

AN ASSESSMENT OF THE BARGAINING RELATIONSHIP BETWEEN RADIO AND VOICE ASSISTANT PLATFORMS IN THE COMING DECADE

A report for Radiocentre

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1 Executive summary

Key findings

This report analyses the relationship between radio services and Voice Assistant platforms in the coming decade¹.

- The growth of Voice Assistant platforms in recent years has provided opportunities for radio service providers to attract new listeners and offer valuable digital advertising.
- But radio service providers' increasing reliance on Voice Assistant platforms for distribution presents risks since a rapidly growing proportion of radio listening is facilitated by Voice Assistants. These risks relate not just to how radio reaches listeners, but how users discover content; how radio service providers access the data they need from the platforms; and how radio services will compete with the audio services offered by the digital platforms.
- The terms of distribution of radio services via Voice Assistant platforms are governed by the interoperability relationship which is defined and set by the Voice Assistant platforms.
- Radio providers' ability to influence these terms of distribution (which are already limited) will diminish over time as radio providers' bargaining power in the relationship decreases further. This is because, in the coming years, Voice Assistant platforms will likely be less dependent on radio services to attract users; whereas radio services will be increasingly dependent on the platforms for distribution.
- The weaker bargaining position presents a risk to radio service providers. Their ability to profitably provide radio services will increasingly be at the mercy of the interoperability relationship over which they will have limited control. Furthermore, they may face growing direct competition (in the supply of audio content or audio advertising) from the Voice Assistant platforms on which they also depend for distribution.

There are opportunities and risks for radio associated with the shift to IP distribution

Radio services are facing a once in a generation technology shift in terms of how it is distributed, moving from broadcast to IP distribution. The change is gaining momentum: already forecasts on IP radio distribution that were produced in 2020² have been exceeded.

¹ As explained in Annex A, Voice Assistants describe the software that interprets, analyses and responds to natural language commands from users by offering access to content services information stored in the cloud.

² Mediatique, "Future audio consumption in the UK", 2020- <https://getdigitalradio.com/wp-content/uploads/2021/10/Mediatique-Future-Audio-Consumption-in-the-UK-update-Dec-2020.pdf>

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The pace of change will accelerate into the future as use of Voice Assistants grows. Voice Assistants will increasingly be the interface that we use to interact with online services, content and connected devices. Their use will grow as new services and content are developed specifically for Voice Assistants and use of Voice Assistants in car becomes the norm.

The shift from broadcast transmission to IP distribution has challenged radio services. In the world of broadcast transmission, radio services were listened to on dedicated devices where they competed with a limited number of other audio services for user's attention. Whereas now, with IP distribution, radio services can be listened to on a multitude of different devices, and they compete with all manner of services and content vying for user attention.

Radio service providers have responded well to this challenge and listening is increasing. Broadcasters have succeeded by keeping their content offer relevant and engaging to audiences in these changing conditions. The shift in distribution to IP has expanded the potential audience size, as users find new ways to listen, on new devices. UK radio now potentially has a global audience. IP has also provided opportunities to offer new audio advertising services which are valuable to advertisers.

However, there is a risk to radio if a greater proportion of listening is intermediated by Voice Assistants that users interact with in order to find their favourite radio content. Radio service providers must interoperate with large digital platforms that provide Voice Assistant services. The ability of radio services to reach end users will increasingly be dependent on the terms of interoperability which are largely set by the large digital platforms. These terms will affect not just how users discover and find radio content among the plethora of global content, but also how radio will be able to gather the data that it needs to develop and grow its services and serve audio advertising. The UK's radio services' dependence on these digital platforms will grow over time as use of Voice Assistants becomes increasingly commonplace.

Currently radio adds value to Voice Assistant platforms

During the early phase of growth in usage of Voice Assistants, the relationship between radio and Voice Assistants was mutually beneficial. While there are many uses of Voice Assistants, it is likely that for many end users radio is a key "anchor" service that has driven take up and ongoing usage of Voice Assistants. Three quarters of listening on smart speaker devices (i.e. speakers with embedded Voice Assistants) is to radio³. Radio also plays a role in educating users in how to use Voice Assistants as radio stations issue "calls to action" for listeners several times an hour which explain how to use Voice Assistants in order to access their radio station (e.g. using voice commands and acting on voice responses).

However, it is possible that over time the value of radio to Voice Assistant platforms will decline. It is likely that new content and services that use Voice Assistants will be developed gradually diminishing radio's role as the "anchor" service. As Voice Assistant take up becomes "saturated" there will be limited scope to grow users. And as the technology becomes more

³ Rajar MIDAS Survey, Summer 2022. https://www.rajar.co.uk/docs/news/MIDAS_Summer_2022_.pdf

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embedded in our daily interactions with the internet, radio will play a lesser role in educating users.

Radio's increasing dependence on digital platforms for distribution poses risks

This report sets out a simple bargaining framework which can be used to assess how the relative bargaining position of radio and Voice Assistant platforms will change over time. This in turn can be used to infer whether changes in the bargaining position might lead to risks for radio.

In the next decade radio service providers will become even more dependent on Voice Assistant platforms to reach users; but radio will also likely play a declining role in supporting the take up and use of Voice Assistant platforms. This suggests that there is a material risk that radio will have a significantly weaker relative bargaining position in relation to the Voice Assistant platforms with which it must interoperate to reach listeners. A further weakening in radio's bargaining position could harm radio's ability to agree terms of interoperability that are necessary to be able to offer audio content and advertising services.

Risks for radio are exacerbated where it competes directly with Voice Assistant platforms in providing audio or advertising services. All three of the main Voice Assistant platforms (Amazon, Google, Apple) already offer competing audio services (such as music subscriptions or radio-like services). They also offer advertising and some are looking to grow their audio advertising services. The incentives of Voice Assistant platforms to provide interoperability will change where they compete directly with third parties who seek to interoperate with them.

There is a high degree of uncertainty in how the Voice Assistant market will develop over the coming decade. It is not known how Voice Assistant platforms plan to monetise their investments in their services. This report therefore considers two scenarios: a scenario assuming Voice Assistant platforms earn relatively low incremental value from complementary services; and a scenario where they earn higher incremental value from complementary services. The risks to radio in each scenario – and the conditions implying benign and non-benign outcomes for radio – are considered.

In a benign scenario the relationship between radio and Voice Assistant platforms remains as per the "status quo". However, there is also a 'non-benign' scenario which entails a risk for radio.

Figure 1 Summary of potential outcomes

	Low Incremental Revenue Scenario [for Voice Assistants]	High Incremental Revenue Scenario [for Voice Assistants]
Benign [for radio]	<ul style="list-style-type: none"> Radio is an important driver of Voice Assistant take-up. Voice Assistant platforms' monetisation strategy are not focused on competing with radio. 	<ul style="list-style-type: none"> Radio's contribution to Voice Assistant's value decreases as the proportion of usage derived from radio declines. Voice Assistant platforms are used for a wide variety of other services. Voice Assistant platforms' monetisation strategy is focused on smart speaker sales, e-commerce, and complementary services that do not compete with radio and / or selling complementary devices.
Non- Benign [for radio]	<ul style="list-style-type: none"> Radio remains the core use case for Voice Assistants alongside music streaming. The Voice Assistant platforms attempt to directly monetise their investment through radio. Voice Assistant platforms monetise their data assets to offer audio advertising. 	<ul style="list-style-type: none"> Radio becomes very dependent on Voice Assistants for distribution. The Voice Assistant platforms attempt to monetise by charging an access fee to its platform to radio broadcaster's or end users. Voice Assistant platforms' monetisation strategy is focused on increasing profits from competing audio services. Voice Assistant platforms monetise their data assets to offer audio advertising.

Source: Frontier Economics.

Note: Throughout the report, the value share estimates that we present assume a "status quo" relationship between radio and Voice Assistant platforms, which broadly reflects the benign outcome for radio.

Policy makers should act promptly to consider the risk to radio

Based on the experiences in other sectors and the risk of a shift in relative bargaining power in favour of Voice Assistant platforms, there appears to be a considerable risk that the non-benign scenario could materialise (instead of a continuation of the "status quo"). Non-benign outcomes would not just harm radio broadcasters and listeners, but could also impair the ability of radio to continue to provide the wider range of social, cultural and economic benefits that it currently brings.

Given the pace at which the market moves, and the adverse effect on radio were the market to evolve to the non-benign outcome, policy makers should promptly consider the risks for both effective competition and the significant broader public value contribution made by radio in the event of a non-benign scenario materialising, and consider regulatory interventions that could minimise such risks.

2 Introduction

Over the past decade the advance in digital technologies has disrupted all sectors, including the media sector. However, the radio sector remains strong. Listening to radio is still a popular activity, despite the rise of many new audio services competing for listener's attention, such as podcasts, streaming music, or audiobooks. Radio's ability to retain, and indeed grow its listener base, during this period of technological disruption demonstrates the important role that it plays in all our lives. Radio is able to innovate and grow in an era where revenues in other media sectors have been under pressure.

However, radio increasingly relies on large digital platforms and their Voice Assistants to distribute content and reach listeners.

Defining Voice Assistants

Voice Assistants⁴ describe the software that interprets, analyses, and responds to natural language commands from users by offering access to content services information stored in the cloud. Typically, users interact via voice commands (but can also interact in other ways). Voice Assistants are integrated into many different types of consumer devices, including smart speakers, laptops/desktops, watches, smartphones, cars, TVs and on IoT (Internet of things) devices.

Voice Assistant services in the UK are principally provided by large digital platforms ("Voice Assistant platforms") such as Google, Amazon (Alexa) and Apple (Siri). These Voice Assistant platforms incorporate their Voice Assistant services on their proprietary hardware (including smartphones, smart speakers or smart home devices) and may license their Voice Assistant technology to third party providers to include on third party devices or interoperate with third party services. See Annex A for details.

Radiocentre has commissioned Frontier Economics to assess how radio's increasing dependence on Voice Assistant platforms will affect future outcomes in the sector.

This report, therefore, describes:

1. the shift in radio listening from broadcast to IP distribution, often intermediated by Voice Assistants, which has to date been beneficial to radio and vice-versa;
2. the role that radio has played in generating value for Voice Assistant platforms;
3. the bargaining dynamics between Voice Assistant platforms and radio broadcasters, now and in the coming decade; and,
4. the implications of changing bargaining dynamics on radio and wider UK society.

⁴ Voice Assistants are sometimes referred to as Virtual Assistants. This report uses the term Voice Assistant but assumes that it is synonymous with Virtual Assistant.

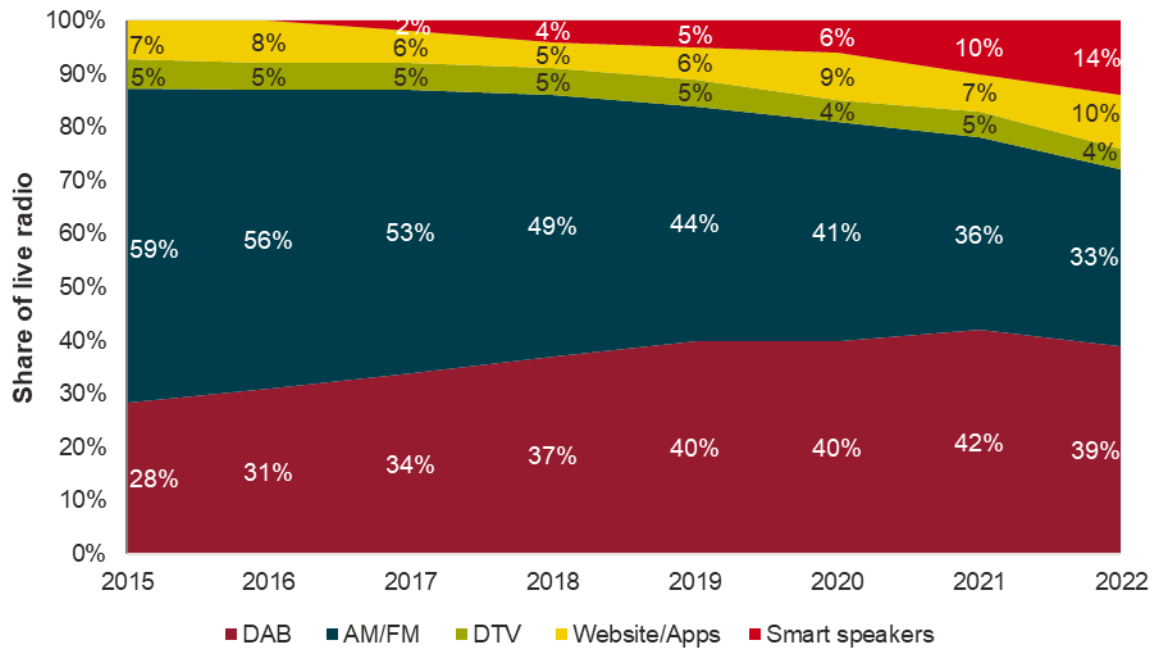
3 The structural shift in how radio is distributed presents opportunities but also risks

3.1 Radio is facing a once in a generation technology shift in how it is distributed - from broadcast to IP distribution

For the century that broadcast radio has been in existence it has relied almost entirely on broadcast transmission to reach listeners on dedicated devices. The radio signal is broadcast in a single stream to listeners using scarce radio spectrum which is received on dedicated devices. This has shaped the competitive environment for radio – where it has competed with a limited range of substitutes. The shift to IP distribution represents a significant shift, suddenly changing the market conditions, changing how we listen and the competitive environment in which it operates.

This switch to IP distribution is happening at a rapid pace. In the past four years, the share of live radio that is listened to over IP has more than doubled from 11% in 2019 to 24% in 2022 (Figure 2). 14% of radio listening is now via a smart speaker⁵ (i.e. enabled by a Voice Assistant) and 10% is via web or app interfaces, much of which will also be enabled by a Voice Assistant.

Figure 2 Live radio audio share in the UK, by distribution channel



Source: Frontier Economics elaboration of Rajar MIDAS survey data.

⁵ Rajar Data Release Q42022. https://www.rajar.co.uk/docs/news/RAJAR_DataRelease_InfographicQ42022.pdf

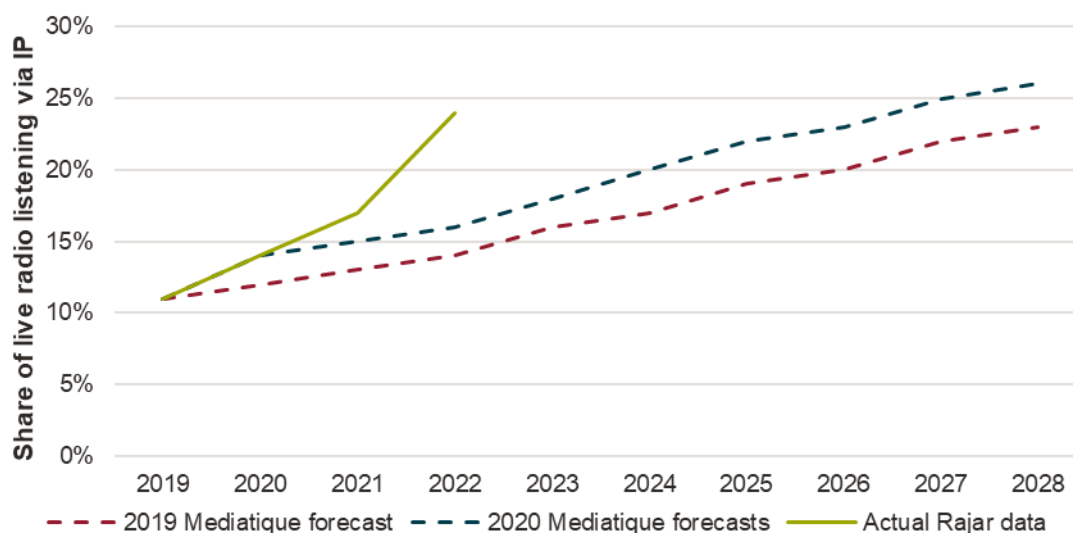
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Note: Frontier Economics elaboration of Rajar Data Release and Rajar MIDAS Survey. We draw data from two sources as smart speakers share of live radio started to be reported in Rajar Data Release only from 2022, while Rajar MIDAS Surveys provide such values also for previous years.

3.2 The change is at a relatively early stage but is accelerating

The change is at a relatively early stage, but is gaining momentum. Forecasts made in 2019⁶ and 2020⁷ on the share of radio listening via IP are already well out of date. IP's share of radio listening is already at 24% where it was predicted to reach this by 2026 (in the 2020 forecast) and beyond 2028, in the 2019 forecast (Figure 3).

Figure 3 Growth in IP listening exceeds recent forecasts



Source: Frontier Economics elaboration of Rajar and Mediatique data.

The change will accelerate into the future, as use of Voice Assistants increases and use of in-car connectivity to listen to radio becomes the norm.

3.2.1 Smart speaker penetration is growing rapidly

Smart speakers are a rapidly growing segment in the UK and have driven growth in the use of Voice Assistants. In 2022 over 39%⁸ of all households had a smart speaker compared to

⁶ Mediatique, "Future audio consumption in the UK", 2019- <https://getdigitalradio.com/wp-content/uploads/2021/10/Mediatique-Future-Audio-Consumption-in-the-UK-update-Dec-2020.pdf>

⁷ Mediatique, "Future audio consumption in the UK", 2020- <https://getdigitalradio.com/wp-content/uploads/2021/10/Mediatique-Future-Audio-Consumption-in-the-UK-update-Dec-2020.pdf>

⁸ Ofcom, "Tech Tracker 2022 Main Data Tables"- https://www.ofcom.org.uk/data/assets/pdf_file/0022/239431/Tech-Tracker-2022-Main-Data-Tables.pdf

20%⁹ in 2019 and 6% at the end of 2017¹⁰. It is projected to reach a penetration of 62% by 2035¹¹, though even this could be low given how recent forecasts have been overtaken by out-turn.

In the UK, the use of Voice Assistants has significantly helped listeners become accustomed to smart speakers' Voice Assistants. According to a Voicebot study, 66% of smart speaker owners said they are daily active users, and 93% use the devices at least monthly¹².

3.2.2 Voice Assistants will play an important role supporting in-car radio listening

The use of Voice Assistants will grow as they become important to support control of car, infotainment functions including radio¹³. Given that 23% of all radio listening is done in the car¹⁴, this will change how users interact with radio.

There are a number of factors that are likely to mean that Voice Assistants will play a more significant role in in-car listening in the future. First, some cars may not incorporate analogue or digital tuners and instead rely exclusively on IP streaming either directly via devices connected to the car, or via inbuilt connectivity in the car¹⁵ (by 2035 90% of all households' cars will be connected cars¹⁶). Second, recent changes to safety legislation prohibits drivers from using their mobile devices while driving¹⁷. Drivers must instead rely on Voice Assistants to control their mobile devices, which are paired with their car infotainment systems and provide access to radio station apps. Third, Voice Assistant platforms have developed specific services for in-car use (such as Android Auto and Apple CarPlay), which in many cases are

⁹ Ofcom, "Online Nation 2019 report", Accessed Feb 2023

https://www.ofcom.org.uk/data/assets/pdf_file/0025/149146/online-nation-report.pdf

¹⁰ Ofcom, "International Communications Market Report 2017", Accessed Feb 2023-

https://www.ofcom.org.uk/data/assets/pdf_file/0032/108896/icmr-2017.pdf

¹¹ Mediatique, "Ownership and use of audio-enabled devices in 2035", 2021- <https://getdigitalradio.com/wp-content/uploads/2021/10/Mediatique-Ownership-and-use-of-audio-enabled-devices-in-2035-June-2021.pdf>

¹² "Consumers in Germany and the UK use their Smart Speakers Much More Than the U.S." Voicebot.ai. Accessed April 2023.

<https://voicebot.ai/2021/07/05/consumers-in-germany-and-the-uk-use-their-smart-speakers-much-more-than-the-u-s/#:~:text=European%20Smart%20Speaker%20Frequency%20of,%25%2C%20and%2023.5%25%20respectively.>

Note that the frequencies shown differ from those elsewhere in the report, as this last one considers Voice Assistant usage with different devices, including smart speakers.

¹³ One survey noted already 19 million consumers in the UK use a Voice Assistant while driving. Voicebot, "In-Car Voice Assistant Users 127 Million in the U.S. with Strong Adoption in the UK and Germany as Well – New Report", Accessed Jan 2023- <https://voicebot.ai/2021/08/23/in-car-voice-assistant-users-127-million-in-the-u-s-with-strong-adoption-in-the-uk-and-germany-as-well-new-report/>

¹⁴ Rajar MIDAS Summer 2022. https://www.rajar.co.uk/docs/news/MIDAS_Summer_2022_.pdf

¹⁵ Some brands are already phasing out AM radio. <https://www.thedrive.com/news/heres-why-some-automakers-tune-out-am-radios-in-new-cars>.

¹⁶ Mediatique, "Ownership and use of audio-enabled devices in 2035", 2021- <https://getdigitalradio.com/wp-content/uploads/2021/10/Mediatique-Ownership-and-use-of-audio-enabled-devices-in-2035-June-2021.pdf>

¹⁷ The Highway code, road safety, and vehicles rules <https://www.gov.uk/using-mobile-phones-when-driving-the-law>.

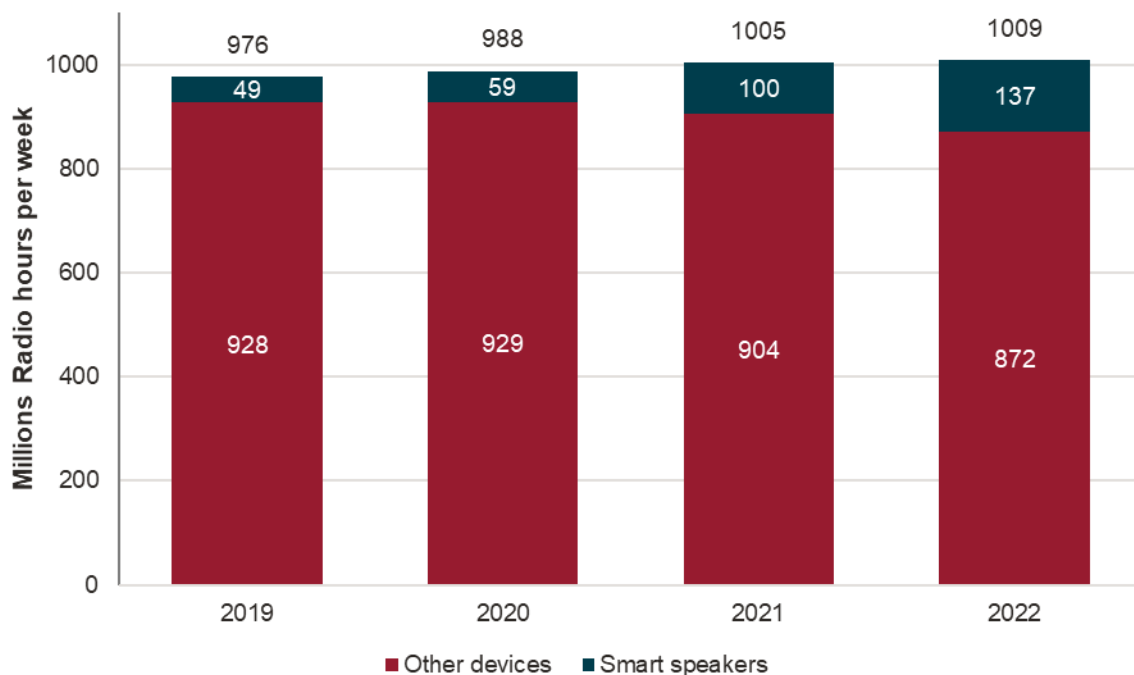
integrated within the car’s infotainment system. These are optimised to use the platform’s Voice Assistant, to enable users to discover and play their favoured radio content on the move. Fourth, the Voice Assistant platforms are developing auto software services which will support the car’s wider environmental, engineering, and safety functions and will incorporate full infotainment functionality including Voice Assistants¹⁸¹⁹. These are competing alongside the car manufacturers own proprietary infotainment systems and will likely encourage the use of the platforms’ Voice Assistant services.

3.3 Voice Assistants have supported radio in reaching listeners and embedding IP distribution

3.3.1 Listening to live radio is continuing to grow

Listening to radio via Voice Assistants appears to have a role in driving growth in radio volumes (Figure 4). At a time where there are many competing demands for our attention, the volume of radio listening is holding up and indeed has grown in recent years.

Figure 4 Total live radio listening



Source: Frontier Economics elaboration of Rajar data.

¹⁸ “The Future of the EU Automobile Sector” stated that for OEMs to be successful, they need to be able to provide complete packages combining hardware, the vehicle, with software and associated services.
[https://www.europarl.europa.eu/RegData/etudes/STUD/2021/695457/IPOL_STU\(2021\)695457_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/STUD/2021/695457/IPOL_STU(2021)695457_EN.pdf) .

¹⁹ Amazon Web Services supports the automotive industry, including “digital customer engagement” and “connected mobility”-
<https://aws.amazon.com/automotive/>.

Recent research by Ofcom supports the proposition that smart speakers are driving increases in listening to audio, including radio.²⁰ The research found *“people generally felt that they listened to the radio more than they had done before they had a smart speaker because it was now quicker and easier to do so. Even many of the non-users found they were listening to the radio more since receiving a speaker. Most were confident that they could access all the radio stations they wanted to, and that their smart speaker allowed them to listen to a wider range of stations than had previously been available to them via their radio sets.”*²¹

Radio listening habits may have also changed as a result of COVID-19 which has led to longer term changes in working practices. The initial lockdowns prompted increases in radio listening as people were at home more²². These habits have likely persisted as many workers have transitioned to hybrid home working, leading to more listening at home slightly offset by less listening at work.

3.3.2 The transition to IP distribution will enable radio broadcasters to generate incremental value

IP distribution technology offers new opportunities to radio broadcasters. First, it offers broadcasters the ability to offer a more valuable advertising proposition. Commercial radio depends on advertising revenues²³, and as listening migrates to IP distribution it provides radio with the opportunity to develop its digital advertising services.

²⁰ In an Ofcom research study, most participants felt that they had listened to the radio more than before they had a smart speaker because it was now quicker and easier to do so Ofcom, *“Smart speaker research”* Dec 13, 2022.
https://www.ofcom.org.uk/data/assets/pdf_file/0022/249142/Smart-speakers-research.pdf

²¹ Ofcom (2022) Smart speakers research with the public Research report December 2022.
https://www.ofcom.org.uk/data/assets/pdf_file/0022/249142/Smart-speakers-research.pdf

²² <https://www.radiocentre.org/commercial-radio-listening-enjoys-huge-working-from-home-boost-during-coronavirus-lockdown/>

²³ https://www.ofcom.org.uk/data/assets/pdf_file/0014/105440/uk-radio-audio.pdf

Radio has developed digital advertising propositions

Radio stations have developed digital advertising which is differentiated from the standard advertising supplied over traditional broadcast networks. Digital targeted audio advertising trades at a premium to standard advertising. Industry stakeholders have suggested that the Cost per Impression²⁴ (CPM) is around two to seven times higher for digital advertising relative to standard advertising. Digital advertising trades at a premium because it offers greater functionality, measurement capability and greater targeting. Though not all advertising heard on radio IP streams is “digital/targeted advertising” since it may be standard (non-targeted) advertising being streamed.

In the UK, radio broadcasters are developing their advertising offer. Bauer Media Audio UK and News Broadcasting²⁵ (owned by News UK) launched Octave Audio²⁶, a digital audio company for the UK advertising market. DAX, the largest digital audio ad sales and insertion platform in the UK (owned by Global) was founded in 2014 and reaches around 30 million people in the UK²⁷.

Second, radio broadcasters are able to use data collected from listening via IP to build a rich understanding of the listening habits of the users (although as explained below this is usually limited to listening via the broadcaster’s first party apps). This is essential to be able to build and evolve a content proposition that reflects user demand in a dynamic way and therefore supports advertising and programming.

Third, IP distribution will enable radio broadcasters to offer content and services which are personalised and tailored to their listener base.

However, in order to be able to exploit these opportunities radio needs to be able to access data that is generated by their listeners. Where this data is generated on radio broadcasters’ first-party apps then they will be able to access richer data than might be possible where it is generated by users’ interactions with third party platforms (such as voice assistant platforms). Furthermore voice assistant platforms may be able to combine data from listeners with other data that they hold to create much richer and more valuable data than could be generated by interactions with radio broadcasters’ first-party services.

²⁴ Cost Per Impression (CPM) relates to the cost to advertisers of 1000 impressions from users.

²⁵ News Broadcasting was branded as Wireless Group prior to 2023.

²⁶ Octave. <https://octaveip.com/>

²⁷ Dax. <https://global.com/dax/>

3.4 Radio's growing reliance on Voice Assistants to reach listeners presents risks

As set out above the move to IP distribution provides opportunities for radio: it enables UK broadcasters to reach new listeners, not just in the UK, but potentially also around the world²⁸. It has therefore helped grow listening and create engagement with users. It has enabled it to offer new, more valuable, advertising services to listeners. This has enabled radio to continue to invest and succeed in a digital world where many more content and services fight for listeners' attention.

Voice Assistants will play a growing role in supporting listeners' access to their preferred radio content. Users will increasingly turn to Voice Assistants to help them find radio stations, rather than navigate via web interfaces or touch screens and dedicated apps.

As radio becomes increasingly dependent on Voice Assistant platforms to reach users, its ability to generate revenues depends on the commercial relationships that it has with the digital platforms, which might include business negotiations as well as interoperability agreements. Radio must be assured that the digital platforms will support radio in continuing to be able to reach listeners; that radio can access the listener data held by those digital platforms that it requires to supply its services; and, that radio is discoverable within the wider suite of services offered via Voice Assistants.

The commercial arrangements which govern the terms of business between UK radio broadcasters and Voice Assistant platforms is not a standard negotiation where parties bilaterally negotiate and agree terms of supply. Instead, large digital platforms set out the terms by which the many thousands of different content and service providers (including radio broadcasters) can interoperate with them (this is briefly summarised in Annex A).

There is a risk that the digital platforms could change the terms of business in a way that adversely affects radio. Currently this risk is mitigated to a degree as digital platforms benefit from the ability of users to access radio via their Voice Assistant platforms (this is explored in Section 4). However, changes in market conditions could affect the ability and incentives of the digital platforms to interoperate in a way that benefits radio.

²⁸ Subject to copyright restrictions and listener demand, which is typically national or local..

4 Radio generates value for Voice Assistant platforms

Voice Assistants are a core part of the strategy of digital platforms, and radio has played a key role in supporting use and take up of Voice Assistants. Hence, this symbiotic relationship between radio and Voice Assistants helps create value for digital platforms.

4.1 Voice Assistants are integral parts of digital platforms' strategies

Large digital platforms have invested considerable amounts in their Voice Assistant technologies. While different digital platforms have different core consumer strategies (search and mobile advertising for Google; e-commerce and advertising for Amazon; hardware and apps and content services for Apple), their use of Voice Assistant technologies share similarities. All three platforms offer a wider ecosystem of linked and complementary services and hardware which is built around their core services; and the digital platforms are active at multiple levels of the value chain offering services to end users, as well as acting as platforms connecting service providers and end users.

The platforms are all “open” to some degree meaning they encourage third parties to “interoperate” by allowing devices and services (such as apps or content) to be compatible with their platform and Voice Assistant (as described in Annex A This interoperability is a core part of the platforms' commercial strategies. Interoperability also drives value for end users who are able to access hardware and software services which work with their device.

The platforms' Voice Assistants support their ecosystem of products and services, making them more attractive and user-friendly to end users, and hence also to the service providers that wish to access end users via the digital platform. The Voice Assistants are also able to gather data on end users which enables them to more effectively and efficiently provide their own (“first-party”) services (whether apps, services, or hardware) and in turn earn incremental revenues.

The precise approach to monetising Voice Assistant investments will vary by digital platform depending on each platform's core strategy. However, they will to some degree all depend on making users more engaged with the wider digital ecosystem and/or increasing purchases within that ecosystem in a way that is valuable to the platform. According to Amazon's Senior Vice President for Devices and Services, Alexa drives sales in e-commerce, smart home devices and services and subscription services.²⁹ Amazon describes the approach of using its

²⁹ “Fifty per cent of Alexa customers use it for some form of shopping, smart home [i.e. connected devices for the home] is up 25 or 30% year on year in terms of usage and every time someone engages with smart home they go out and buy smart lights or smart plugs ... obviously there are subscription services [such as] Amazon Music”.

<https://www.thetimes.co.uk/article/amazon-has-big-plans-for-alexa-is-it-all-talk-fw2hgccij>

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Voice Assistant to generate complementary sales (whether by direct engagement or exploiting data gathered) in another part of the business as its “Flywheel”³⁰ approach.

Amazon has conceded that its Voice Assistant Alexa is not currently profitable. It is reported that Amazon’s strategy has focused on growing market share and high future profit margins, at the expense of low profit margins in the near term. Indeed Amazon Worldwide Digital unit is expected to face losses of \$10 billion USD this year as a result of its investment in Alexa and other devices³¹. According to one report “*Amazon would not confirm a date when it would become profitable only that there was a plan for this internally we are figuring out how to monetise it*”³². Nonetheless, an Amazon Executive noted that Amazon is as committed as ever to Alexa, and will continue to invest heavily in it.³³

However, industry sources have pointed to the role that more advanced AI (such as ChatGPT) could play in growing the use, engagement and versatility of Voice Assistants in the coming years. Apple’s Siri co-creator, Adán Cheyer, noted that this new technology “*will enable that breadth and flexibility and complexity that has not existed with the previous generation of voice assistants*”.³⁴ This in turn will offer new opportunities for users and developers to generate value from the technology.

Despite recent reports that indicate that Amazon has not yet been able to monetise its voice assistant investments, it is necessary to be cautious about inferring what this means for the long-term monetisation strategy of digital platforms. Digital platforms do not identify the costs and revenues associated with Voice Assistants in public reports so it is not possible to verify the reports of losses at Amazon or extrapolate to other platforms. And it is not uncommon in growing sectors (like Voice Assistants) for providers to seek to prioritise growth in market share over profitability in the early stages, with the aim of generating profitability at a later stage when market share is higher. For example, by selling Voice Assistant hardware at low (or sometimes negative) margins the digital platform can encourage wider engagement with the ecosystem.³⁵ In digital markets where “network effects” are present (i.e. benefits that

³⁰ Flywheels are designed to capture momentum and retain energy. The term is used to describe the engagement that an Amazon customer feels in one part of the business driving sales in another part of the business.

³¹ Business Insider. “Amazon is on pace to lose \$10 billion this year from Alexa and other devices”. Accessed April 2023. <https://www.businessinsider.com/amazon-lose-10-billion-this-year-from-alexa-other-devices-2022-11>

³² <https://www.thetimes.co.uk/article/amazon-has-big-plans-for-alexa-is-it-all-talk-fw2hggcjj>

³³ One report noted, “*Amazon’s Alexa voice assistant division is expected to lose up to £8.4 billion this year. ...Alexa has been around for 10 years, despite never managing to create a substantial revenue stream. ...While timers, music, and weather forecasts might be good for users, they are hardly high earners for the platform providers.*” “Amazon Alexa on track to lose \$10 billion this year, described as ‘colossal failure’ in new report”, Fox Business (Nov 22, 2022). [Link](#)

³⁴ Financial Times “Amazon’s big dreams for Alexa fall short”. Accessed March 2023. <https://www.ft.com/content/bab905bd-a2fa-4022-b63d-a385c2a0fb86>

³⁵ Ofcom Research found that “*Some participants used VAs on other devices, for example on their phones or smartwatches or in the car, and there was some sense that they had started to do this more since getting used to using the VA on their smart speaker. : “I probably use it more on my phone than I ever did, simply because you’ve got into the habit of doing it with a smart speaker and it just seems to make sense when you’re away from home and you’ve got your phone out, just asking in the same way.”*” Multiple speakers focus group participant” Ofcom, “Smart Speaker Research Report”, Accessed Jan 2023- https://www.ofcom.org.uk/data/assets/pdf_file/0022/249142/Smart-speakers-research.pdf

accrue to the firms with the biggest customer base) then it can be profitable to grow market share in the early stage of development (while not making profit) before benefiting from value created by network effects once the customer base has grown³⁶.

4.2 Radio is an important driver for Voice Assistant usage

Radio services generate value to digital platforms in (at least) two ways. First, radio is a popular service that drives sales and encourages the use of hardware (devices) that contains the Voice Assistant (principally a smart speaker). Second, radio plays an important role in educating and socialising the use of the Voice Assistants.

With respect to the first effect, radio is likely to play a significant role in driving the initial smart speaker purchase decision³⁷. While there are clearly many uses of Voice Assistants it appears that radio is a very important use case: 64%^{38 39} of owners use smart speakers to listen to live radio, and a further 17% to listen to catch-up radio (Figure 5).

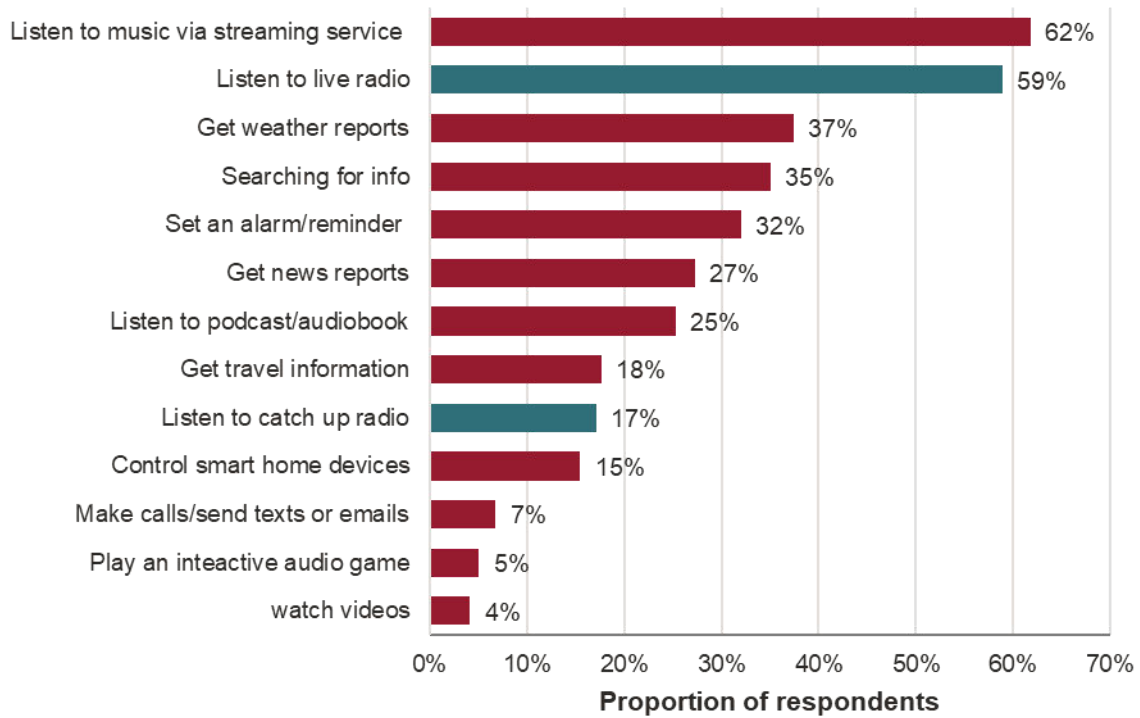
³⁶ Uber and Epic Games are examples of tech firms that have focused on growing market share at the expense of profit.

³⁷ Ofcom, "Smart Speaker Research Report", Accessed Jan 2023-
https://www.ofcom.org.uk/data/assets/pdf_file/0022/249142/Smart-speakers-research.pdf

³⁸ Rajar, "Rajar Data Release Quarter 4, 2022", Accessed Feb 2023
https://www.rajar.co.uk/docs/news/RAJAR_DataRelease_InfographicQ42022.pdf

³⁹ There is a slight difference between Rajar's reported "Listen to radio" figure, 64%, and Ofcom's reported figure, 59%. This might be derived by the date the sample was collected or the sample itself.

Figure 5 Most common activities via smart speakers in the UK, 2022

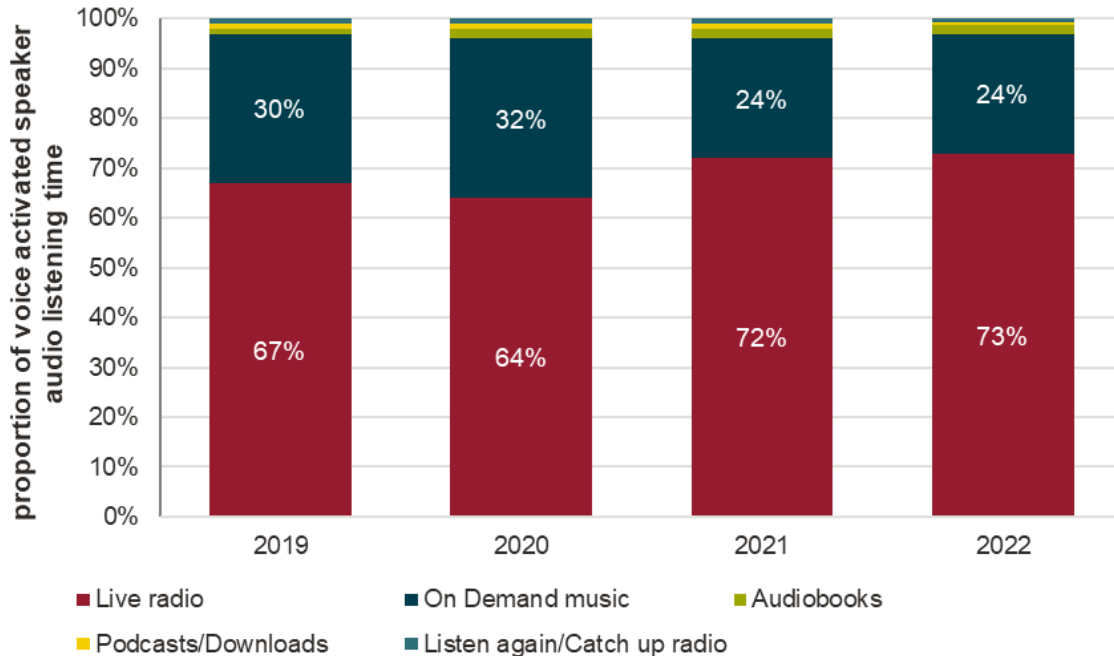


Source: Frontier Economics elaboration of Ofcom Tech Tracker 2022, table 39.

Note: Base of respondents: Where has smart speaker. Question: "Thinking of your household's smart speaker, which of the following functions do you personally use your smart speaker for?".

Furthermore, the vast majority (71%) of all audio content listened to via smart speakers is live radio (Figure 6). The share of listening on smart speakers accounted for by live radio is growing over time.

Figure 6 Voice activated speakers audio listening time share, by source of audio



Source: Frontier Economics elaboration of Rajar MIDAS survey data.

Note: Data refer to listening time in the UK, 2022.

The importance of radio in how consumers use smart speakers and Voice Assistants suggests that it could be a key driver in the use and uptake of Voice Assistant technology. For many consumers the ability to use smart speakers to access radio likely prompted the initial purchase decision, and drives ongoing use of the technology. As consumers become accustomed to using Voice Assistants they gradually use it for more and varied services.⁴⁰

Radio also plays an important role in educating and socialising the use of Voice Assistant technology. Radio stations will typically issue “calls to action” for listeners several times an hour which explain how to use Voice Assistants in order to access their radio station. Thus 89% of the UK population⁴¹ that listen to the radio each week (including those listening on AM/FM/DAB broadcast transmission) will hear instructions many times a day on how to interact with Voice Assistants. It is highly likely that this drives their usage, particularly among current non-users.

⁴⁰ Ofcom Research found that “Some participants used VAs on other devices, for example on their phones or smartwatches or in the car, and there was some sense that they had started to do this more since getting used to using the VA on their smart speaker. : “I probably use it more on my phone than I ever did, simply because you’ve got into the habit of doing it with a smart speaker and it just seems to make sense when you’re away from home and you’ve got your phone out, just asking in the same way.” Ofcom, “Smart Speaker Research Report”, Accessed Jan 2023-

https://www.ofcom.org.uk/data/assets/pdf_file/0022/249142/Smart-speakers-research.pdf

⁴¹ https://www.rajar.co.uk/docs/news/RAJAR_DataRelease_InfographicQ42022.pdf

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The value that radio generates in encouraging take up of hardware that includes Voice Assistants, and driving use of Voice Assistants, will ultimately be reflected in higher revenues of the Voice Assistant platforms. More people engaging with Voice Assistants, partly as a result of radio, will increase opportunities to drive sales in complementary goods and services. This is explored in section 5.

5 Bargaining dynamics between Voice Assistants and radio will affect the commercial relationship

The previous sections explain how both radio and Voice Assistant platforms benefit as a result of radio interoperating with Voice Assistant platforms. Radio benefits by reaching its listeners, in a way that increases the volume of listening. Voice Assistant platforms benefit as radio drives adoption and ongoing use of the services which in turn enhances the platforms' ability to earn incremental profit across its ecosystem. It is clearly in both parties' interests therefore to interoperate in such a way that users are able to access radio via the Voice Assistant platforms.

Currently, the terms of business are largely set by the platforms, neither party pays a fee to the other, and each bears their own costs. Annex A describes the process by which radio and Voice Assistant platforms interoperate.

The terms by which two parties choose to conclude commercial agreements to work together will depend on the bargaining dynamics that exist between them. These bargaining dynamics are unlikely to be static over time and changes will affect bargaining outcomes. The bargaining outcomes can affect different aspects of the commercial arrangement between the parties, such as the terms of engagement, the data that is passed between them, or the prominence or discoverability that is given to content on the platform.

This section, therefore, develops a framework that can be used to understand how the bargaining power between radio and Voice Assistant platforms might change.

5.1 A framework for considering bargaining outcomes

In order to assess the extent to which bargaining outcomes between radio and Voice Assistant platforms will change over the coming decade the following four factors are considered (Figure 7).

1. The balance of value that radio and Voice Assistant platforms provide to each other. This describes the potential impact to the parties if one chooses not to interoperate.
2. The bargaining dynamics are related to the negotiating power that would affect the relationship between the radio broadcasters and the Voice Assistant platform (for example whether broadcasters negotiate collectively or individually).
3. The commercial strategies of the connected platforms⁴².
4. The types of behaviours that connected platforms may adopt in the future.

⁴² The commercial strategies of radio broadcasters will also affect the bargaining outcomes. However, to simplify the analysis this has been excluded.

Figure 7 Factors that affect the bargaining outcomes



Source: Frontier Economics.

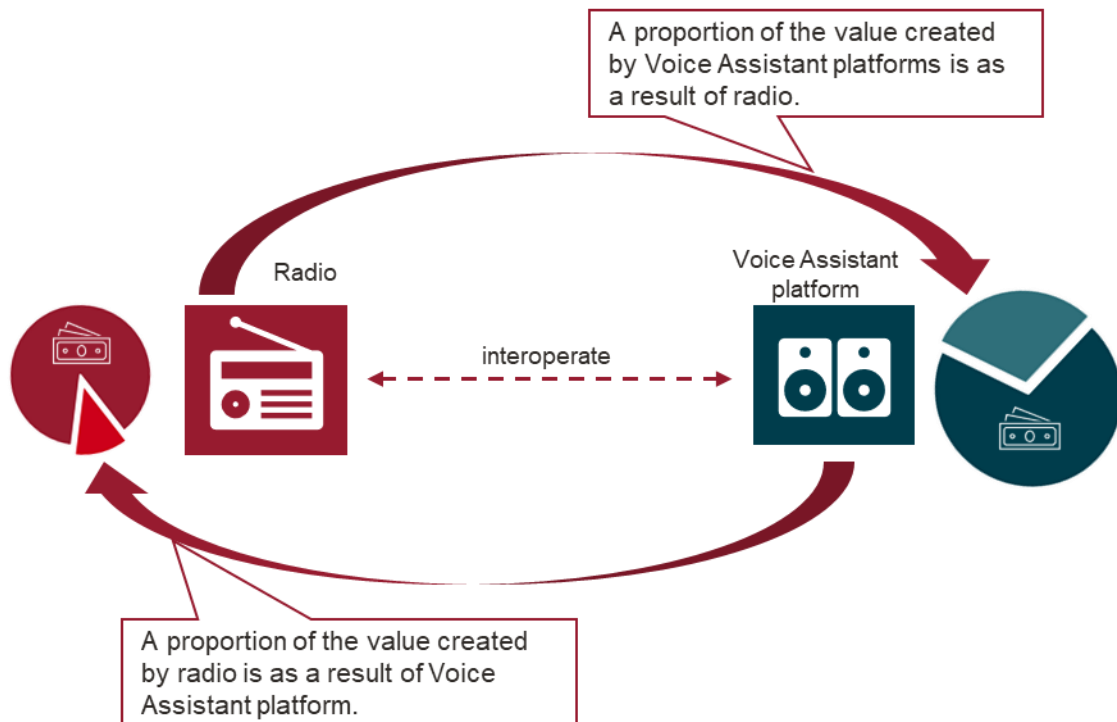
Each of these factors can affect bargaining outcomes. This section provides a high-level assessment of the likely position for the parties (recognising a degree of uncertainty in this assessment) and then considers how these will change in the coming decade. This simple framework is not intended to exhaustively describe all of the factors that affect bargaining outcomes⁴³. But using this framework it is possible to infer whether bargaining outcomes are likely to shift in favour of one or other party over time.

5.2 Radio and Voice Assistant platforms provide value to each other

Radio service providers and Voice Assistant platforms each generate a “gain from trade” from interoperating. Radio gains incremental listening which enables it to earn incremental commercial revenues (or public value in the case of the BBC). Voice Assistant platforms also gain from having radio present (for example through incremental sales or from the use of valuable data) as is illustrated in Figure 8.

⁴³ Bargaining outcomes between two parties are affected by a complex mix of interrelated factors. The purpose of this framework is to identify for key factors which make a significant contribution to bargaining outcomes. But many other factors will also affect outcomes. For example, Voice Assistant platforms interoperate not just with radio but with many tens of thousands of different types of service and content providers. There is therefore an of asymmetry in the transaction costs associated with interoperability between content and service providers who interoperates with a limited number of Voice Assistant platforms; and the Voice Assistant platforms who interoperate with many tens of thousands of service and content providers. Bargaining outcomes will also be affected by the competitive dynamics between the platforms.

Figure 8 The gains from commerce



Source: Frontier Economics.

The contribution that each party makes to its counterparty's value can be used to consider their relative bargaining power. In negotiations⁴⁴ each party can, at the extreme, threaten to not do business together⁴⁵. Exercising this threat will reduce the value of the counter party (i.e. lower its expected revenues and profits) and the threat can therefore be used to leverage bargaining power in negotiations. However, choosing not to interoperate by one party also implies a reduction in the profitability of the party exercising that threat. In a negotiation, each party will weigh up the relative value of a threat to withdraw and the negative impact on it of exercising that threat.⁴⁶

The sections below explain how the relative gains from interoperating for radio and Voice Assistant platforms can be estimated.

⁴⁴ The term "negotiations" is used to describe the interaction between the parties to agree terms, it does not necessarily imply parties reach agreement following a bilateral discussion. As noted in Annex A terms of interoperability are largely set by digital platforms.

⁴⁵ Note that a threat to withdraw (i.e. not to interoperate) is a stylised action for the purposes of the modelling used to understand the bargaining position. It does not necessarily represent actual likely outcomes used in negotiations.

⁴⁶ In a simple bargaining framework each party will weigh up the losses that it could impose on the counterparty, as well as losses it would incur itself, if it chooses not to interoperate. Relatively small losses for the party exercising the threat and large losses for the counterparty would imply a higher degree of bargaining power. Conversely relatively large losses for the party exercising the threat and small losses for the counter party would indicate lower bargaining power.

5.2.1 The value that Voice Assistant platforms gain from interoperating with radio

For the reasons set out in section 4, it is not possible to identify from public sources the full range of value that digital platforms derive from Voice Assistant services, and hence the contribution that radio makes to this value. Nonetheless, it is possible to estimate the value based on reasonable assumptions positing different potential scenarios on how value is created. Therefore this report uses publicly available data and reasonable assumptions to arrive at an estimate of the value that Voice Assistants generate from their services⁴⁷ by:

- First, estimating the total direct and indirect value generated by Voice Assistants in the UK;
- Second, estimating the proportion of these gross margins that can be attributable to radio (i.e. how much lower would these profits be if radio were unavailable via Voice Assistants).

Gross margin is used as a proxy for “value” that parties derive from interoperating

There are many different potential metrics that can be used to proxy the change in value that each party derives from interoperating including: operating profit, revenues, or gross margin.

This analysis uses the change in **gross margin** for each party as a proxy for the value that each party derives from interoperating. Gross margin equates to *total revenues minus costs of sales*.

The “cost of sales” are the costs borne by the supplier which directly relate to the supply of the services. For example, in the case of Voice Assistant platforms supplying smart speakers, the cost of sales would include the wholesale cost to the supplier of the smart speaker device. In the case of radio the cost of sales would include costs that are directly caused by the supply of radio such as costs of licensing music to supply radio. Costs of sales would *not* include wider costs such as presenters, accommodation, overheads or transmission.

Gross margin is a reasonable proxy of how value will change as a result of an increase or a decrease in the supply of services. It enables the analysis to compare the impact across different businesses which have different margins (for example the gross margin on advertising is likely to be much higher than the margin on retailing consumer hardware devices such as smart speakers). Gross margin should not be interpreted as a measure of profit.

⁴⁷ This is an approximate estimate as it relies on a number of assumptions so should therefore be treated with some caution.

Total direct and indirect value generated by Voice Assistants

The direct and indirect value that can be attributable to Voice Assistant platforms in the UK relate to the following⁴⁸.

- The direct sales of Voice Assistant devices and hardware (such as smart speakers).
- The incremental indirect value earned by selling complementary products and services as a result of the Voice Assistant platform. This includes complimentary audio services which may compete with radio (music streaming); other complementary services which do not compete with radio (other subscription services or smart home devices); incremental e-commerce sales made using the Voice Assistant platforms; increased audio advertising; and app revenues (whether from consumer purchases or levied to businesses providing apps (e.g. Skills on Amazon) sold as a result of the Voice Assistant platforms.

Forecasts over the next 10 years are subject to a considerable degree of uncertainty for a number of reasons: the market for Voice Assistants and smart speakers is still developing in terms of products and services available; as noted above, the Voice Assistant platform's future long-term monetisation strategies remain unclear (as described in section 4).

Given the inherent uncertainty in the ability of Voice Assistant platforms to monetise their investments, this analysis posits two scenarios of the incremental revenue that Voice Assistants earn for their platform:

- a **low incremental revenue scenario** where Voice Assistant platforms are assumed to earn limited incremental value from their services Voice Assistant; and
- a **high incremental revenue scenario** where Voice Assistant platforms are assumed to earn higher incremental value from their services.

The key assumptions in each scenario are described in Figure 9 below.

⁴⁸ Described in more detail in Annex A.1.

Figure 9 Scenarios on incremental revenues earned by Voice Assistants

	Low Incremental Revenue Scenario	High Incremental Revenue Scenario
Common Assumptions	<ul style="list-style-type: none"> Smart speaker penetration is growing at the current pace. Radio advertising revenue is not affected by Voice Assistants. 	
Scenario Specific Assumptions		
Indirect revenues from e-commerce or complementary subscriptions	<ul style="list-style-type: none"> Revenues from complementary products (e.g. e-commerce) and services (e.g. Amazon Prime or Apple Music) are relatively low. 	<ul style="list-style-type: none"> Complementary subscription services increase at a faster pace due to strong complementarities between Voice Assistants and other services: <ul style="list-style-type: none"> digital platform's music streaming services and other digital platforms subscription services (e.g., Amazon Prime). Increased expenditure of Voice Assistant users in the platform's e-commerce marketplace. Some incremental revenue generated from app sales.
Revenues from Audio Advertising	<ul style="list-style-type: none"> Voice Assistant share of audio advertising profits grows at a slow pace. 	<ul style="list-style-type: none"> Digital platforms can generate revenues from audio advertising (but not at the expense of radio advertising).
Role of Radio	<ul style="list-style-type: none"> Radio is considered a key use case for Voice Assistants and smart speakers since users do not derive significant value from other complementary Voice Assistant services. 	<ul style="list-style-type: none"> Radio is considered a less important use case for Voice Assistants since users enjoy many other services which are complementary to Voice Assistants.

Source: Frontier Economics.

These two scenarios assume the “status quo” relationship with radio, (which broadly reflects the benign outcome described in section 6.1): i.e. no significant changes in Voice Assistant strategy with regard to the provision of services which directly compete with radio (whether content or advertising).

The proportion of Voice Assistant value that can be attributable to radio

If radio were not present via Voice Assistants, the Voice Assistant value would be lower, as users would be less inclined to use and engage with Voice Assistant services; and / or the service would be less valuable to users and therefore less inclined to make complementary purchases of hardware, subscriptions or e-commerce. It would also imply that audio advertising enabled by Voice Assistants is less valuable.

The contribution that radio makes to the value of Voice Assistants might well decline overtime as users become more accustomed to using Voice Assistants and a greater range and variety of services are developed, offered and adopted by users⁴⁹.

5.2.2 The value that radio broadcasters gain from interoperating with Voice Assistants

The value that radio broadcasters gain from working along with Voice Assistants can be estimated by forecasting total value of radio broadcasters; then estimating the proportion of this value that is attributable to Voice Assistants (i.e. how much lower would radio value be if radio services could not be accessed via Voice Assistants).

The value generated by radio broadcasters

The forecasts of commercial radio broadcaster value are based on a simple trend of radio sector revenues⁵⁰, extrapolated to 2032; and an assumed gross margin⁵¹.

The value generated by radio also includes value generated by the BBC. The BBC, as a public service broadcaster, does not generate revenue or gross margin. It is nonetheless important to include in the analysis (the BBC's public value would be lost if BBC Radio did not interoperate with Voice Assistant platforms). Given the scope of this report, it is not proportionate to undertake a review of the economic public value generated by BBC Radio. In order to provide a high-level proxy for the purposes of this analysis gross margin of commercial radio is uplifted in proportion to overall listening to account for incremental value of BBC Radio. It should be noted that this simplifying assumption does not imply that BBC Radio would have the same gross margin as commercial radio were it to operate commercially⁵².

The proportion of radio broadcaster value that can be attributed to Voice Assistants

The proportion of radio's value that depends on Voice Assistants will relate to:

- the volume of listening that is enabled via a Voice Assistant (e.g. on smart speakers or via Voice Assistants in the car);

⁴⁹ The proportion of users that view voice assistant or smart speaker merely as a replacement for radio declines, and the proportion of users that consider voice assistants as a gateway to a wider set off content information and services gradually increases as users become more accustomed to using voice assistants.

⁵⁰ Commercial radio industry revenues are published by Radiocentre. <https://www.radiocentre.org/the-audio-market/ad-revenues-and-forecasts/>

⁵¹ The gross margin broadly is reflective of broadcasting margins, and published margins for radio broadcasters. A gross margin of 75% is assumed for radio. It relates to the total revenues minus radio cost of sales (i.e. licensing costs, or direct costs such as competition prizes). It does not relate to operating profit which would subtract operating expenses (costs of presenters, accommodation, transmission and overheads) and costs of depreciation.

⁵² There are many reasons why BBC gross margins might differ from commercial radio margins were BBC to operate commercially. These relate to its different costs, different economies of scale and scope, different audience demographics. Furthermore were BBC to operate commercially the supply of advertising impressions would increase significantly which would likely have a negative impact on the price per impression for all broadcasters.

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- offset by assumptions on how much of this listening to radio would be retained if it were not available via Voice Assistants (for example as end users used alternative ways to listen to radio such as directly interacting with an app, web page or traditional radio).

Listening to radio via Voice Assistants is projected to increase over the coming decade and the listening will migrate to connected devices which will be intermediated by Voice Assistants. Given 23% of listening that is undertaken in cars, this will increasingly rely on Voice Assistants, driven by the prohibition on using mobile phone handsets in cars; increasing incorporation of connected technology within cars; the potential moves by digital platforms to develop software solutions for car manufactures; and the eventual analogue radio switch-off that is expected to happen in 2032⁵³.

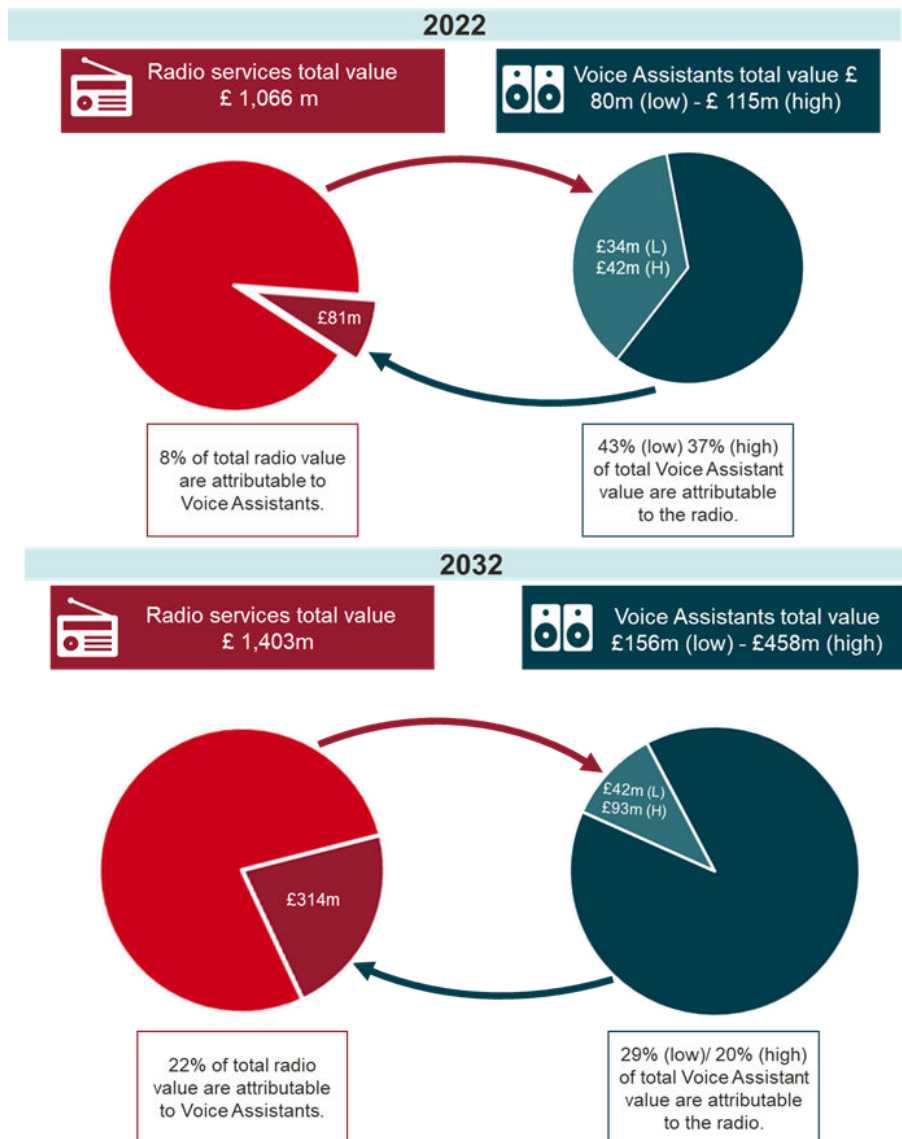
5.2.3 The estimated gain from trade that each party earns from doing business together

The relative value that each party earns from interoperating is described in Section 5.2.4 and Annex C . It sets out the total value of radio and Voice Assistants, and the proportion of that value that can be attributed to the other party in the way described above (in 2022 and 2032). As noted the value of radio incorporates a simplistic uplift to proxy the public value of BBC Radio for the purpose of this analysis. The value generated by Voice Assistants is set out in the Low and High incremental revenue scenario.

Figure 10 shows that over time an increasing proportion of radio value is dependent on interoperating with Voice Assistants. Whereas a decreasing proportion of Voice Assistants' revenue is dependent on interoperating with radio.

⁵³ Daily Mail "*Big radio switch-off is DELAYED again: AM and FM stations will be available on old devices for another decade as switchover from analogue to digital is put off until 2032*", Accessed March 2023.
<https://www.dailymail.co.uk/news/article-8485629/Radio-fans-listen-FM-decade-digital-switchover-off.html>

Figure 10 Value exchange between the radio and Voice Assistants



Source: Frontier Economics.

The value generated by Voice Assistants that could be attributed to radio

Based on reasonable assumptions, the modelling suggests that the total value⁵⁴ associated with Voice Assistants could rise from £80m in 2022 to £156 million in 2032 in the low incremental revenue scenario; and from £115m in 2022 to £458m in the high incremental revenue scenario in 2032.

⁵⁴ Gross profits relates to the revenues minus the cost of goods sold. The gross profit margin can provide an indication of how incremental revenue will relate to profit.

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In 2022, 43% (low) to 37% (high scenario) of all Voice Assistant gross profits (or £34m (low) to £42m high) can be attributed to radio in 2022. This includes approximately £1m (around 1.2% of the total gross margin) of benefits that Voice Assistants gain in 2022 as a result of the role that radio plays in educating users on how to use smart speakers which declines to zero by 2032 (see B.3 for further details).^{55 56}

The value generated by radio that could be attributed to Voice Assistants

The total value created by radio (including an assumed uplift to account for the BBC's public value) is assumed to be £1,066m in 2022. Based on the assumptions set out above, 8% (or £81m) of the estimated radio's 2022 value can be attributed to Voice Assistant platforms. This reflects the share of radio listening that is enabled by Voice Assistants, adjusted for an assumption of the proportion of that listening that would be lost if radio was not present on Voice Assistants as users would use alternative approaches to listen to radio (web, app or traditional radio).

By 2032, 22% of the value generated by radio can be attributable to Voice Assistants given the increasing share of listening that is expected to be initiated by Voice Assistants (such as from smart speakers or in-car listening).

5.2.4 Summary of the impact of gains from of commerce on the bargaining power

The high-level modelling suggests that in 2022 the gains from interoperating, hence the bargaining power, between the radio and the Voice Assistants is balanced to some extent. The proportion of value that the radio brings to Voice Assistants is 43% / 37% in the low / high incremental revenues scenario compared to the much smaller 8% that Voice Assistants contribute to radio. However, the contribution that Voice Assistants make to radio is higher in absolute terms compared to the contribution radio makes to Voice Assistants. £81m of radio's value is potentially attributable to Voice Assistants, while £34m / £42m of Voice Assistant value is attributable to radio in the low / high incremental revenue scenario.

As the decade progresses radio makes a lower proportionate contribution to Voice Assistants' gross profits (29% / 20% in the low / high scenario by 2032). Though projected increases in Voice Assistant total value mean that by 2032 the absolute contribution of radio to Voice Assistants' gross profits remains broadly steady in the low scenario at £45m, and increases to £93m in the high scenario.

⁵⁵ If radio did not include on-air calls to action educating users about how to use Voice Assistants many times a day it is assumed in the early years of the analysis that Voice Assistant use and take up would be lower, and hence Voice Assistant gross profit would be accordingly lower.

⁵⁶ We assume that by 2027 when take-up has plateaued and consumers are accustomed to using their smart speakers, radio no longer plays a role in educating users on how to use smart speakers

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By contrast radio becomes increasingly reliant on Voice Assistants in order to access listeners. This implies a growing proportion of radio's value is attributable to Voice Assistants (22% or £314m by 2032). This suggests that radio's bargaining power is likely to weaken in the coming decade as it becomes more dependent on Voice Assistants to generate value, and Voice Assistants become less dependent on radio to grow their user base and enable incremental value.

These results are based on a static analysis, which does not attempt to predict counter-strategies of a party to a change in bargaining power, and assumes the key terms of engagement between radio and Voice Assistant platforms do not change (i.e. interoperability is maintained on the current terms, Voice Assistant platforms do not launch further new services which directly compete with radio, or attempt to displace radio advertising).

5.3 Bargaining dynamics

The bargaining dynamics of any commercial relationship (which can incorporate wider interactions between parties⁵⁷) between radio broadcasters and Voice Assistant platforms will affect outcomes.

First, the extent to which users multi-home or single-home in their use of Voice Assistants will affect bargaining dynamics. Single-homing, where households choose one device supplier, rather than different suppliers, can lead to consumer "stickiness" and loyalty to their Voice Assistant provider. This can enhance the bargaining power of Voice Assistant platforms as end users would be less likely to switch to an alternative platform. Where end users multi-home this may support radio broadcasters' bargaining power since a threat to withdraw radio from a Voice Assistant platform would be less likely to hurt radio revenues as users could access it on an alternative platform. While there is a degree of multi-homing in how and when users engage with Voice Assistant platforms, this is likely to be limited (for example as users acquire more complementary services and products which are compatible with their Voice Assistant platform). Multihoming can be less common when users invest in expensive devices that interoperate with the Voice Assistant. For example, users cannot multi-home with the Voice Assistant's embedded in cars and it is not very likely that a user would buy another car only to use a different Voice Assistant.

Second, the extent to which different radio broadcasters' services are substitutable with each other will affect the bargaining dynamics. Where content is seen as substitutable, homogeneous individual suppliers may have less ability to exert bargaining power. Where content is more differentiated from the perspective of end users there may be more scope to exert some bargaining power. While there are thousands of radio stations available to listeners from the UK and around the world, radio broadcasters invest significant amounts in brands and in generating listener relationships via their content and presenters. Therefore, it is

⁵⁷ The "commercial relationship" describes the commercial interactions between the parties, including wider competitive interactions. As noted in the annex the terms of interoperability between Voice Assistant Platforms and content and service providers are largely set by Voice Assistant platforms.

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possible that some of the larger broadcasting groups may have a degree of bargaining power in any commercial interaction, and it is likely that smaller and independent radio broadcasters have limited bargaining power.

Third, the terms on which parties negotiate can affect bargaining power. In some markets for example collective bargaining is undertaken which will enhance the bargaining position of those suppliers. However, radio broadcasters do not interact with Voice Assistant platforms as one collective group⁵⁸. This means that if one party chooses not to accept (unfavourable) terms its closest competitors might benefit.

Fourth, Voice Assistant platforms offer audio music streaming services and radio-like services that directly compete with radio. This means that in considering the bargaining dynamics, a digital platform can to a degree offset any loss which results from a failure to interoperate, against the potential gain that might accrue as a result to its own audio music streaming services and radio-like services being available to listeners but not those of radio broadcasters.

In summary:

- There is a limited degree of multi-homing but this may not be significant enough to support radio broadcasters' bargaining power.
- While larger radio broadcasters may have more bargaining power than smaller and independent radio broadcasters, the UK radio market has many suppliers, most of which fall into the latter category.
- Radio broadcasters do not collectively negotiate with digital platforms.
- Voice Assistants offer services which compete to some degree with radio, and this has the potential to enhance the bargaining position of Voice Assistant platforms.

For the purposes of this analysis it is assumed that there is no significant change in these bargaining dynamics during the forecast period up to 2032.

5.4 The commercial strategies of the connected platforms

It is likely that digital platforms derive value from Voice Assistants in a combination of the following approaches.

First, they can use Voice Assistants to generate engagement and loyalty from users which supports value in their respective wider digital ecosystems. They can exploit network effects between end users and content and service providers⁵⁹, and consumer behaviour characteristics such as the propensity to single-home to a degree. This can then generate

⁵⁸ Potentially related to competition law reasons.

⁵⁹ For example, Alexa users might be more inclined to use Amazon Unlimited Music.

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incremental value by reducing churn and increasing usage of the platform's wider digital ecosystem.

Second, they can use Voice Assistants to gather data generated from users who interact with the technology. The data can in turn be used in related markets, for example enhancing the value of advertising (both audio or standard display), refining their service proposition, or targeting services at users.

Third, they can use the engagement with users to drive incremental sales of their services, which are complementary to the Voice Assistant: for example, complementary audio services, complementary e-commerce, app sales.

Fourth, they can monetise their investment directly from Voice Assistant users. This could be by selling hardware that incorporates their Voice Assistant as a feature (such as smartphones or smart speakers⁶⁰). In principle, they could also charge end users a subscription in order to use the services, and/or charge business users a licence fee to interoperate with the platform.

Fifth, they could insert advertising which could be delivered over or before audio streams are accessed via Voice Assistants. Voice Assistant platforms are known to be developing their audio advertising propositions. Google is using its "Display & Video 360" to offer audio advertising, which will allow advertisers to place targeted audio advertising with publishers who have inventory⁶¹. Amazon has started experimenting with audio advertising in the UK⁶² and recently promoted the value of audio advertising to service and content providers.⁶³

Some of these approaches can be considered complementary to and beneficial for radio. This is because the digital platforms' strategies may seek to enhance the value of Voice Assistants to end users by ensuring the content and services that users enjoy is available and discoverable on their platform (although concerns have been raised by radio broadcasters in relation to the latter). By ensuring that radio is accessible via Voice Assistants and smart

⁶⁰ In this sense, some commentators have suggested that Amazon's strategy of selling its Echo device at very low prices, may need to be reconsidered to one better suited for hardware (such as Apple's): "It should focus on improving the technology and services around Echo and Alexa so consumers are willing to spend much more than cost price for the device, and for an upgrade every two years or so, just as they do with their smartphones.". The Washington Post, "Alexa, Will You Ever Make Money?", Accessed Jan 2023- https://www.washingtonpost.com/business/alexa-will-youever-make-money/2022/11/22/53caa54c-6a82-11ed-8619-0b92f0565592_story.html

⁶¹ Google, "Run audio ads easily with new tools in Display and Video 360", Accessed Jan 2023. <https://blog.google/products/marketingplatform/360/run-audio-ads-easily-new-tools-display-video-360/>

⁶² Amazon, "Create audio advertising campaigns", Accessed Jan 2023. <https://advertising.amazon.com/solutions/products/audio-ads>

⁶³ Amazon recently published a report that concluded that audio advertisements listened through smart speakers engaged users more than those who listened to the same content on mobile or desktop devices. "In our research, participants experienced streaming audio ads as more engaging than similar ads on radio and linear TV. They found streaming audio more engaging when they could request it by voice using voice-assisted smart speakers". According to Amazon's paper, 75% of smart speaker users enjoy listening to ad-supported content on smart speakers more than ads delivered on other media channels or devices. Amazon and Wondery, "Your emotions on Audio: The science of brand building with sound", Accessed Jan 2023- <https://m.media-amazon.com/images/G/01/AdProductsWebsite/images/blog/2022/Your Emotions on Audio - Thought Leadership White Paper - Q1 2022.pdf>

speakers, end users will continue to engage and use Voice Assistants, and in so doing generate incremental revenues across the platform.

However, other approaches may pose a threat to radio. This is potentially the case where the platform offers services that are in direct competition with radio, such as audio content or audio advertising; or seeks to monetise directly from radio or content providers. Where the platforms directly provide services that compete with radio, they will have incentives to give preference to their own services (or to audio providers with whom they have agreed preferential terms), though Voice Assistant platforms may face a trade-off if preferencing reduces the value of the platform to end users. By illustration, a “walled garden” approach, where *only* first-party services are available (i.e. only services from the digital platform), may not be an attractive proposition to end users.

5.5 The regulatory framework and types of behaviours that connected platforms may adopt in the future

Outcomes for radio will also depend on the regulatory framework which define behavioural obligations and prohibitions in the market, as well as the specific behaviours of digital platforms with regard to radio.

5.5.1 The regulatory framework for interoperability

There is currently no specific “ex-ante” regulation⁶⁴ that applies to the interoperability between Voice Assistants and radio in the UK, though legislation on digital matters based in the UK and Europe may affect outcomes in coming years⁶⁵.

The EU has adopted the Digital Markets Act (DMA⁶⁶), which includes measures applied to Voice Assistant providers which are designated as gatekeepers⁶⁷. While the DMA will not apply to the UK, it is possible that it will influence the behaviour of Voice Assistant platforms in the UK since digital platforms may adopt common behaviours throughout Europe. It is not currently known whether or when any of the digital platforms could be designated as a

⁶⁴ Ex ante regulation defines regulation that imposes limits and prohibitions on the behaviour of firms. It is contrasted with ex-post regulation which applies to conduct already undertaken.

⁶⁵ The Department for Digital, Culture, Media and Sport (DCMS) published a draft Media Bill on 29 March 2023 which if enacted would introduce measures to protect the position of radio accessed via smart speakers by ensuring listeners are able to find the content they expect in an unaltered format, without additional or substituted advertisement. .

⁶⁶ In paragraph 57 of the DMA it is mentioned that “*The gatekeepers should, therefore, be required to ensure, free of charge, effective interoperability with, and access for the purposes of interoperability to, the same operating system, hardware or software features that are available or used in the provision of its own complementary and supporting services and hardware*”. <https://www.consilium.europa.eu/media/56086/st08722-xx22.pdf>

⁶⁷ Voice Assistants were not within scope of the initial draft of the DMA though are within scope of the final text of the DMA. See for example the joint statement of Association of European Radio (AER), the European Digital Radio Alliance (EDRA) and the European Broadcasting Union (EBU) calling the co-legislators to include Voice Assistants in the Digital Markets Act, 7 October 2021. See: <https://www.aereurope.org/aer-joins-edra-and-ebu-in-calling-the-co-legislators-to-include-voice-assistants-in-the-digital-markets-act/>

gatekeeper in relation to the provision of Voice Assistant services, although the three largest providers of Voice Assistants, i.e. Google, Apple and Amazon, are likely to meet the gatekeeper designation thresholds either now or in the near future. If digital platforms were designated as gatekeepers they could be subject to obligations and prohibitions around interoperability, sharing of data, self-preferencing and other matters.

In the UK the government has announced that the Digital Markets, Competition and Consumer Bill will be introduced into parliament in 2023.⁶⁸ This will empower the Digital Markets Unit to undertake investigations and impose ex-ante remedies on firms considered to have Strategic Market Status (SMS) – such firms could include Voice Assistants, depending on the designation decisions to come.⁶⁹

5.5.2 Concerns expressed by service and content providers around behaviour of digital platforms

Service and content providers have expressed concerns about how behaviours of digital platforms could disadvantage them. For example, the European Commission IoT inquiry⁷⁰ noted that the following behaviours of Voice Assistant platforms could potentially have a negative impact on competition, innovation and consumer choice.

- **Self-preferencing practices** of digital platforms could be a threat to third parties that compete with digital platform's services. Digital platforms could potentially preference their services via marketing, ranking in search results, or by unilaterally changing the interoperability and integration processes of third-party smart devices and consumer IoT services, or limiting the functionalities of such devices or services by imposing technical constraints, such as limited APIs⁷¹.
- **Preferential control of data.** Third parties that interoperate with digital platforms rely on data flows in order to generate value for their customers (both their listeners and advertisers). One potential risk is that the Voice Assistant providers not only control the data flows and user relationships, but also might be able to develop competing services using such data and/or leverage these advantages into adjacent markets⁷². This concern was reflected in a recent decision in an adjacent market where the European Commission accepted commitments from Amazon to address competition concerns over its use of non-

⁶⁸ See: <https://www.gov.uk/government/publications/autumn-statement-2022-documents/autumn-statement-2022-html>

⁶⁹ See: <https://www.gov.uk/government/consultations/a-new-pro-competition-regime-for-digital-markets/outcome/a-new-pro-competition-regime-for-digital-markets-government-response-to-consultation>

⁷⁰ Final report - sector inquiry into consumer Internet of Things (SWD(2022) 10 final) https://competition-policy.ec.europa.eu/system/files/2022-01/internet-of-things_final_report_2022_en.pdf

⁷¹ *ibid*

⁷² *ibid*

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public marketplace seller data and over a possible bias in granting to sellers access to its Buy Box and its Prime programme.⁷³

- **Advantages to digital platforms in the provision of advertising.** Digital platforms are able to leverage vast volumes of data relating to the behaviour and preferences of end users to supply advertising services. Third parties that interoperate with the digital platforms may be unable to offer equivalent advertising services, and may as a result be less able to compete with the digital platforms⁷⁴.
- **Exclusivity using default settings.** The digital platforms operate many parts of the value chain and may use their market position across the ecosystem to apply exclusivity or tying provisions which may give competitive advantages to the provider of a service that is pre-installed. The services favoured in this way could be the proprietary services of the leading providers of consumer IoT technology platforms, or other large international creative content service providers, to the detriment of smaller and/or local players. It is reported that the European Commission is investigating whether the activities of Google in relation to exclusivity and tying practices in its Voice Assistant amounts to an abuse of a dominant position⁷⁵.
- **Control over the end user relationship.** The role of digital platforms is partly to intermediate between service and content providers such as radio and end users. However, this has potential to act against the interests of content and service providers in some ways. It may mean that service and content providers cannot actively engage with their end users (for example by enabling end users to adjust the technical or privacy settings of the content providers' services). It may also mean that content and service providers cannot directly react to technical issues around the supply of their services. For example, if a user's voice command is not interpreted appropriately by the Voice Assistant the service provider relies on technical support provided by the Voice Assistant. This has the potential to put content and service providers at a disadvantage to the digital platforms who can provide services directly to end users, engage and communicate directly with end users, and whose first party services are fully integrated with the platform's services⁷⁶.

⁷³ The European Commission accepted Amazon's commitments to address the data usage concern which includes: not using non-public data relating to or derived from, independent sellers' activities on its marketplace, for its retail business. This applies to both Amazon's automated tools and employees that could cross-use the data from Amazon Marketplace, for retail decisions; and not use such data for the purposes of selling branded goods as well as its private label products.
https://ec.europa.eu/commission/presscorner/detail/en/ip_22_7777

⁷⁴ "A number of respondents indicated that the identified data monetisation opportunities are expected to benefit the leading consumer IoT technology platform providers and, in particular, the few consumer IoT players that are already present in the digital advertising market. According to some respondents, the data collected from consumer IoT products and services allow these companies to attribute advertising space to third-party advertisers in a more accurate manner taking into account user preferences."

⁷⁵ <https://www.reuters.com/technology/google-under-new-eu-antitrust-investigation-mlex-reporter-2021-09-09/>

⁷⁶ "respondents have raised several concerns over the control these providers have over the user relationship and user experience. As a result, respondents fear ...how these providers control the access to consumer IoT services and related data. A third set of concerns relates to technical performance and processes. For example, respondents indicate that they are dependent on the technical support provided by voice assistants and operating system providers as well as the timely advance notice of software updates and other updates. By contrast, the leading providers of consumer IoT technology platforms fully control the experience relating to their first-party products and services from the very beginning of the user interaction, collect relevant user data and in most cases do not depend on a third-party to solve technical issues."

6 Conclusions and implications

6.1 Assessment of the bargaining framework

In general, radio broadcasters and Voice Assistant platforms add considerable value to each other. However, the analysis presented in Section 5 suggests that the bargaining outcomes may not be static over time and that radio might face some challenges moving forward as it is likely that the relative bargaining power will shift in favour of the Voice Assistant platforms.

The value that radio and Voice Assistant platforms provide to each other

In relation to the value that radio and Voice Assistant platforms provide to each other, the analysis presented in section 5.2 suggests that radio may become more dependent on Voice Assistants, and therefore the bargaining power may shift further in favour of Voice Assistant platforms in the coming decade.

It is likely that a growing share of radio revenues can be attributable to Voice Assistants as listeners increasingly rely on Voice Assistants to access radio. The increasing incorporation of connected technology in cars, and the more stringent safety requirements while driving, means that the 23% of radio listening that takes place in cars will also increasingly rely on Voice Assistants. All else being equal, this is expected to reduce the bargaining power of radio with regard to Voice Assistants and increase the bargaining power of Voice Assistants. This is because a threat by radio to withdraw from interoperating with Voice Assistants becomes more costly to radio and therefore potentially less credible.

On the other hand, while a significant proportion of the Voice Assistant platforms' gross margins can be attributed to interoperating with radio, this proportion might decline over time if radio plays a lesser role in encouraging engagement with Voice Assistants.

The strategies adopted by the Voice Assistant platforms

It is not possible to know what the precise strategy of each digital platform is. Some strategies are clearly supportive of radio as radio continues to support value creation in the platforms and therefore the platform's ability to earn incremental revenues.

Whereas other strategies have the potential to harm radio, particularly where platforms offer services that compete directly with radio. Already digital platforms have a number of services that compete directly with radio including music streaming, radio-like services, audiobooks, and podcasts.

In relation to offering audio advertising in competition with radio, it appears that though the platforms are interested in offering audio advertising this is currently at a relatively early stage. To the extent that Voice Assistant platforms support new incremental audio advertising inventory from third parties, and do not leverage data owned by Voice Assistant platforms, this outcome may be relatively neutral for radio. Voice Assistant platforms will have a strong

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incentive to avoid harming the value of their service in the eyes of users by inserting excessive amounts of advertising (for example by inserting advertising mid-stream).

However, there is scope for greater risk for radio if Voice Assistant platforms offer first-party advertising (e.g. Amazon may offer advertising from other Amazon businesses) if they overlay or interrupt radio's audio advertising; or if digital platforms leverage the vast amount of data collected by the platforms' ecosystems to offer highly targeted advertising; or if Voice Assistant platforms further restrict commercial radio's access to the data that it generates and needs to serve advertising (BBC is required to provide its services free of advertising).

If platforms are closer to the "low" incremental revenue scenario (i.e. with limited incremental revenues generated via complementary sales or wider engagement with the ecosystem), then there is a risk for radio that platforms could seek to monetise their investments directly from those services that consumers most value and use: i.e. radio or streaming services. Though in this scenario radio is proportionately more important to Voice Assistant platforms than in the high incremental revenue scenario (offsetting the risk to radio to a degree).

The behaviours of the Voice Assistant platforms

As noted in section 5.5 content and service providers have expressed concerns to the European Commission that self-preferencing and data hoarding⁷⁷ by platforms could harm the ability of content and service providers to compete.

Implications for bargaining outcomes for the UK radio sector

The radio sector and Voice Assistant platforms add considerable value to each other, therefore they have strong incentives to interoperate. Currently, the parties interoperate on a fee-free basis (where each party bears its own costs). The degree to which this arrangement will continue (i.e. consistent with a "benign outcome" for radio) will partly depend on bargaining outcomes as described in this report. The benign outcome is broadly reflected in the estimates of value created by radio and Voice Assistants as described in section 5.2.

To the extent that there is a material risk that the bargaining outcomes move in favour of digital platforms, then there is a risk that the platforms may seek to capture some of the value currently generated by radio (i.e. a "non-benign outcome" for radio).

In Figure 11 below, we summarise the conditions and assumptions that would imply a benign, and a non-benign outcome with respect to radio, in each of the two scenarios forecasting incremental Voice Assistant revenue (i.e. low and high incremental revenue scenarios).

⁷⁷ "Data hoarding" is defined in this context as the collection of vast amounts of data generated by users without processes to appropriately (e.g. in a way that is consistent with privacy laws and consumer requirements) to share it with interested parties.

Figure 11 Conditions for a benign and non-benign outcome for radio

	Low Incremental Revenue Scenario [for Voice Assistants]	High Incremental Revenue Scenario [for Voice Assistants]
Benign [for radio]	<ul style="list-style-type: none"> Radio is an important driver of Voice Assistant take-up and Voice Assistant platforms heavily rely on radio to increase Voice assistant and smart speaker usage (bargaining power lies more heavily with the radio). Voice Assistant platforms' monetisation strategy is not focused on competing with radio. They are focused on indirect incremental e-commerce sales, non-competing services, and the direct sales of smart devices. 	<ul style="list-style-type: none"> Radio's contribution to Voice Assistant's value decreases as the proportion of usage derived from radio declines. Voice Assistant platforms are used for a wide variety of other services. Voice Assistant platforms' monetisation strategy are not focused on competing with radio. They are focused on indirect incremental e-commerce sales, non-competing services, and from the direct sales of smart devices.
Non- Benign [for radio]	<ul style="list-style-type: none"> Radio remains the core use case for Voice Assistants alongside music streaming (implying a degree of bargaining power lies with radio). The Voice Assistant platforms attempt to directly monetise their investment through radio (by charging access fees or charging a commission based on the profits radio receives for advertising). 	<ul style="list-style-type: none"> Radio is very dependent on voice assistants for distribution. Voice Assistant platforms' monetisation strategy is focused on increasing profits from competing audio services e.g. their own music streaming service (including radio-like services) / podcasts/news services; and/or extracting value from third-party skills/actions; and/or Audio advertising is an important driver of incremental growth for Voice Assistants, which could be harmful to radio. Exists a risk that Voice Assistants self-preference their radio-like services or by competing in audio advertising.

Source: Frontier Economics.

6.2 The risk to radio will have wider implications

The value that the radio sector brings to the UK is more than the measurable economic value of its output. Radio broadcasting plays an integral role in UK culture. Therefore, the potential for a non-benign outcome for radio could have wider social and cultural implications. If radio revenues were materially reduced in the non-benign outcome, the sector's ability to invest to continue to support its significant public value, across both the commercial and Public Service Broadcaster segments, would be diminished.

In particular the following contributions to public value could be harmed in this scenario.

Radio is a trusted provider of news

In a world where individual news consumption is increasingly filtered by digital algorithms, radio provides a trusted source of reliable and engaging news. Radio continues to support the plurality of news provision by broadcasting high-quality and reliable news. It is the most trusted medium in Europe and in the UK 61% of people expressed their trust in radio⁷⁸. 89% of adults in the UK listen to the radio each week, which is an audience of 50m adults exposed to trusted news bulletins.

Media plurality is an essential component of any well-functioning democratic society. According to Ofcom *“Plurality is not a goal in itself, but instead makes an essential contribution to ensuring: citizens are well-informed, able to access and consume a wide range of viewpoints across TV, radio, online and print media from a variety of media organisations; and no single media owner, or voice, is able to exercise too great an influence over the political process”*⁷⁹

The ability of radio to continue to invest in news and therefore support the plurality of content, will depend on the ability of radio to continue to reach its audience.

Radio supports public and civic outcomes

Radio supports public and civic outcomes. As well as offering news and current affairs it creates awareness of issues that affect listeners’ lives and communities, and fosters audiences’ sense of their own place in public life.

It is an important medium for local news that is relied on in times of local emergency (such as severe weather, local travel emergencies, provision of local services). For example, during the COVID-19 health crisis⁸⁰, when many communities were forced to remain in isolation, radio stations formed a crucial role as leaders in communication and media during the pandemic that could not be replicated by other providers.

Live radio is very important for older and more vulnerable audiences, as a way for people to keep connected with society and also to counter isolation and loneliness. For example, 93% of blind and partially-sighted people listen to the radio⁸¹.

⁷⁸ Radio Today, Accessed March 2023. <https://radiotoday.co.uk/2022/10/survey-radio-remains-the-most-trusted-medium-in-europe/>

⁷⁹ Ofcom, “Media plurality and online news”, Accessed March 2023. https://www.ofcom.org.uk/data/assets/pdf_file/0030/247548/discussion-media-plurality.pdf

⁸⁰ Chivers, T., and Allan, S. “Discussion Paper 2022/01 What is the Public Value of Public Service Broadcasting?: Exploring challenges and opportunities in evolving media contexts”, Accessed March 2023. <https://cdn2.assets-servd.host/creative-pec/production/assets/publications/What-is-the-Public-Value-of-Public-Service-Broadcasting-PEC-Discussion-Paper-Jan-2022.pdf>

⁸¹ “Digital Radio and Audio Review”, Accessed Feb 2023- https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1079580/Digital_Radio_and_Audio_Review_FINAL_REPORT_single_view.pdf

Radio represents the UK's diverse communities

Radio provides local and community-based content which is relevant and accessible to local communities throughout the UK. These range from national stations such as BBC Asian Network, to the multitude of regional, and local commercial and community stations catering to the UK's diverse communities and languages such as Welsh and Gaelic.

Radio supports the wider music and entertainment sector

The UK has a world-beating music and entertainment sector with internationally renowned talent artists, producers, venues, and events. Radio has a key role in shaping the UK's creative industry ecosystem. Radio has invested in infrastructure, skills, and technological innovation that has fuelled the growth of the music and entertainment sector⁸².

The UK music industry's contribution to the economy in 2021 was £4 billion⁸³, including music creation performance publishing venues and management. The sector is a key foreign exchange export earner which benefits the entire UK economy – generating export earnings of £2.5bn in 2023. UK radio, whether national or local stations, invests to provide a platform for the UK's best talent, and thereby supports the wider sector. Outcomes which restrict the ability of radio to invest, limit radio's reach among the UK population, or otherwise prevent radio from reaching listeners could have far reaching effects across the wider music and entertainment sector.

6.3 Policy makers can mitigate the risk to radio

Policy makers should act promptly to mitigate the risk to radio. Based on the experiences in other sectors and the risk of a shift in relative bargaining power in favour of Voice Assistant platforms, there appears to be a considerable risk that the non-benign scenario could materialise (instead of a continuation of the "status quo"). Non-benign outcomes would not just harm radio providers and listeners, but could also impair the ability of radio to continue to contribute to the wider range of social, cultural and civic outcomes that it currently supports.

Given the pace at which the market moves, and the adverse effect on radio were the market to evolve to the non-benign scenario, policy makers should promptly consider the risks for both effective competition and the broader public value contribution made by radio to prevent a non-benign scenario from materialising, and consider proportionate interventions that could minimise such risks.

⁸² Chivers, T., and Allan, S. "Discussion Paper 2022/01 What is the Public Value of Public Service Broadcasting?: Exploring challenges and opportunities in evolving media contexts", Accessed March 2023. <https://cdn2.assets-servd.host/creative-pec/production/assets/publications/What-is-the-Public-Value-of-Public-Service-Broadcasting-PEC-Discussion-Paper-Jan-2022.pdf>

⁸³ "This Is Music 2022" UK Music <https://www.ukmusic.org/research-reports/this-is-music-2022/>

Annex A How radio interoperates with Voice Assistants

Voice Assistants are not new, but their use has grown rapidly in recent years. Since their introduction to the market over a decade ago⁸⁴, Voice Assistants have evolved from being only capable of the most basic commands to being able to understand complex questions and capable of tasks that exceed human capabilities (like integrating with smart home technology⁸⁵).

Voice Assistants describe the software that interprets, analyses, and responds to natural language commands from users by offering access to content services information stored in the cloud. Typically users interact via voice commands (but can also interact in other ways). Voice Assistants are integrated into many different types of consumer devices, including smart speakers, laptops/desktops, watches, smartphones, cars, TVs and on IoT (Internet of things) devices.

Figure 12 illustrates an example of the interaction between a user and a Voice Assistant. Voice Assistants work by interacting with a user, this interaction can be via voice but also it can interact with text display or other means. First, the user activates or starts the interaction by saying a “wake word” such as “Alexa...” and then gives the instruction (activation can also happen through the press of a screen or button). Then, this command is processed by the Voice Assistant in two stages. First, using speech recognition software, the Voice Assistant transforms the speech into a format that the machine can read (usually text) and analyses it for meaning. Second, the assistant identifies the available responses and ranks these based on a number of factors including relevance to the command, predicted user satisfaction, suitability of the response, and, in some cases, ambient data such as location or time of day. Finally, the Voice Assistant responds by presenting the highest-ranking response or responding with a list of options⁸⁶, or undertakes a specific action for example in relation to a smart home device.

In order that a content or functionality from a service or device provider can be accessed by the end user via a Voice Assistant it may be necessary for the device or service provider to interoperate with the Voice Assistant platform. Typically in most cases the terms of interoperability are largely set by the platform, and involve device or service providers undertaking a certification process to ensure that the service, content or device is appropriately compatible with the Voice Assistant platform. This will ensure, for example, that the quality of service, privacy and security standards required by the platform are met. Voice Assistant platforms may also serve content directly sourced from the internet, for example by using a

⁸⁴ The Verge, “Hey Siri, what happened?”, Accessed February 2023- <https://www.theverge.com/22704233/siri-apple-digital-assistant-10-years-development-problems-why>

⁸⁵ Soundhound, “How Voice Assistants Can Deliver Value and Generate Revenue”, Accessed Jan 2023. <https://www.soundhound.com/voice-ai-blog/how-voice-assistants-can-deliver-value-and-generate-revenue/>

⁸⁶ Telus International, “OK Google, how do voice assistants work?”, Accessed Jan 2023 - <https://www.telusinternational.com/articles/ok-google-how-does-alexa-work-voice-assistants-explained>

radio station's URL (potentially not requiring direct interoperability between the content provider and the platform).

Figure 12 Example of how a Voice Assistant interacts with the user and responds to commands



Source: Frontier Economics.

Voice Assistants have a number of economic features

First, they act as platforms that bring together different user groups. They allow users to access content and services including audio content (such as radio, audiobooks, and podcasts), and they enable content and services providers to access listeners. Therefore, this market might be considered a “two-sided or multisided market”⁸⁷, as it simultaneously provides services to two or more categories of users. Multi-sided platforms stand to benefit where demand for one group of users is related to demand from another group of users. As more users are attracted to a platform, this increases demand from service providers to interoperate with that platform in order to access users. This in turn makes the platform more valuable to end users.

Second, there are significant fixed costs in developing and updating the software which (i) interprets user commands, (ii) selects the appropriate action or response from the relevant algorithm (iii) delivers speech-based responses. There is likely also a degree of network effects in this investment such that providers with a larger number of end users are better able to develop their services (since the greater volume of user commands will enable more accurate interpretation and responses).

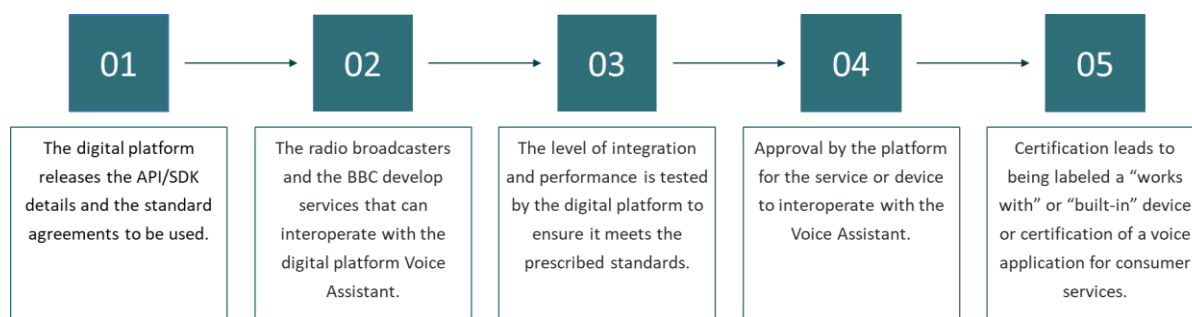
⁸⁷ Multisided markets are characterized by the presence of several groups of customers among which a certain kind of interaction takes place.

Content and service providers such as radio need to interoperate with Voice Assistant platforms in order to ensure that content reaches listeners

In order for radio content to reach listeners via Voice Assistants, radio broadcasters must interoperate (as described in section Figure 13) with Voice Assistant platforms. This process has a number of functions.

- It ensures that the content is discoverable for users (i.e. that a user’s command is appropriately identified, given the users’ specific characteristics, and linked with the radio broadcast).
- It provides the technical capability via which the radio stream can be delivered to Voice Assistant end-users.
- It ensures the appropriate data can flow between radio broadcasters and Voice Assistant platforms.
- It ensures that devices and services that interoperate with the digital platform do so in a way that preserves and supports the security and privacy features of the digital platform.
- To connect and interoperate with Voice Assistants, third-party service and content providers, in most cases, go through a standard development and certification process set out by each Voice Assistant platform to ensure the provider meets certain required standards, as is summarised in Figure 13 below⁸⁸.

Figure 13 Process for enabling interoperability between Voice Assistants and consumers of radio services



Source: Frontier Economics.

Currently, the process of interoperability between Voice Assistants and content providers such as radio is conducted on a no-fee basis. That means each party bears its own costs in

⁸⁸ This general process begins with Voice Assistant providers publishing APIs/SDKs developers can use to integrate their products with the assistant. While this process is used in most cases, there are exceptions. For example, Google’s documentation for developers wishing to interoperate with Google Assistant suggests that in certain cases, they grant particular third-party partners greater access to resources and work with them to build custom integrations outside of this standardized process. Google, How Google Assistant Actions are built, Accessed Jan 2023 - <https://developers.google.com/assistant/howassistantworks/developers>

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the process of technically interoperating and there is no exchange fee or license fee provided on either side.

Annex B Summary of assumptions used in the modelling

B.1 Estimation of direct and indirect gross margins for Voice Assistants

Estimates of the gross margins generated by Voice Assistants rely on assumptions on incremental revenue digital platforms derive across a range of complementary services and products. The assumptions used in these estimates are set out below.

Direct sales of smart speakers

- Smart speaker volume sales are a function of the growth in the number of households and household penetration; the number of devices per household; and the replacement rate (the number of existing stock of speakers that are replaced each year).
- Smart speaker prices are based on weighted average to prices (ex VAT) of the different smart speaker models that Amazon, Google, and Apple offer.⁸⁹ With an observed discount applied, and assumed inflation of 2% a year.
- Company specific gross margin assumptions are applied.

Incremental e-commerce sales including complementary audio subscription services

Incremental Amazon e-commerce gross margins relate to the uplift in Amazon e-commerce gross margins achieved as a result of the integration with Voice Assistants.

- E-commerce gross margins by Amazon attributable to Voice Assistant platforms are a function of the volume of Amazon Alexa users, assumptions are the average customer spend by an Amazon user per year, Amazon's commission on third-party sales, and the share of Amazon's direct retail sales and its third-party sales.
- The average annual expenditure by Amazon user per year (assumed to be £570 ex VAT in 2022⁹⁰) and grows at 5% per year (2% inflation⁹¹, 3% real growth).
- Different assumptions on gross margins are applied on Amazon e-commerce sales and third-party ecommerce sales via Amazon.

Sale of audio advertising inventory

⁸⁹ For avoidance of doubt, the average price is computed across different models of the same company, e.g. Amazon Echo Show, Echo Studio and Echo dot.

⁹⁰ Weighted average of average Amazon Prime members' spend and non-Prime members spend. Source for average spend: <https://fashiondiscounts.uk/amazon-statistics/>; source for prime vs non-prime members: <https://www.junglescout.com/blog/amazon-statistics/>

⁹¹ The 2% inflation rate reflects BoE MPC target.

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Incremental advertising gross margins represent the incremental advertising profits achieved as a result of the integration with Voice Assistants.

- Non-radio audio advertising (e.g. from podcasts or streaming services) was £103m⁹² in 2021. Non-audio advertising is assumed to grow at 15% a year.⁹³
- The estimated gross margin for digital audio advertising revenues is 55%.⁹⁴
- The difference between low and high scenario is driven by assumptions made on the share of total podcast and audio streaming services advertising revenues that are imputable to Voice Assistants.

Sale of Skills/Apps

Incremental app gross margins are the uplift in app gross profits achieved as a result of app store owners' integration with Voice Assistants.

- App gross margins attributable to Voice Assistants are a function of total app downloads in the UK per year, the app sales share on Voice Assistant platforms/Voice Assistants-related apps, the commission on app sales, the average purchase per user per app and Google's, Apple's, and Amazon's share in app downloads.
- The gross margin on sales of apps is assumed to be 71%⁹⁵ on the commission (typically 30%⁹⁶ of the app price).
- The difference between low and high scenario number of Voice Assistant-related apps (such as Voice Assistants skills) and app sales on Voice Assistant platforms play.

Music streaming and premium services

Incremental music subscription gross margins relate to the uplift in subscription profits achieved as a result of the integration with Voice Assistant platforms (this could be as a result of incremental additions, and reduced churn, or higher subscription prices).

⁹² Ofcom Media Nations 2022. Figure 69 and Figure 71 https://www.ofcom.org.uk/data/assets/pdf_file/0016/242701/media-nations-report-2022.pdf

⁹³ This growth rate may be conservative since podcast advertising revenues more than doubled in the 2019-2021 period. Source: Ofcom Media Nations 2022. https://www.ofcom.org.uk/data/assets/pdf_file/0016/242701/media-nations-report-2022.pdf

⁹⁴ We proxy digital advertising gross margin with Alphabet's gross margin, which was c.a. 55% in Q4 2022. Source: Ycharts.com. [https://ycharts.com/companies/GOOG/gross_profit_margin#:~:text=Alphabet%20Gross%20Profit%20Margin%20\(Quarterly\)%3A%2053.53%25%20for%20Dec.,31%2C%202022](https://ycharts.com/companies/GOOG/gross_profit_margin#:~:text=Alphabet%20Gross%20Profit%20Margin%20(Quarterly)%3A%2053.53%25%20for%20Dec.,31%2C%202022)

⁹⁵ The gross margin on app sales is proxied by Apple's gross margin on the services business unit (71.5% margin). Source: cnbc.com <https://www.cnbc.com/2022/07/28/apples-services-slowdown-in-q3-potential-concern-for-investors-.html>

⁹⁶ TheVerge.com. <https://www.theverge.com/21445923/platform-fees-apps-games-business-marketplace-apple-google>

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- Complementary music subscription gross margins are a function of the number of users that have both a Voice Assistant and a music subscription plan from the same provider⁹⁷, and assumptions on the incremental value generated from these users as a result of Voice Assistants.
- The difference between low and high scenario relate to: different assumptions on additions and reduced churn rates as a result of listening to music via Voice Assistants; the proportion of Voice Assistant users that have complementarities with a music subscription plan (e.g. user listening to Amazon Music unlimited via Amazon Echo dot); and higher real increase (4% nominal p/a, of which 2% accounts for inflation) in the high scenario compared to the low scenario (2% nominal p/a, of which 2% accounts for inflation) reflecting an increased ability by the Voice Assistants of generating gross margins from such services in the high scenario.
- A gross margin of 32%⁹⁸ is assumed.

B.2 Estimation of value for radio sector

The value generated by commercial radio stations is proxied by the industry total gross margins.

- Annual revenues for commercial radio industry are published on the Radiocentre⁹⁹ website. Commercial radio revenues are assumed to grow at 2.8% p/a, which is the effective annual growth rate between 2019-2023.
- The gross margin on radio revenues is assumed to be 75% (consistent with broadcasting media gross margin¹⁰⁰, and gross margins of a UK radio broadcaster).
- The public value generated by the BBC is assumed to be proportionately the same per hour of listening as commercial radio, recognising this is an imperfect proxy to quantify the “value” generated by BBC.

B.3 Exchange of added value

Changes in value added by radio to Voice Assistants

The contribution that radio makes to the value of Voice Assistants is driven by how the take-up of Voice Assistants (and Voice Assistants use) would change if radio was not present. There are two effects to consider: first, radio is a popular service that drive sales and

⁹⁷ E.g. Apple Music and Apple HomePod, Google Nest Hub and Youtube Music/Premium, Amazon Music Unlimited and Amazon Echo dot.

⁹⁸ Economics of music streaming. <https://committees.parliament.uk/publications/6739/documents/72525/default/>

⁹⁹ Radiocentre.org. <https://www.radiocentre.org/the-audio-market/ad-revenues-and-forecasts/>

¹⁰⁰ This reflects judgment based broadcasting gross margin benchmarks, and UK radio group benchmarks. Large UK radio group benchmarks represent a likely upper bound with smaller radio broadcasters having lower margins.

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encourages use of Voice Assistants. Second, in addition, radio plays an important role in educating and socialising the use of Voice Assistants.

Changes in value added by Voice Assistants to radio

The value that Voice Assistant platforms bring to radio can be estimated by considering the loss in gross margin if it was not distributed over Voice Assistant platforms. Based on:

- Share of total radio listening via Voice Assistants, modelled as the sum of listening in-car and other listening. Voice Assistant accounts for 15% of all radio listening (of which listening via smart speakers is 14%¹⁰¹) plus an uplift for a proportion of listening via IP in-car and other listening.
- An assumption about the proportion of households that listen to radio via Voice Assistants that would stop listening to radio if it was not available on Voice Assistants.

¹⁰¹ Rajar Data Release Q42022. https://www.rajar.co.uk/docs/news/RAJAR_DataRelease_InfographicQ42022.pdf

Annex C The value that radio and Voice Assistant platforms bring each other by interoperating

Table 1 Incremental value added by radio to Voice Assistants (in £m)

	Modest Voice Assistant complementary profits			Optimistic Voice Assistant complementary profits		
	2022	2027	2032	2022	2027	2032
Total Voice Assistant profits	£80	£102	£156	£115	£227	£458
Incremental profits added by radio to Voice Assistant	£34	£35	£45	£42	£59	£93
As a % of total Voice Assistant profits	43%	34%	29%	37%	26%	20%

Source: Frontier Economics.

Note: All figures are expressed in nominal prices.

Table 2 Incremental value added by Voice Assistants to radio (in £m)

	2022	2027	2032
Total radio profits	£1,066	£1,223	£1,403
Incremental profits added by Voice Assistants to radio	£81	£164	£314
As a % of total radio profits	8%	13%	22%

Source: Frontier Economics.

Note: All figures are expressed in nominal prices.

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