-rate encoding – varying the resolution of video in line with available bandwidth – goes hand-in-hand with the migration of video delivery to IP. The transition of video delivery infrastructure to an IP-based OTT architecture means that ABR has become a key building block for next-generation TV delivery and is fast becoming a default technology as multiscreen and non-linear viewing grows.

We asked survey respondents to share their views on how far and how fast IP video and ABR will become the universal technologies for distribution.

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Next-generation TV delivery

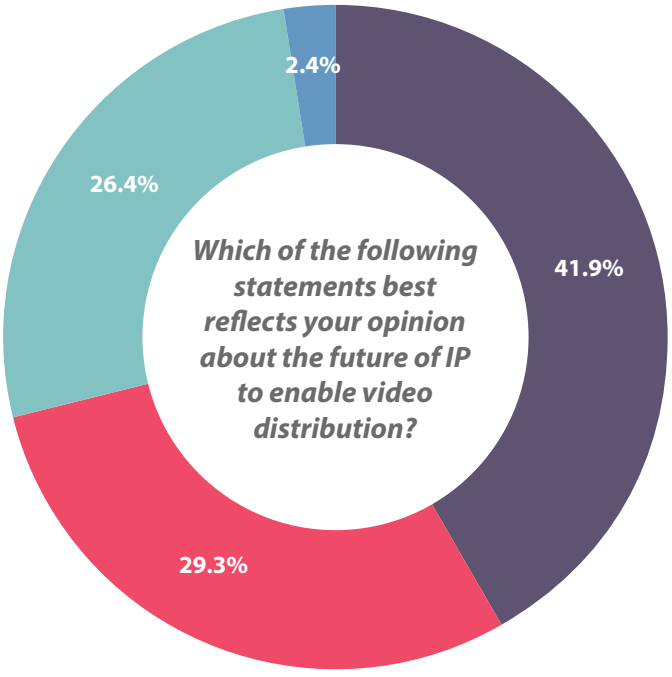
The move to IP and adaptive bit-rate video

While there is a broad consensus that video is migrating to IP, views about how fast this will happen – and which areas will lag behind – vary. In particular, there is a question over how far and how fast mainstream broadcast distribution will move to IP, given the scale benefits of traditional one-to-many broadcast technology.

The question of how economic it will be to deliver video over predominantly unicast IP networks is particularly pertinent in discussion of the future of terrestrial broadcasting, where the spectrum currently used for over-the-air services is coveted by mobile telecom giants that foresee exponential growth in demand for mobile data – largely driven by mobile video.

We asked our survey respondents to give their views about how far video distribution will have traveled down the IP path in 15 years' time.

Fig. 34



According to our respondents, the answer is quite far indeed. Some 29% of our survey sample believe that in 15 years' time, all video will be delivered via IP, and digital-terrestrial, satellite and cable broadcast TV will be a thing of the past.

A further 42% of respondents believe that while there may be a few hold-outs, the vast majority of video that people view on large screens will be delivered over IP networks and broadcast TV will have entered a phase of rapid decline.

Only a minority believe broadcast has a long-term future. Some 26% believe that while there will still be a mix of IP-delivered and broadcast TV viewed on large screens, the latter will be declining slowly but steadily. Only just over 2% of respondents believe that broadcast TV will still account for the majority of consumption on large screens in 15 years, with IP still accounting for only a minor part of overall viewing. (**fig.34**)

Adaptive bit-rate (ABR) encoding is seen as a crucial tool to enable migration of video distribution to IP – and more specifically, IP-based OTT TV – matching the resolution of content with the available bandwidth and ensuring a consistent end-user experience without freezing or buffering. In the collective view of respondents to our survey, ABR video is a crucial enabler for IP migration.

First, it is worth noting that there is a high level of awareness among our industry sample of ABR as a technique, with only 5% of respondents saying they do not know what it is.

Some 25% of respondents believe that ABR video will completely transform the video distribution landscape, entirely superseding other technologies by enabling video to be distributed over any IP network to any device.

A further 50% of our survey sample adopt the slightly more nuanced position that ABR will be the main technology choice to enable TV distribution but that other technologies such as broadcast and constant bit-rate IP video will still have a role to play.

More pronounced scepticism about the transformational potential of ABR is confined to a minority. Some 18% of respondents believe that ABR video will play a role in enabling TV distribution alongside other technologies such as broadcast and constant bit-rate IP video but will not supersede these technologies, while just under 3% believe that ABR will play only a minor role in enabling TV distribution in the future (**fig.35**).

ABR video: the benefits and challenges

The use of ABR video to help deliver consistent IP video quality is well understood. The extent to which ABR can be used to expedite IP migration will, however, depend on a range of other factors – most notably the complexity and cost of migrating from the various legacy technologies.

We asked our survey sample to consider the speed with which ABR

Fig. 35

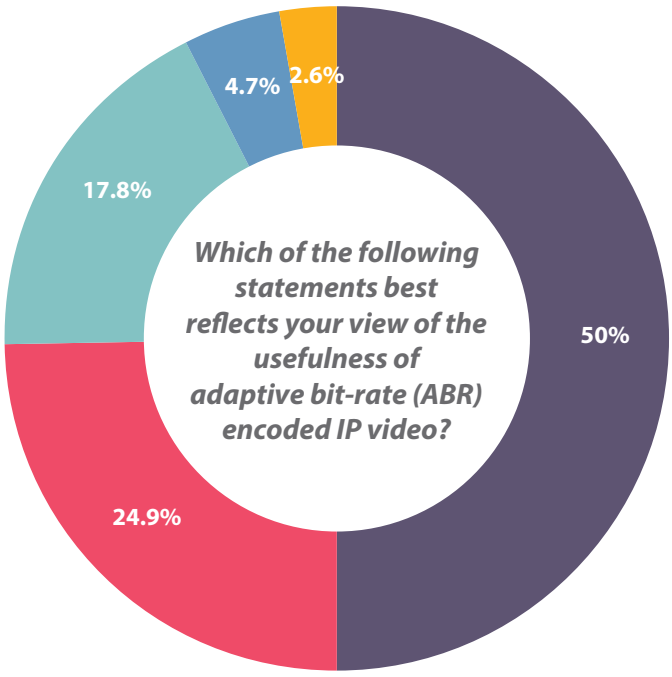
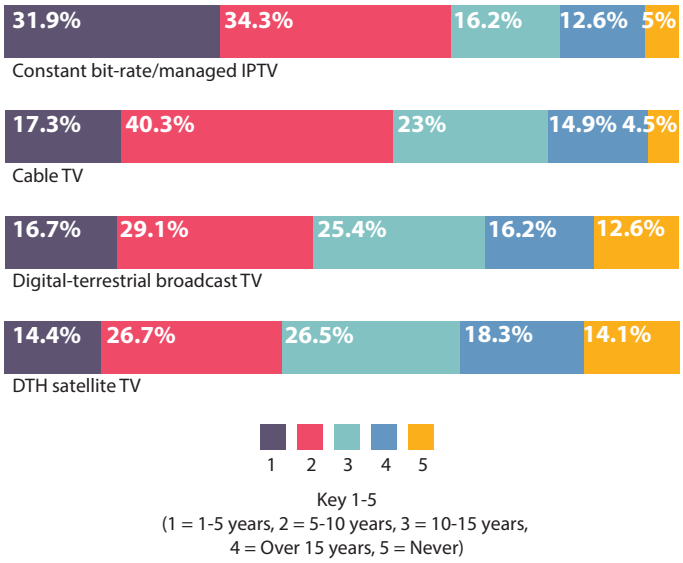


Fig. 36 When do you think that 'broadcast TV' as delivered over the following types of video infrastructure will be fully replaced by adaptive bit-rate IP video delivered over broadband networks



could enable various legacy distribution platforms to make the move to IP. In the view of respondents, constant bit-rate or managed IPTV networks will make the shift relatively quickly and comprehensively. Some 32% of respondents believe managed IPTV networks will be replaced by ABR/OTT TV within one to five years, with a further 34% believing they will be replaced within five to 10 years.

Cable TV is likely to be the next to go. Some 17% of respondents believe cable TV will move to ABR-enabled IP within five years, and a further 40% believe this will happen in five to 10 years. Some 23% believe the shift will happen within a 10-15 year window.

Digital-terrestrial and satellite TV will take longer, in the view of our survey sample, and a significant minority of respondents believe either that the transition will take over 15 years or that it will never happen. In the case of digital-terrestrial broadcasting, 17% believe this will transition to ABR-enabled IP distribution within five years, 29% believe it will happen in five to 10 years and 25% believe it will happen in 10-15 years. However, 16% believe it will take over 15 years and slightly fewer than 13% believe it will never happen.

Respondents' views on satellite TV follow a similar pattern, with the proportion – 14% – that believe the transition will happen within five years matched by the proportion that believe it will never happen (**fig.36**).

The factors that will drive migration to ABR-enabled IP distribution are varied, but growth in mobile and non-linear video consumption is obviously of key importance. Asked to rate various perceived benefits of ABR, our survey respondents give the power of the technology to enable delivery of video to any device over a single infrastructure top slot. Some 57% of our sample says that this is a very important benefit, with a further 36% rating it a moderately important benefit.

41% believe that the vast majority of video on large screens will be delivered via IP in 15 years.

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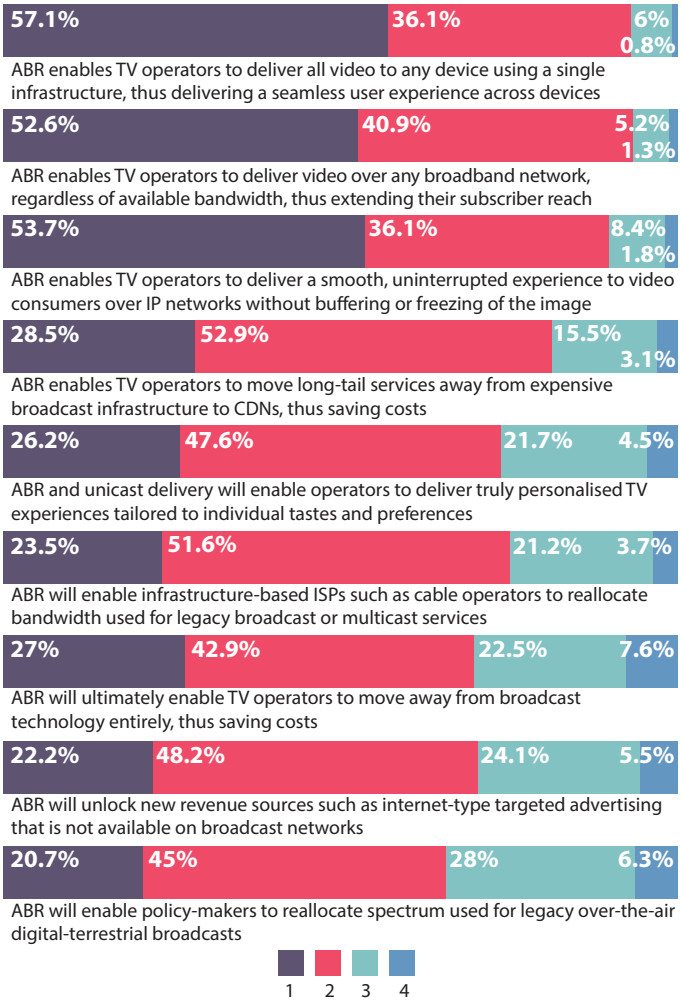
Fig. 37 What are the main benefits you associate with the use of adaptive bit-rate technology to deliver TV services?



Key 1-4
(1 = Very important benefit, 2 = Moderately important benefit,
3 = Not very significant benefit, 4 = Not at all important benefit)

Our survey respondents also rate ABR's enabling of TV operators to deliver video over any broadband network irrespective of bandwidth highly. Some 53% of respondents rate this a very important benefit and a further 41% rate it a moderately important benefit.

A similar proportion rate the ability of ABR to deliver a smooth, uninterrupted experience to video consumers as being very important, with a further 36% rating this as moderately important.

Some 29% believe that the power of ABR to enable TV operators to move long-tail services away from expensive broadcast infrastructure to CDNs and save costs – a way-station on the road to comprehensive broadcast-IP migration – to be a very important benefit, with 53% believing it to be moderately important.

Also significant in the view of respondents is the perceived ability of ABR to unlock new revenue streams such as targeted advertising that is not available on existing broadcast networks. However, this revenue opportunity is seen as relatively less significant than the more technical merits of the technology. Some 22% believe unlocking new revenue to be a very important benefit, with a further 48% believing it to be moderately important. Some 30% believe it either to be not very significant or not at all important (**fig.37**).

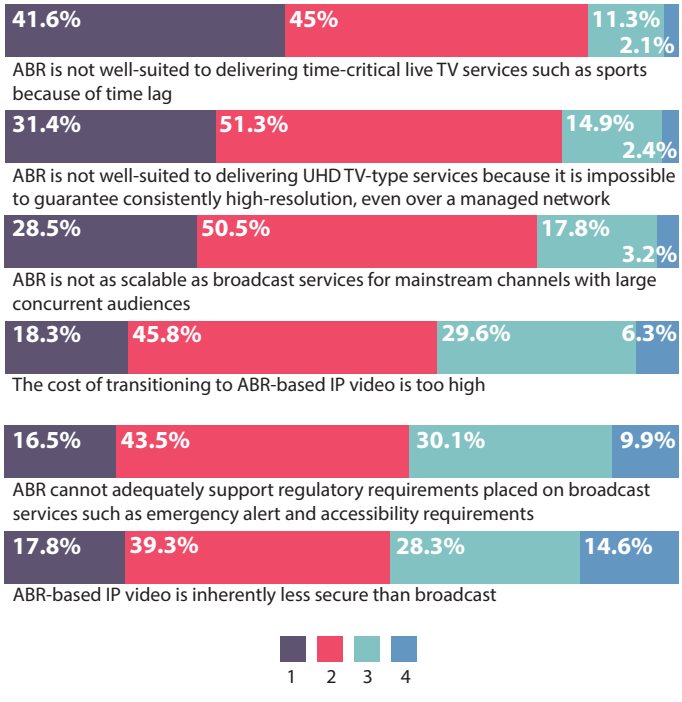
The challenges in the way of migration to ABR-enabled IP video include the time lag that could impact live streaming, the problem of guaranteeing consistent high-resolution for certain premium services such as Ultra HD TV, and scalability in the case of live linear services and on-demand services with large concurrent viewership.

In the view of respondents to our survey, the time lag in the case of live streaming is the most important issue. Some 42% believe this is a very important challenge and a further 45% believe it is a moderately important challenge.

Respondents also believe that Ultra HD TV could present a significant challenge to the adoption of ABR. Asked about the extent to which they considered ABR not being suited to UHD TV services because it is impossible to guarantee a consistently high resolution, even over a managed network, some 31% say this is a very important challenge and a further 51% say it is a moderately important challenge.

The challenge of scalabilty is also important, though not to quite

Fig. 38 What are the main challenges you associate with the use of adaptive bit-rate technology to deliver TV services?



Key 1-4
(1 = Very important challenge, 2 = Moderately important challenge,
3 = Not very significant challenge, 4 = Not at all significant challenge)

the same extent as time lag and resolution. Some 29% of respondents believe that ABR not being as scalable as broadcast for mainstream channels with large concurrent audiences is a very important challenge and a further 51% rate it as moderately important.

Other challenges are relatively less significant in the view of respondents. The perception that ABR cannot adequately support regulatory requirements such as emergency alerts and accessibility is seen as moderately important by 44% but some 40% regard it as either not very significant or not at all significant. ABR-based IP video not being as secure as broadcast is seen as a moderately important challenge by a significant number of respondents, but 43% regard it as either not very significant or not at all significant.

Survey respondents are also relatively sanguine about the cost of transitioning to ABR-enabled IP video. This is seen as a very important challenge by only 18% and a moderately important challenge by 46%. Some 36% of respondents see it as either not very significant or not at all significant (**fig. 38**).

IP and ABR: the return on investment

As has been noted above, our survey respondents do not view the transition to ABR-enabled IP video primarily as a way to generate additional revenue. Rather, it is seen as a way to make video distribution more efficient and to facilitate the transition of video consumption from mass-market broadcast to multiscreen and non-linear viewing – as well as a way to unlock the perceived economic benefit of freeing up broadcast spectrum for alternative uses.

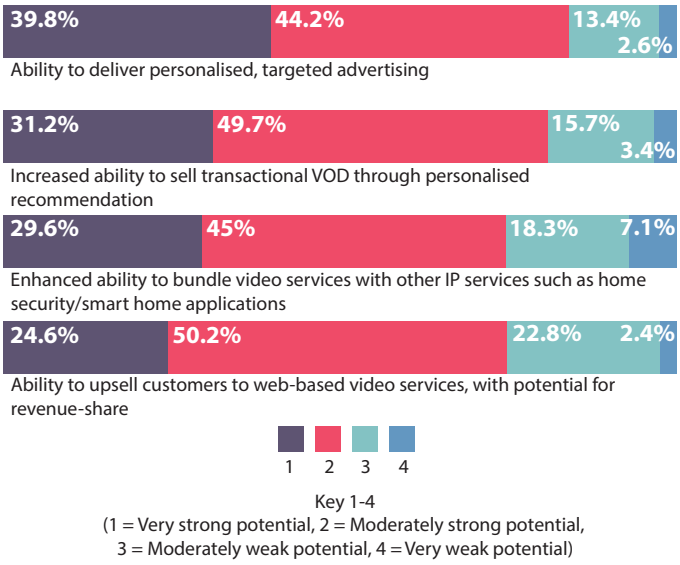
Nevertheless, ABR-enabled IP video does open up some potential new avenues to generate revenue. Of these, our survey sample rates its ability to facilitate personalised or targeted advertising as the most significant. Some 39% of respondents rate this as having very strong potential with a further 44% believing it has moderately strong potential.

The enhanced ability of IP video to enable the selling of transactional video-on-demand content through personalised recommendations is also seen as having strong potential to deliver incremental revenue. Some 31% of respondents rate this as having very strong potential with a further 50% rating it as having moderately strong potential.

Two other models associated with IP video are also seen as having modest potential. The enhanced power of IP video networks to facilitate the bundling of video services with other IP services such as home security and other smart home applications is seen as having strong potential by 30% of respondents and as having moderate potential by 45%.

53% rate ABR's ability to deliver video over any broadband network as a very important benefit.

Fig. 39 Which of the following new revenue sources has the greatest potential to deliver a return on investment in migrating to ABR-enabled IP video delivery for all TV services?



Key 1-4
(1 = Very strong potential, 2 = Moderately strong potential, 3 = Moderately weak potential, 4 = Very weak potential)

The ability to upsell customers to web-based video services, with a possible revenue-share agreement is seen as having strong potential by 24% of survey respondents and as having moderate potential by 50% of respondents (**fig.39**).

The ultimate goal in making the shift from legacy technologies to IP is to use a single technology across the entire video delivery chain. We also asked our survey respondents to rate the perceived benefits of 'glass-to-glass' IP video, from content capture through to end-user consumption.

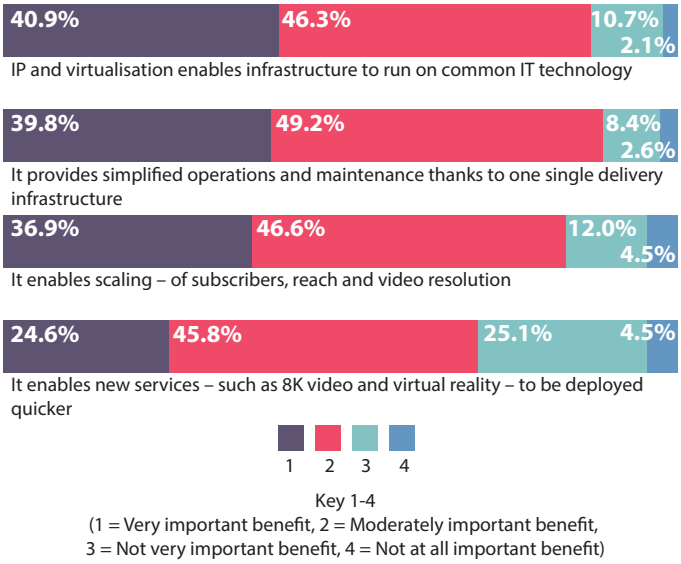
The key benefits, in the view of respondents, are operational simplicity and the use of common IT technology.

Some 41% rated IP and virtualisation, enabling infrastructure to run on common IT technology, as being a very important benefit, with a further 46% rating it a moderately important benefit. Some 40% of respondents also rated the ability of glass-to-glass IP to provide simplified operations and maintenance thanks to a single delivery infrastructure as being a very important benefit, with a further 49% rating this as moderately important.

Slightly further down the pecking order of importance is the ability of glass-to-glass IP to enable scaling of subscribers, reach and video resolution. This is rated very important by 37% of respondents and as moderately important by 46%.

Finally, of relatively lesser significance – but still important – is the ability of glass-to-glass IP to enable new services such as 8K video and virtual reality to be deployed more quickly. This is seen as very important by 25% of respondents and as moderately important by 46% (**fig.40**).

Fig. 40 What are the key benefits of 'glass-to-glass' (from content capture right through to end consumer) IP video?



Conclusion

Video distribution is migrating to IP technology at a fast pace, in the view of industry respondents to our survey. A significant proportion of our survey sample believe that all video will be delivered via IP in 15 years' time, and an overwhelming majority of respondents – over 70% – believe either that broadcast will be dead or that the vast majority of video that people view on TV screens will be delivered over IP networks in 15 years' time.

There is a very high level of awareness of ABR video among our survey respondents, and most of them believe that ABR will be the key technology in enabling IP video distribution. While constant bit-rate IPTV and cable TV are likely to migrate to ABR-enabled IP relatively quickly, however, satellite and digital-terrestrial TV is likely to take longer to make the shift, given the extent of existing deployments of legacy technology.

Uptake of ABR-enabled IP video is primarily driven by growth in multiscreen and non-linear video consumption although other factors – notably the ability of ABR to extend the reach of services to low-bandwidth networks – will also be important.

Challenges do exist – the most significant being the time lag involved in delivering live services and the challenge in maintaining a consistent high resolution in the case of premium Ultra HD TV services – but are unlikely to hold up migration.

For our survey respondents, ABR is primarily about improving the efficiency of delivery, maintaining consistency of quality and enabling service providers to reach multiple screens over un-managed networks rather than a means to increase revenue. However, the implementation of ABR-enabled IP video as a default distribution technology will open out some additional revenue opportunities – particularly through its ability to facilitate the delivery of targeted or personalised advertising.

Ultimately, however, migration to ABR-enabled IP video will enable content companies and TV operators to simplify their operations and facilitate the virtualisation of important infrastructure. ●

SPONSOR'S COMMENT

Roland Mestric, video marketing director, Nokia

The survey reveals that it is not so much a question of whether the distribution of television and video content will transition to an all-IP model. It's a question of when.

Not surprisingly, people have different views about when this switchover will happen (fig. 34). In reality, no two markets (or regions) start at the same point, nor advance at the same speed.

As switchover approaches, consumers will care less and less about how content is delivered and will simply demand the highest-quality viewing experience, agnostic to the screen, device and location of their choosing. Nine out of ten respondents agree that ABR, as a technology, will enable this smooth and seamless transition of TV services (fig 37).

Nokia shares this view. However, video delivery remains a complex problem and ABR does come with its challenges. One of the most significant issues is scalability (fig. 38). A number of major outages recently experienced by commercial OTT services confirmed that delivery of live TV becomes more difficult to scale as more and more viewers join the live stream. Other significant challenges highlighted by the survey are related to perceived service quality and include slow start and high lag times; and as the demand for UHD content increases, operators are challenged to push higher and higher bitrates over the last mile and into the home over already constrained networks.

While these challenges may remain in a pure OTT environment, they are easier to mitigate for service providers who control the delivery chain. Enhanced technologies, caching algorithms and delivery techniques are already increasing the effectiveness and efficiency of ABR delivery. As ABR achieves the resilience and reliability of broadcast services it will become mainstream for TV delivery.

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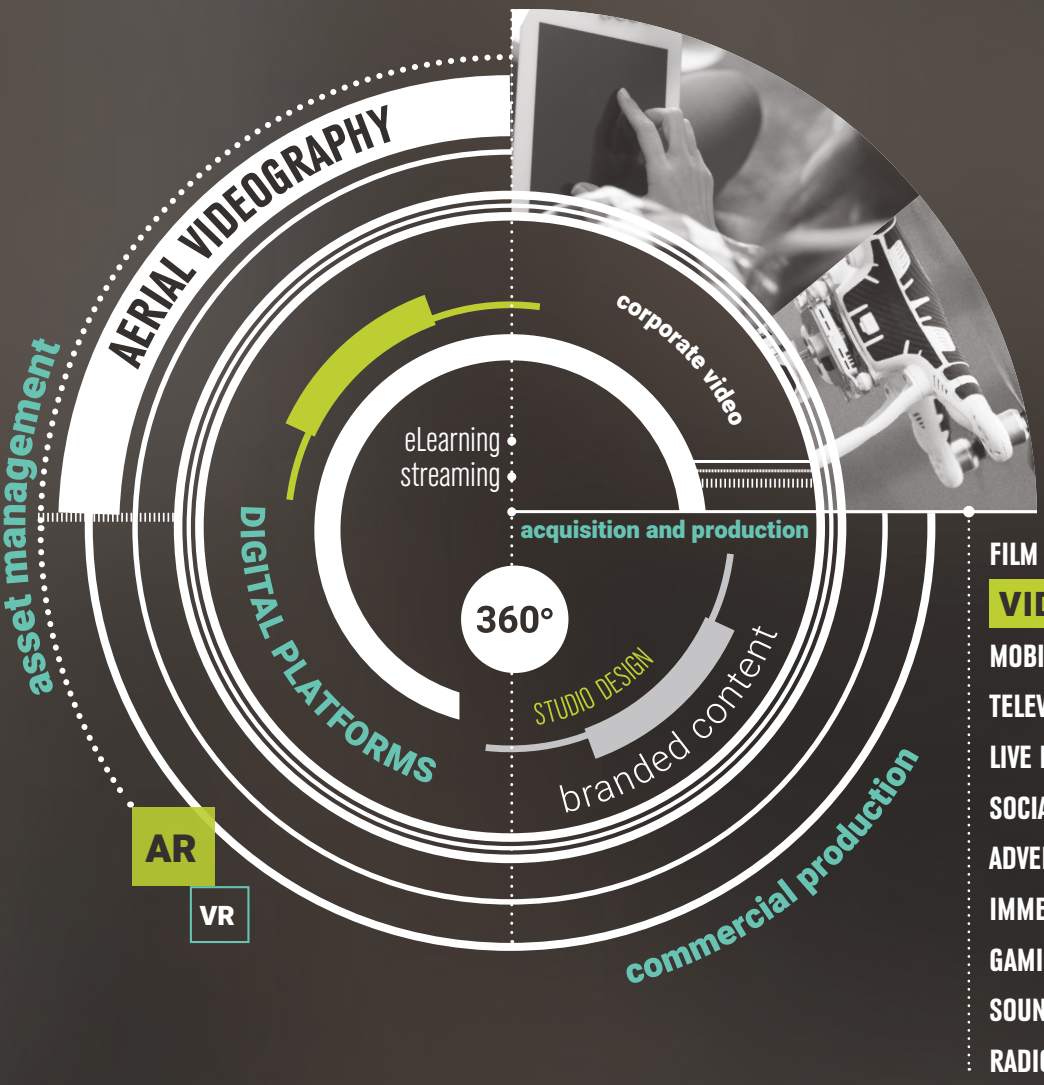

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