MOBILE BROWSERS AND CLOUD GAMING MARKET INVESTIGATION

WP1: Nature of competition in the supply of mobile browsers and browser engines

27 June 2024

This is one of a series of consultative working papers which will be published during the course of the investigation. This paper should be read alongside the Issues Statement published on 13 December 2022 and other working papers published.

These papers do not form the inquiry group's provisional decision report. The group is carrying forward its information-gathering and analysis and will proceed to prepare its provisional decision report, which is currently scheduled for publication in October 2024, taking into consideration responses to the consultation on the Issues Statement and responses to the working papers as well as other submissions made to us.

Parties wishing to comment on this paper should send their comments to browsersandcloud@cma.gov.uk by **22nd July 2024**.

The Competition and Markets Authority has excluded from this published version of the working paper information which the inquiry group considers should be excluded having regard to the three considerations set out in section 244 of the Enterprise Act 2002 (specified information: considerations relevant to disclosure). The omissions are indicated by [✂]. Some numbers have been replaced by a range. These are shown in square brackets. Non-sensitive wording is also indicated in square brackets.

Contents

Tables

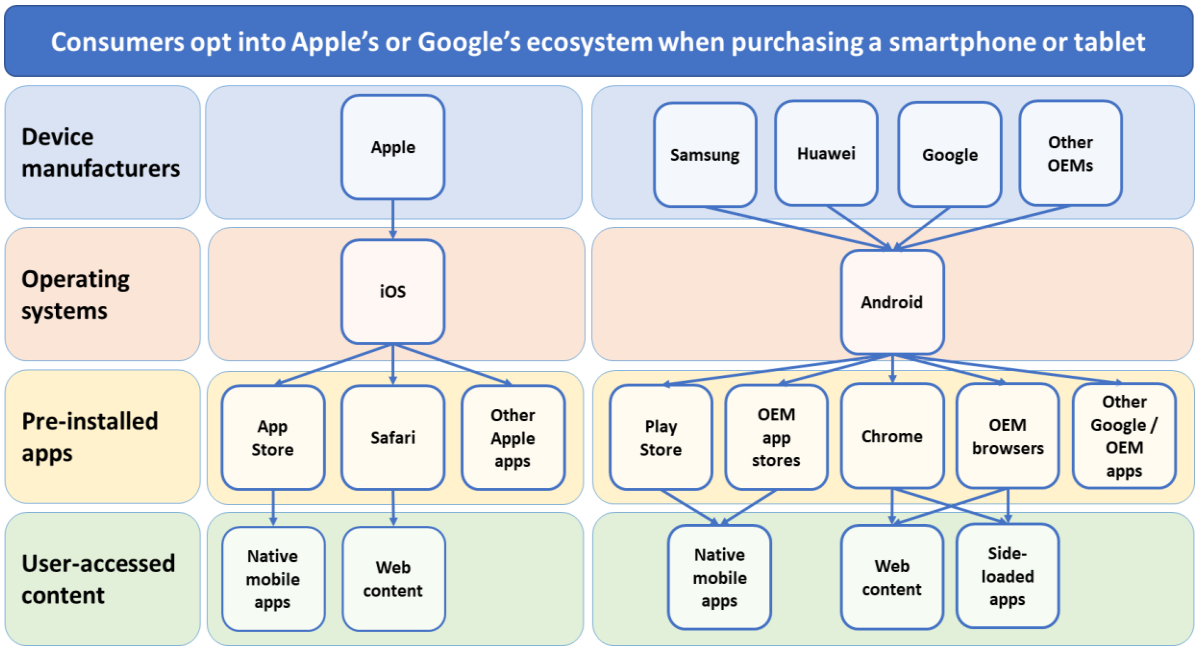
Figures

1. Introduction

1.1 The issues statement in this market investigation set out that this investigation relates, in part, to the supply of mobile browsers and mobile browser engines (and the supply of related ancillary goods and services) in the United Kingdom.[1]

1.2 Apple and Google supply the two main mobile operating systems in the UK, iOS and Android. The chart below demonstrates the key aspects of the iOS and Android ecosystems.

Figure 1.1: Apple and Google mobile ecosystems



Source: MEMS final report

1.3 Mobile browsers are applications that enable users of mobile devices (mobile phones and tablets) to access and search the web and interact with content on it. Mobile browsers (otherwise described in this paper as 'browsers') rely on browser engines to render web pages or web apps (applications which run in browsers) into content that users can engage with.

1.4 A range of mobile browsers are available to users, with Apple's Safari and Google's Chrome being the most common browsers on mobile devices (with the largest market share on iOS and Android devices respectively).[2] Other mobile browsers include Mozilla Firefox, Opera, and DuckDuckGo.

1.5 This working paper provides an overview of our emerging thinking on the nature of competition and market definition in relation to the supply of mobile browsers and

[1] Issues statement.
[2] As set out in Section 4, the available data shows that Apple's Safari and Google's Chrome have a combined market share on mobile devices in the UK of 89% in 2024, with Safari having a share of supply of 45% and Chrome a share of 45%.

mobile browser engines. This is one of a series of papers designed to inform our assessment of whether there is an adverse effect on competition in the supply of mobile browsers and mobile browser engines in the UK.

1.6 The following additional working papers due to be published by the CMA in this market investigation set out further analysis which builds on key points covered in this paper:

(a) WP2 - The requirement for browsers operating on iOS devices to use Apple's WebKit browser engine.

(b) WP3 - Access to browser functionalities within the iOS and Android mobile ecosystems.

(c) WP4 - In-app browsing within the iOS and Android mobile ecosystems.

(d) WP5 - The role of choice architecture in the supply of mobile browsers.

(e) WP7 - Potential remedies.

1.7 The remainder of this paper is structured as follows.

(a) Section 2 provides an overview of the nature of competition in mobile browsers. This underpins our assessment of the key competitive constraints relating to mobile browsers and therefore our approach to what the most appropriate relevant market(s) should be.

(b) Section 3 presents our emerging thinking on the most appropriate market definition based on the evidence seen so far.

(c) Section 4 sets out key information relating to shares of supply in the relevant market(s).

1.8 We plan to continue to develop our evidence base on the above issues, particularly through considering submissions made in response to these working papers, and further evidence gathering as appropriate.

2. Nature of competition

2.1 This section describes the industry in which the supply of mobile browsers and mobile browser engines takes place, how key market participants interact in it and key competitive dynamics. These factors are relevant our emerging thinking on the most appropriate market definition, as set out in Section 3. The section does not seek to undertake a competitive assessment of the market or assess whether a feature or features of the market give rise to an adverse effect on competition.

2.2 The remainder of this section is structured as follows:

(a) the first sub-section describes how browsers and browser engines work;

(b) the second sub-section discusses the range of market participants that are relevant to the supply of mobile browsers and browser engines and how they compete; and

(c) the third sub-section presents a number of structural characteristics which are relevant to the supply of mobile browsers and browser engines.

How browsers and browser engines work

2.3 Mobile browsers are a type of application that enable users of mobile devices to interact with content on the web. Most mobile devices typically come with at least one mobile browser pre-installed and users can either use the pre-installed one or decide to download another. Approximately 8% of user time spent on Android devices in 2022 consisted of interacting with standalone mobile browser apps.[3]

2.4 There are two main elements required for mobile browsing:

(a) a browser engine, which renders websites (or web apps – applications which run in web browsers) that users can see and engage with; and

(b) a branded user interface (UI), which is responsible for user-facing functionality (a browser).

2.5 A mobile browser engine is the core software component of a mobile browser that handles the rendering and display of web content. The browser engine is responsible for processing HTML, CSS, and JavaScript code, and rendering websites into the visual format that users see on their mobile devices. In practical terms, this means the main reason that websites may look, load and work differently in different browsers is their browser engines.

[3] Statista, Share of global time spent on browsers and apps 2022.

2.6 There are specialist companies which develop mobile browser engines, and mobile browser engines can vary in their features and performance characteristics. Mobile browser engine providers also typically provide mobile browsers. The most widely used mobile browser engines are WebKit (used by all browsers operating on Apple's mobile operating system iOS), Blink (used by Google's Chrome browser and a range of other mobile browsers available on Google's operating system Android), and Gecko (used by Mozilla's browser Firefox on Android).

2.7 On iOS, all browsers are required to be built on the version of Apple's WebKit browser engine that is bundled together with the iOS device. Paragraph 2.5.6 of Apple's App Store Review Guidelines restricts mobile browser and native apps to use such version as basis for their product.[4] On Android, the majority of browsers are Chromium-based, meaning that they use browser engines based on Blink.[5] Chromium is the open-source Chrome browser code that includes the Blink engine and parts of the Chrome browser except for some of Google's proprietary features. As such, Chromium is a common starting point for most browsers on Android.

2.8 Mobile browser engines play an important role in the user experience of mobile browsing, as they can impact factors such as speed, stability, and compatibility with different types of web content and websites. Different browser engines may also offer different levels of support for web standards, features and technologies, which can impact the types of web content that can be displayed on a particular mobile browser.

2.9 Built on top of a mobile browser engine, the mobile browser is responsible for user interface features such as web favourites, browsing history, remembering passwords and payment details. It also determines the layout of the navigation bar and settings. A browser vendor may also add features on top of the engine that affect the privacy, security, and compatibility of the browser.

2.10 Product differentiation can happen at both the browser engine and the browser level (ie within the browser code) sitting on top of the engine. For example, assuming no restrictions are placed at this level, improvements to browser performance, including better speed and increased levels of web compatibility, are typically implemented at the browser engine level, as are most security features (eg site isolation),[6] while changes to the user interface, or features such as password managers, can be incorporated at the browser level. This is not always

[4] App Store Review Guidelines - Apple Developer, accessed by the CMA 19 April 2024. This means that all browser apps and other native apps need to use a WebKit-based browser or in-app browser. This is covered in further detail in 'WP2 - The requirement for browsers operating on iOS devices to use Apple's WebKit browser engine' and 'WP4 - In-app browsing within the iOS and Android mobile ecosystems'.
[5] The CMA's Mobile Ecosystems Market Study (MEMS) estimated that, on Android in 2021, the Blink-based browser engines have an above 95% market share (MEMS final report, Table 5.2). Importantly, even though many browsers use Blink, they may use slightly modified versions of Blink. This is an important distinction from on iOS, where using WebKit means the browser cannot modify the engine at all.
[6] Site isolation is a feature that allows web pages in unrelated tabs to run in parallel. For example, Chromium site Isolation.

clearcut and, in some cases, browser vendors may have some flexibility in deciding at which level to build a feature.

2.11 There are two key ways for users to access web content on their mobile devices. The first is using a 'dedicated' browser – that is a standalone mobile browser app which is primarily used to navigate the web. The second way of accessing web content is within a native app via an 'in-app' browser – this refers to a situation where a user views web content while remaining in a native app instead of being taken to a dedicated browser app on a mobile device.

2.12 Examples of native apps with in-app browsers include a large variety of different types of apps, including chat apps such as Snapchat or WeChat, online social networks such as Facebook or Instagram, search widgets such as Google Search and Microsoft Bing Search, and email clients such as Gmail. Dedicated browsers and in-app browsers use the same set of browser engines such as those supplied by Google, Apple, and Mozilla.[7] The evidence to date on in-app browsers will be covered as part of 'WP4 - In-app browsing within the iOS and Android mobile ecosystems'.

Supply of mobile browsers and browser engines

2.13 A number of market participants are relevant to the supply of mobile browsers and browser engines: (i) users of mobile devices; (ii) web developers; (iii) mobile operating system providers (most notably Apple and Google); (iv) original equipment manufacturers (OEMs); (v) browser vendors; and (vi) browser engine providers. This sub-section provides an overview of each type of market participant and how they contribute to the competitive dynamics relevant to the supply of mobile browsers and browser engines.

Users

2.14 Almost all mobile device owners are users of mobile browsers. Evidence indicates that people use mobile browsers frequently. For example, approximately 8% of user time spent on Android devices in 2022 consisted of interacting with standalone mobile browser apps.[8] Ultimately, users use browsers to access content on the web which is made available by web developers.

2.15 Users employ a mobile device which most often will come with a mobile browser pre-installed. Subsequently, users can either use the pre-installed browser or download a different one on their device.

[7] MEMS final report, paragraph 5.7.
[8] Statista, Share of global time spent on browsers and apps 2022.

2.16 The CMA has commissioned Verian (formerly Kantar Public) to conduct qualitative research with consumers as part of this market investigation, which is being published alongside this paper.[9] This research aimed to measure and develop an understanding of consumer behaviour in the mobile browser market, with a particular focus on understanding the role of pre-installation and the drivers of browser choice on smartphone devices. This research found that:[10]

(a) There is low engagement with mobile browsers by users – it is a low salience topic, seen as not the most exciting aspect of a smartphone use, and the use of a mobile browser is rarely considered, if noticed at all, by respondents.

(b) Awareness of different mobile browsers is low, and respondents did not think there were differences between them (even among those who had experience of multiple browsers). As a result, there is minimal perceived benefit to switching or using multiple browsers.

(c) There are barriers to users switching between different browsers which include: (i) strong preference for familiarity; (ii) brand loyalty; and (iii) the inconvenience of migrating any saved passwords from one system to another.

(d) Users may use alternative browsers (to the pre-installed ones) where they encounter compatibility or specific performance[11] issues on a particular browser, or to having strong views about privacy and mainstream technology companies.

(e) While respondents were typically able to find and download alternative browsers, they often encountered difficulties working out how to change their 'default' dedicated browser – with success not always dependent on digital capability.

(f) Overall, respondents felt that there is adequate choice of browsers available to them, even if this choice has not been presented to them at any point. This is because: (i) they may feel they have made a choice once (even if in the past); and/or (ii) they would prefer not to have to change their browser.

2.17 Building on this qualitative research, we have commissioned Verian to undertake a representative survey to gain a more comprehensive picture of consumer behaviour in the mobile browser market. The key findings from this research will be published alongside 'WP4 - In-app browsing within the iOS and Android mobile

[9] We note that this publication is an interim output and is in advance of the full combined qualitative/quantitative report which will draw together findings from both strands. Please see the progress update published alongside this working paper for further details.
[10] Verian Group UK (2024), Mobile Browsers Qualitative Consumer Research, slide 10.
[11] For example, issues with web content not being fully readable or compatible with a certain browser or a browser being slow/performing worse.

ecosystems' and 'WP5 - The role of choice architecture in the supply of mobile browsers', and will be followed by a detailed written report to be published during August.[12]

Web developers

2.18 Web developers design, develop and maintain websites and web apps[13] to make web content available to users. Web development can be carried out in-house or outsourced, and websites range from being very simple (eg static, non-interactive websites such as blogs) to very complex (eg sophisticated software products such as games).

2.19 Web developers want to ensure their websites work for as many users as possible. Indeed, evidence submitted as part of the CMA's Mobile Ecosystems Market Study (MEMS) report suggested that both web developers and content providers favour ensuring that their websites are compatible (meaning fully accessible and readable) with both Chrome and Safari, as these are the most popular browsers.[14]

2.20 As set out in the CMA's MEMS report, developers also want access to new features which allow them to build innovative websites and web apps, as this attracts users and helps their businesses to grow.[15]

2.21 As part of this market investigation, the CMA commissioned Jigsaw Research to undertake qualitative research to understand the experiences of a wide range of web developers working with mobile browsers and mobile browser engines.[16] This research shows that respondents consider the major browsers when developing their websites. In particular, the research found that:

(a) Web developers interviewed tended to test the compatibility of their web apps and websites for mobile devices with browsers with the biggest market share, namely Chrome, Safari, sometimes Firefox, Brave or Edge.[17]

(b) Respondents' choice of the main browser to prioritise when developing was driven by a range of factors, and the features of the browser were not the only or main influence. For most respondents, the main browser they optimised for was Chrome, driven by its share of web traffic, familiarity, ease

[12] See the progress update published alongside this report for further details.
[13] Web apps, which can be regarded as an alternative to native apps, are applications built using common standards based on the open web, and are designed to operate through a web browser (rather than being specific to an operating system). MEMS final report, paragraph 2.7.
[14] MEMS final report, paragraph 5.33 to 5.36.
[15] MEMS final report, paragraph 5.34.
[16] Jigsaw Research (2024), Qualitative Research with Developers on Mobile Browsers and Mobile Browser Engines.
[17] Jigsaw Research (2024), Qualitative Research with Developers on Mobile Browsers and Mobile Browser Engines, page 7.

of use and the quality of the developer tools.[18] A few favoured Safari, as they saw it as better for developing on Apple hardware that they used, and a few others preferred use of Firefox and Brave as they favoured these for privacy and security as both a user and developer.[19]

(c) Web developers interviewed described the process of building web apps and websites for mobile as building once then checking for compatibility across browsers, operating systems and devices.[20] Ongoing web app and website maintenance also formed a significant part of their work. Most participants felt ensuring compatibility across browsers was a relatively small part of their work, estimating that it typically took 5-10% of their time. However, some estimated that the time taken was outside this range, with a few saying it took very little or even a negligible amount, and a few others that it took 20% to 25% of their time.[21]

(d) Increased ease of web app and website development for mobile devices over the last five years was mentioned as a key trend, for reasons including: (i) use of frameworks and libraries, where re-use of modules of code can reduce manual changes required to build and ensure compatibility across browsers and devices; (ii) increasing use and capabilities of web apps; (iii) improving functionality and standardisation of browsers, meaning fewer compatibility issues arise; (iv) AI tools bringing speed to some tasks such as writing, editing, simplifying, and annotating code; and (v) many communities and resources for advice and troubleshooting (eg Stack Overflow and code repositories like GitHub).[22]

(e) Though respondents noted that developing web apps and websites for mobile devices is becoming easier, web developers interviewed noted that there are still some common day-to-day technical challenges. Respondents noted that key challenges stem from the existence of multiple mobile screen sizes, multiple versions[23] and updates to ecosystems and tools, and the need to maintain privacy and security. Respondents further noted that ensuring

[18] Jigsaw Research (2024), Qualitative Research with Developers on Mobile Browsers and Mobile Browser Engines, page 7.
[19] The research also found that many of the strengths and weaknesses perceived in the Android or Apple ecosystems seemed to be a reflection of that ecosystem's approach to how it managed its services, ie Android was more open compared to Apple, which was seen as more closed or a 'walled garden'. Each of these approaches was seen to have both weaknesses and strengths that reflected this overall 'philosophy', and some participants would develop first, or prefer to develop, for the ecosystem that best matched their personal preferences for such systems. See Jigsaw Research (2024), Qualitative Research with Developers on Mobile Browsers and Mobile Browser Engines, page 8.
[20] Jigsaw Research (2024), Qualitative Research with Developers on Mobile Browsers and Mobile Browser Engines, page 21.
[21] Jigsaw Research (2024), Qualitative Research with Developers on Mobile Browsers and Mobile Browser Engines, page 7.
[22] Jigsaw Research (2024), Qualitative Research with Developers on Mobile Browsers and Mobile Browser Engines, page 6.
[23] We understand that by 'multiple versions' participants were referring to things such as multiple product releases, minor updates (e.g. security/bug fixes), and/or more up-to-date services.

browser compatibility is a part of these challenges, but not a primary concern.[24]

Mobile operating system providers

2.22 Mobile operating systems are pre-installed system-level software that come with smartphones and tablets, which enable them to run programs and applications.[25] A mobile operating system loads when the device is turned on, and just like with a desktop computer, it displays a home screen with icons for selecting and accessing a range of applications, in addition to facilitating a range of less visible uses, like the input from a keyboard and mouse, managing memory allocated to programs, and keeping time.

2.23 The operating system determines and controls a range of features that are important to users of mobile devices, ranging from the appearance of the user interface, through to the speed, technical performance, and security of the device. They can also determine what kinds of software can run on top, including all applications, such as native apps or websites run in a browser.

2.24 As set out in the CMA's MEMS report, Apple and Google hold an effective duopoly in mobile operating systems with iOS and Android. The two main mobile operating systems in the UK – Apple's iOS and Google's Android – each power roughly half of active smartphones in the UK.[26]

2.25 Apple does not license iOS to other device manufacturers (ie it is only available on Apple mobile devices), nor does it allow consumers to install alternative operating systems on its devices. In contrast, Google allows device manufacturers to license the Android operating system, although this comes with a range of conditions and incentives that support the use and prominence of Google's other key services.[27]

2.26 There are different rules within the iOS and Android ecosystems in relation to the operation of browser engines:

(a) On iOS (and iPadOS), all browsers are required to be built on Apple's WebKit browser engine.[28] Apple's iPhones and iPads also come with Apple's Safari browser pre-installed.[29]

---

[24] Jigsaw Research (2024), Qualitative Research with Developers on Mobile Browsers and Mobile Browser Engines, page 6.
[25] MEMS final report, paragraphs 2.17 to 2.21.
[26] MEMS final report, Chapter 3.
[27] MEMS final report, paragraph 2.46.
[28] Paragraph 2.5.6 of Apple's App Store Review Guidelines restricts browser and native apps to use a WebKit-based browser or in-app browser. This will be covered in further detail in 'WP2 - The requirement for browsers operating on iOS devices to use Apple's WebKit browser engine'.
[29] MEMS final report, paragraph 2.27.

(b) It is possible for different browser engines to operate within Android, although the majority of browsers are Chromium-based, meaning that they use browser engines based on Blink.[30] Mobile devices using the Android operating system also generally come with Google's Chrome pre-installed.[31]

OEMs

2.27 Original Equipment Manufacturers (OEMs) manufacture mobile devices, such as smartphones and tablets. As set out in the CMA's MEMS report, Apple is the largest smartphone and tablet device manufacturer in the UK and Samsung is the largest manufacturer of Android smartphone and tablet devices in the UK.[32]

2.28 OEMs can also pre-install or promote certain browsers within their devices. As set out in the CMA's MEMS report, on Android, device manufacturers receive financial incentives from Google for pre-installing the Chrome browser and setting it as default.[33] On iOS devices, Safari is pre-installed and set as the default browser.

Browser vendors

2.29 Browser vendors develop browser apps, including for mobile devices. As explained below: (i) different browser vendors may have different focuses; (ii) most develop both desktop and mobile browsers, as this allows them to provide a cross-platform experience and benefit from cost efficiencies; and (iii) browsers are typically monetised indirectly, most often via agreements with search engines, and to a lesser extent display advertising and payments for premium or additional features such as VPN services. Below, we summarise the evidence we have collected to date on browser vendors' strategies.

2.30 Google (Chrome) and Apple (Safari) are the largest browser vendors, but there are several smaller competitors, including Mozilla (Firefox), Microsoft (Edge), Samsung (Samsung Internet), Opera (Opera) and Brave (Brave).[34] [35]

2.31 Browser vendors compete by offering differentiated features. Browser vendors have different focuses and differentiating strategies, with smaller ones in particular focusing on a specific differentiating strategy aimed at users downloading and

---

[30] MEMS (MEMS final report, Table 5.2) estimated that, on Android in 2021, the Blink-based browser engines have an above 95% market share. Importantly, even though many browsers use Blink, they may use slightly modified versions of Blink. This is an important distinction from on iOS, where using WebKit means the browser cannot modify the engine at all.
[31] MEMS final report, paragraph 2.27.
[32] MEMS final report, paragraphs 3.15 to 3.24.
[33] MEMS final report, paragraph 2.46.
[34] MEMS final report, paragraph 5.24 and table 5.1.
[35] Google has submitted to the CMA that there has recently been dynamic entry in browsers. It provided examples of two new entrants: (i) Arc Search, an AI-powered browser; and (ii) Chatloop, which seeks to add social components to browsers. Google presentation [✂].

using an alternative browser to those that often come pre-installed and set as the default browser on iOS and Android devices. For instance:

(a) Brave told the CMA that it will continue to 'pioneer privacy innovation through rigorous research to stay ahead of its rivals'. Brave defines its browser offering as being on the 'aggressive end' of the privacy spectrum with 'arguably the most complete protection out-of-the-box'.[36]

(b) Google told the CMA that while a browser's strengths or weaknesses are to some extent subjective and depend on users' needs, Chrome strives to compete across all relevant parameters of competition. Google told us that it prioritised Chrome's simplicity, speed, security and stability.[37] [✂].[38]

(c) Microsoft told the CMA that Edge 'seeks to differentiate itself by focusing on being excellent on productivity scenarios with features like tab collections and vertical tabs'.[39] Microsoft told us Edge also offers strong privacy and security features 'on par with Firefox and Safari'.[40] In relation to the Edge mobile browser specifically, Microsoft told us that it seeks to provide a good companion app for business users who use Edge on their PCs, which applies security and privacy policies, including those set by business users' organisations.[41]

(d) Mozilla told the CMA that it focuses on producing a browser and browser engine which will contribute to its overall objectives for an open internet.[42] Mozilla said it has an 'opinionated direction' and that better privacy, and a faster web is what it invests most of its energy in, meaning it is its priority. It stated that when it comes to features of this sort, it tries to influence other market participants to create a more private web which is open and accessible to all.[43]

(e) Vivaldi told us it focuses on 'customization, feature richness and user interface flexibility'.[44] Vivaldi told us that compared to other browsers, it has more features and it considers itself more 'privacy-centred'.[45] Vivaldi explained that it aims to provide the best browser on all platforms that its users have.[46]

---

[36] Brave's response to the CMA's information request [✂].
[37] Google's response to the CMA's RFI [✂].
[38] Google submission to the CMA [✂].
[39] Which enable users to organise tabs in different ways.
[40] Microsoft's response to the CMA's information request [✂].
[41] Note of meeting with Microsoft [✂].
[42] Mozilla's response to the CMA's information request [✂].
[43] Note of meeting with Mozilla [✂]. Mozilla pointed the CMA to a public document which sets out their vision for the web: Mozilla Web Vision.
[44] Vivaldi's response to the CMA's information request [✂].
[45] Note of meeting with Vivaldi [✂].
[46] Note of meeting with Vivaldi [✂].

(f) DuckDuckGo told us that building innovative privacy protections is its main differentiator.[47]

(g) Opera told us it competes by providing a unique and personalised experience to users, and constantly introducing new and innovative features.[48] In particular, Opera told us that it specialises in building unique, differentiated products for specific segments of customers, either based on the region or type of customer / personal preferences.[49]

2.32 We have seen evidence in Apple's internal documents that it benchmarks Safari against Chrome and Firefox when it comes to privacy features (including for example 'safe browsing').[50] For example:

(a) Apple submitted a presentation from July 2021 that covered features WebKit should offer, the rationale for the features, and how to practically implement them. The document stated that one of Apple's justifications for developing [✂], showing that Apple considers what features other browsers offer when implementing their own.[51]

(b) Apple submitted a presentation from February 2022 which states Apple has invested heavily in privacy and is [✂]. It also states that the Google Chrome team has an alternate vision of privacy that is centred on its advertising business model.[52]

2.33 We have seen evidence in Google's internal documents that it considers Chrome to have achieved its leading market position through differentiation, [✂].[53] We have also seen evidence that Google is looking to increase differentiation [✂].[54]

2.34 Google's internal documents also demonstrate that Google benchmarks its offering against rivals. For example, it benchmarks: (i) Chrome/Android performance against [✂].[55]

2.35 Almost all browser vendors develop both desktop and mobile browsers. Browser vendors submitted that the primary motivation for providing a browser on both desktops and mobile devices is to provide a cross-platform experience, which users may find valuable. In particular:

(a) Apple explained that: 'One way in which having a desktop browser helps Apple attract browser users on Mobile Devices, and vice versa, is Apple's

[47] DuckDuckGo's response to the CMA's RFI [✂].
[48] Opera's response to the CMA's RFI [✂].
[49] Note of meeting with Opera, [✂].
[50] Apple's internal document, [✂].
[51] Apple's internal document, [✂].
[52] Apple's internal document, [✂].
[53] Google's internal document, [✂].
[54] Google's internal document, [✂].
[55] Google's internal document [✂].

ability to offer features across its browser platforms, including syncing passwords, tabs, tab groups, and bookmarks between its desktop Browser and Mobile Browser. Syncing allows the user to conveniently and seamlessly continue a browsing session, even when switching between Apple devices.'[56]

(b) Google submitted that offering both a mobile and desktop browser can have positive brand association benefits. For example, a desktop user who is highly satisfied with Chrome may be more likely to use it on their Mobile Device, and vice versa.[57]

(c) Mozilla found that its users like to use the same browser on both mobile and desktop, [✂].[58]

(d) Vivaldi stated that many users will not use a browser if they cannot use it across all devices.[59]

2.36 Evidence obtained from browser vendors during this market investigation indicates that desktop and mobile browsers share a large proportion of the code base when these are based on the same browser engine.[60] This suggests that there may be cost efficiencies associated with providing both desktop and mobile browsers.

2.37 Browsers are typically made available on a global basis, but versions are sometimes released which target particular territories. For example, Firefox Lite (an Android browser) was designed and marketed towards Asia and other regions in which a low-bandwidth browser would be appealing.[61]

2.38 Browsers are not monetised directly, with users typically being offered browsers free of charge. However, browser vendors are still able to generate revenues through their browser via search agreements (whereby search advertising revenue is shared by a search service provider with the browser vendor), advertising and payments for premium or additional features (such as VPN services).

2.39 Some browser vendors have other supporting motivations for distributing their browser. In particular, as set out in the CMA's MEMS report, these reasons include:[62]

(a) Complementing other products they sell: Mobile device manufacturers such as Apple and Samsung developed their browsers to make their devices more attractive and to improve the 'out of the box' experience for users.

[56] Apple's response to the CMA's RFI [✂].
[57] Google's response to the CMA's RFI [✂].
[58] Mozilla's responses to the CMA's RFI [✂].
[59] Note of meeting with Vivaldi [✂].
[60] Responses to the CMA's information requests [✂].
[61] Firefox Lite (mozilla.org).
[62] MEMS final report, paragraph 5.15.

(b) Strengthening a position in another market: For example, Apple can take decisions with regard to its browser functionality that can encourage greater use of native apps that are downloaded from its app store (which benefits Apple financially through commissions and advertising), whereas Google may encourage browsing to ensure the existence of content which can be found by its search engine (which benefits Google financially through advertising). Microsoft submitted that: 'Edge helps to make the Windows OS better and more attractive to users, thereby increasing customer demand for Windows which Microsoft licenses for a royalty'.[63]

(c) Public interest: Several browser vendors are not-for-profit, or have broader public missions. For example, Firefox is developed by a subsidiary of the non-profit Mozilla Foundation, as part of its mission of a decentralised, interoperable and open web. Tor, operated by the non-profit Tor Project, has a mission to provide private access to an uncensored web.[64]

Browser engine providers

2.40 Browser engines are the technology underlying browsers. They convert web source code into websites (or web apps – applications which run in web browsers) that users can see and engage with. The three main mobile browser engines are WebKit (used by all browsers on iOS),[65] Blink (used by eg Google's Chrome on Android), and Gecko (used by eg Mozilla's Firefox).

2.41 WebKit, Blink and Gecko are open-source projects – that is, they are not directly monetised, their code can be viewed by anyone, and anyone can suggest changes. However, each browser engine has a 'steward' (Apple, Google and Mozilla for each of these projects, respectively), and it is the steward that determines which changes are ultimately accepted and is therefore in control of the open-source project. Additionally, on devices where the engine a browser can use is not restricted, browser vendors may 'light fork', meaning take a version of the browser engine, slightly modify it and then use this as a new version. This may allow them to develop newer features or features not yet in the main engine code (including by adding on top of the engine).

2.42 The stewards of the three main browser engines each have different rationales for providing their respective browser engine. In particular, as set out in the CMA's MEMS report:

[63] Microsoft's response to the CMA's RFI [✂].
[64] www.torproject.org
[65] Paragraph 2.5.6 of Apple's App Store Review Guidelines restricts browser and native apps to use a WebKit-based browser or in-app browser. This will be covered in further detail in 'WP2 - The requirement for browsers operating on iOS devices to use Apple's WebKit browser engine'.

(a) Apple requires all browsers on iOS to use the version of its WebKit browser engine which is bundled together with the iOS device. Development of the WebKit browser engine therefore allows Apple to control the use of browsers on its devices.[66]

(i) In its original response to the market investigation issues statement in January 2023, Apple stated that its WebKit requirement was justifiable on the grounds of increased user security, privacy and performance; enhanced competition and innovation; and benefits for vulnerable consumers.[67]

(ii) In its supplemental response to the market investigation issues statement in February 2024, Apple reiterated these points and stated that it had introduced several performance improvements and other features and functionalities to WebKit between March 2023 and February 2024.[68] Apple's position was that these updates served to address numerous features raised during the market investigation and the CMA's MEMS, including push notifications, badging, offscreen canvas and screen notifications. In addition, Apple submitted that its updates had also introduced material features such as compression streams API, user activation API and storage API.

(iii) In its supplemental response to the market investigation issues statement in February 2024, Apple concluded that 'Properly assessed, this evidence shows there is no basis on which WebKit could be viewed as having anything but a positive impact on competition for the distribution of web apps, including alternative mobile browsers, on iOS.'[69]

(b) Google has stated publicly that it launched Blink to 'spur innovation and over time improve the health of the entire open web ecosystem'.[70]

(i) In its original response to the issues statement in January 2023, Google stated that Apple's WebKit restriction had no parallel on Google's Android, where browser developers are free to use any browser engine or a mixture of browser engines.[71] Google concluded that: 'The choice and openness at the heart of the Android ecosystem has had an

[66] MEMS final report, paragraph 5.18.
[67] Apple's issues statement response.
[68] Apple's supplemental issues statement response.
[69] Apple's supplemental issues statement response.
[70] Chromium Blog: Blink: A rendering engine for the Chromium project
[71] Google's issues statement response.

undeniable and enduring positive impact on users, developers, device manufacturers, and users in the UK [sic].'[72]

(ii) In its supplemental response to the issues statement in February 2024, Google reiterated this stance and submitted that the CMA's concern around Apple's WebKit restriction did not apply to Google as it had no corresponding restriction on Android.[73]

(iii) Google stated that it supported competition and innovation and stated that improvements to Chrome and Chromium over time reflect competitive pressure (eg a user interface for Enhanced Safe Browsing which can adapt in real time to malicious attacks or behaviour). [74]

(iv) Google also stated that it is incentivised to invest in the open web, with advertising being the core of its business.[75]

(v) Further, Google noted that security and performance are linked and there can be tradeoffs, for example with speed, simplicity and usability. This can happen for instance because security solutions can use more of a machine's memory, which can slow the speed of the browser. Google explained that its position has usually been that users are safer in the browser if it can be explained to users how they can use it safely. Google also indicated the link between security and user experience was a 'false dichotomy', with the most effective security solutions being focused on usability in Google's view.[76]

(vi) Finally, Google submitted that Blink's commercial attractiveness for [✂] and functionality, and that Google invests in Blink for the benefit of Chrome and web developers broadly.[77]

(c) The CMA's MEMS report also refers to evidence from Mozilla that it developed the Gecko browser engine 'to shape the internet and pursue our public mission of a decentralised and open web'.[78]

Key competitive dynamics

2.43 In this sub-section, we summarise how key market participants interact in relation to the supply of mobile browsers and browser engines.

[72] Google's issues statement response.
[73] Google's supplemental issues statement response.
[74] Note of meeting with Google [✂].
[75] Note of meeting with Google [✂].
[76] Note of meeting with Google [✂].
[77] Google's response to the CMA's RFI [✂].
[78] MEMS final report, paragraph 5.20.

(a) **Browsers compete for users (including via OEMs).** Browsers compete for visibility and usage (ie traffic) by users and primarily seek to secure users through contractual agreements with OEMs concerning pre-installation, placement and default settings on mobile devices, as well as through other access points such as voice assistants or widgets (eg Siri/Spotlight on iOS devices). For users that actively choose their browser, browsers can seek to distinguish themselves on several dimensions of quality, including:

(i) performance (eg speed, stability) and user-facing features (including at the UI level);

(ii) privacy and security; and

(iii) energy efficiency / battery life.[79]

(b) **Browser engines compete for browsers**. Browser engines are able to compete to be chosen by browsers as the base to build their product on (this is currently only possible on Android where browser engine choice is unrestricted). They do this by supplying a browser engine that is easy to turn into a browser (or in-app browser), by ensuring strong compatibility with online content and by implementing advanced features which enable browsers to provide a better user-facing experience.

(c) **Browser engines compete for web developers and online content providers more generally**. Browser engines compete to be prioritised by web developers for compatibility (ie web developers making their web content compatible with a certain browser engine) by: (i) providing access to a large user base (through their inclusion in popular browsers); and (ii) including new features which online content providers can use to develop their content.

(d) **Web developers compete for users**. Web developers compete for users by creating online content (which is compatible with users' browsers) which users can access.

(e) **OEMs and mobile operating system providers compete for users.** As set out in the CMA's MEMS report, Apple, Google and other device manufacturers and mobile operating system providers compete for users in relation to the price and quality of mobile devices (including features, functionality and performance, content available on devices, and interoperability); and the brand of mobile devices.[80]

---

[79] For example, see: Chrome updated to match Safari battery life on M2 MacBook Pro.
[80] MEMS final report, paragraph 3.9.

Structural characteristics

2.44 Below, we provide an overview of our emerging thinking on the following structural characteristics that are relevant to the supply of mobile browsers and browser engines:

(a) indirect network effects resulting from web compatibility;

(b) vertical integration across layers of the supply chain;

(c) barriers to entry and expansion; and

(d) low user awareness and engagement with mobile browsers.

Indirect network effects arising from web compatibility

2.45 As set out in the CMA's MEMS report, web compatibility represents a barrier to competition in browsers.[81] This refers to the browser's ability to properly access and display the content on a particular website, and primarily depends on the browser engine (ie although there may also be some differences between them, browsers with the same browser engine generally tend to perform similarly on web compatibility).

2.46 The CMA's MEMS report considered a range of possible interventions in relation to mobile ecosystems, including mandating standards for browser functionality to mitigate web compatibility issues. For example, the report considered whether Apple should be required to provide enhanced functionality on WebKit, to allow web developers more comparable access to the technology of the iPhone as native app developers.[82]

2.47 Web compatibility is influenced by indirect network effects: the more users a browser engine has, the more likely online content providers will develop their website in a way that ensures compatibility with the browser engine and thus the more likely are users to use a browser that is based on this browser engine.

2.48 As a result, indirect network effects resulting from web compatibility give large incumbent players an advantage and make it more difficult for smaller browser engines to compete effectively and for new ones to enter the market. More specifically, the indirect network effects created by web compatibility impact market participants as follows:

(a) **Large incumbent browser vendors**. To minimise development costs while serving as many users as possible, web developers tend to develop their

[81] MEMS final report, paragraphs 5.76 to 5.81.
[82] MEMS final report, paragraph 8.127.

websites for browser engines with the most users.[83] This results in more websites being compatible with incumbent browser vendors with a large user base, which advantages those vendors. This was confirmed by the qualitative web developer research conducted by Jigsaw Research which found that respondents tended to test the compatibility of their web apps and websites for mobile devices against browsers with the biggest market share, namely Chrome, Safari, sometimes Firefox, Brave or Edge.[84]

(b) **Rival browser engines and browser vendors**. Network effects make it more difficult for smaller browser engines to compete effectively and for new browser engines to enter.[85] They also mean that browser vendors are less willing to substantially adjust their customised version of an open-source browser engine or fork from it. While browser vendors can modify and distribute their own version of Blink on Android, there is a significant cost to maintaining modified browser engine features which have not been adopted by the browser engine's steward, while avoiding worsening compatibility.[86] Indirect network effects can weaken incentives for smaller vendors to develop or take up features which are not present on the major browsers, as web developers are unlikely to support these unless they are also supported by the major browsers. As a result, there may be an incentive for smaller browsers to focus their innovation on features which are less exposed to web compatibility issues.

(c) **Web developers and online content providers**. The CMA's MEMS report found that bugs, inconsistencies and failure to follow web standards represent a material proportion of costs for web developers and that developers only target a small set of browsers when checking the compatibility of their websites.[87] However, the qualitative web developer research conducted by Jigsaw Research found that most respondents felt ensuring compatibility across browsers was a relatively small part of their work, estimating that it typically took 5-10% of their time.[88] Some respondents estimated the time taken was outside this range, with a few saying it took very little or even a negligible amount, and a few others that it took 20% to 25% of their time.

(d) **Users**. The qualitative consumer research conducted by Verian found that respondents have low engagement with mobile browsers.[89] However, as

[83] MEMS final report, Chapter 5.
[84] Jigsaw Research (2024), Qualitative Research with Developers on Mobile Browsers and Mobile Browser Engines, page 7.
[85] MEMS final report, paragraph 5.79.
[86] This reduces the scope for differentiation and competition between browsers on Android, as the competing Blink-based browsers perform similarly in many ways.
[87] MEMS final report, Chapter 5.
[88] Jigsaw Research (2024), Qualitative Research with Developers on Mobile Browsers and Mobile Browser Engines, page 7.
[89] Verian Group UK (2024), Mobile Browsers Qualitative Consumer Research, slide 10.

explained above, given the network effects associated with web compatibility, users that do engage with mobile browser choice may have an incentive to choose more established browsers, as these tend to be favoured by online content providers when developing their websites and are therefore likely to perform better from the user's perspective.

2.49 Apple's internal documents indicate that ensuring web compatibility is a challenge for web developers and something Apple wants to assist them with, as well as something Apple strives to ensure and improve for WebKit and Safari. For example:

(a) Apple submitted an independent third-party report from July 2020 aimed at diving into issues which may be causing frustration for developers across different platforms, which included: having to support specific browsers, outdated documentation, having to test multiple browsers, and making the design work/look the same across browsers, having to avoid/remove features that would not work across browsers. [90]

(b) Apple submitted a presentation from September 2021 which covered Apple's vision for Safari and proposed new features. The document states that [✂]. This may imply that Apple views [✂].[91]

2.50 Similarly, Google's internal documents also refer to Google's attempts at helping [✂] web compatibility. [✂].[92]

2.51 Standards bodies such as the World Wide Web Consortium (W3C), WHATWG, and the Internet Engineering Task Force (IETF) aim to develop protocols and guidelines to ensure the health of the worldwide web.[93] Standards bodies seek to continually improve how the web works through open consensus processes.

2.52 We heard from several market participants that web standards play an important role in ensuring compatibility. For example:

(a) Apple submitted that 'the web-community relies on web standards process to ensure compatibility between browsers'.[94]

(b) Google noted that compatibility resulting from web standards reduced the barriers to entry in browsers engines when developing Blink/Chromium.[95]

[90] Apple's internal document [✂].
[91] Apple's internal document [✂].
[92] Google's internal document [✂].
[93] See About us | W3C, WHATWG - Wikipedia and IETF | About.
[94] Note of meeting with Apple [✂].
[95] Google's response to the CMA's RFI [✂].

Google also submitted that browser engines 'compete to reach the highest level of adoption and standards compliance'.[96]

(c) Microsoft noted web standards 'play an essential role' but the 'disciplining function of effective competition' is more effective in practice.[97]

(d) Opera submitted that web standards are working well and that 'compatibility between engines is good.'[98]

(e) The qualitative web developer research conducted by Jigsaw Research found that respondents considered that increasing standardisation across browsers was leading to less work to ensure compatibility, as fewer issues were arising.[99]

2.53 Despite the benefits of web standards, they are voluntary and may not fully solve compatibility issues. For example:

(a) Movement for an Open Web (MOW) submitted that it was concerned that the main standards setting body, W3C, is used by Apple and Google to slow down investment and innovation in the web that Apple and Google disagree with. MOW submitted that Apple and Google have representatives chairing committees and pushing through standards to favour themselves or restrict competition and that it is hard for alternative web standards to get adopted if they disagree with them.[100] More generally, MOW submitted that, due to the strength of Chrome, Google dominates standards bodies, allowing it to push its preferred specifications which must then be implemented by its competitors. [101]

(b) Mozilla said it was concerned about the increasing deployment in the last few years of non-standardised web technologies after in-house development or within incubation groups, [✂].[102]

(c) Apple provided a list of examples of sites that have known compatibility issues with, and impact on, WebKit-based browsers.[103] These compatibility issues arise from the fact that those sites were built using components only available in Blink which caused them a loss in functionality or loss of access.

---

[96] Google's response to the CMA's RFI [✂].
[97] Microsoft's response to the CMA's RFI [✂].
[98] Note of meeting with Opera [✂].
[99] Jigsaw Research (2024), Qualitative Research with Developers on Mobile Browsers and Mobile Browser Engines, page 8.
[100] As specific examples of the specific standards that demonstrate Google and Apple favouring their own products in W3C, MOW mentioned Federated Credential Management for single sign-on, First Party Sets/Related Website Sets and rejection of SWAN.
[101] MOW's submission to the CMA [✂].
[102] Note of meeting with Mozilla [✂].
[103] Apple's response to the CMA's RFI [✂].

(d) Microsoft noted that the decisions over what standards and functionality Apple chooses to support in Safari impacts directly whether web applications can compete with native app experiences on iOS, whether they run on WebKit or a competing browser engine.'[104]

(e) An app developer noted that, compared to other browser vendors, it had found Apple's level of engagement with respect to web standards frustrating. For example, the same app developer said it had [✂]. Additionally, the same app developer noted that: 'when Apple brings forward a standard, it does not do so with the intention to discuss it and instead raises standards that it has already shipped, which differs to how everyone else engages in the process'. In comparison, the same app developer regarded Google as cooperative and willing to give and receive feedback on standards. [105]

2.54 The Annex to 'WP2 - The requirement for browsers operating on iOS devices to use Apple's WebKit browser engine' considers differences between browser engines and browsers in relation to web compatibility in further detail.

Vertical integration

2.55 As illustrated in Figure 1.1, the CMA's MEMS report found that consumers enter into either Apple's or Google's ecosystem when purchasing a mobile device as a result of the supply chain structure.[106]

2.56 The CMA's MEMS report sets out that Apple and Google are similarly active across all layers of the supply chain. In particular, they each supply their own: (i) operating system (Apple's iOS and Google's Android); (ii) browser engine (Apple's WebKit and Google's Blink); and (iii) browser (Apple's Safari and Google's Chrome).

2.57 As demonstrated across the various working papers published in this investigation, this vertical integration, and in particular the control that Apple and Google have in relation to the iOS and Android operating systems over the software and functionality available to competing providers of other products offered on their platforms (including browsers), creates a risk that Apple and Google may give preferential access to their own products. This may create a barrier to entry and expansion to other competing browsers.

[104] Microsoft's response to the CMA's RFI [✂].
[105] Note of meeting with [✂].
[106] MEMS final report, Chapter 3.

Barriers to entry and expansion

2.58 The key potential barriers to entry and expansion being considered in this market investigation relating to the supply of mobile browsers and browser engines are as follows.[107]

(a) Indirect network effects resulting from web compatibility discussed above appear to be an intrinsic barrier to entry and expansion in this relevant market, as they make it harder for smaller rival browsers to compete. Therefore, they may also reinforce the effects of other potential barriers to entry and expansion.

(b) The risk that Apple and Google may limit access to certain software and functionality to rival products – in particular, the requirement for browsers operating on iOS devices to use Apple's WebKit browser engine – and the extent to which rival browsers have limited access to certain functionalities may impact on the ability of other browsers to differentiate themselves from Safari and/or Chrome.[108] This topic will be covered in more detail in 'WP2 - The requirement for browsers operating on iOS devices to use Apple's WebKit browser engine' and 'WP3 - Access to browser functionalities within the iOS and Android mobile ecosystems'.

(c) Similarly, Apple's and Google's restrictions on in-app browsing and potential favouring of their own in-app browsers may create barriers to entry and expansion for rivals. This topic will be covered in more detail in 'WP4 - In-app browsing within the iOS and Android mobile ecosystems'.

(d) Apple's and Google's control and use of choice architecture practices (particularly pre-installation and default settings) may increase barriers to entry and expansion, by restricting the ability of rival browsers to compete effectively. This topic will be covered in more detail in 'WP5 - The role of choice architecture in the supply of mobile browsers'.

Low user awareness and engagement with mobile browsers

2.59 Finally, end users of mobile devices appear to have low levels of awareness and engagement with mobile browsers.

(a) Mobile devices are generally sold with one or more browsers pre-installed, typically with one set as the default for instances when a user clicks on a link within another application. For example, Apple's iPhones and iPads come

---

[107] Issues statement.
[108] Paragraph 2.5.6 of Apple's App Store Review Guidelines restricts browser and native apps to use a WebKit-based browser or in-app browser. This will be covered in further detail in 'WP2 - The requirement for browsers operating on iOS devices to use Apple's WebKit browser engine'.

with Apple's Safari browser pre-installed and set as the default, and mobile devices using the Android operating system generally come with Google's Chrome pre-installed and set as the default.

(b) Pre-installation and default settings may have a significant impact on consumer behaviour. In particular, there is typically a strong correlation between the browsers that are pre-installed or set as defaults on mobile devices and their usage.

(c) There is low engagement with mobile browsers by users (they are a 'low salience topic'), limited awareness of alternative browsers available and minimal perceived benefit to switching or using multiple smartphone browsers, as per the findings of the qualitative consumer research conducted by Verian[109] – see the section above describing the key market participants interacting with browsers and browser engines.

(d) As set out further in 'WP5 - The role of choice architecture in the supply of mobile browsers', Apple's and Google's choice architecture practices (in particular, pre-installation, placement and default settings) mean that consumers may make less effective choices about which browser to use on their mobile device, and this could result in fewer consumers switching between different browsers and contributing to competition on the merits between browsers.

[109] Verian Group UK (2024), Mobile Browsers Qualitative Consumer Research, slide 10.

3. Market definition

3.1 Market definition is the process to identify the boundaries within which competition occurs for particular goods and services, such as which firms compete for which customers' business. The CMA considers two main dimensions of market definition – the product dimension and the geographic dimension.

3.2 Defining the relevant market can help to focus on the sources of any potential market power and provides a framework for the assessment of the effects on competition of features of a market.[110] In doing so, the CMA may conclude that the market should be defined more widely or more narrowly than the goods and services or areas of supply set out in the market investigation terms of reference.[111]

3.3 The composition of a relevant market is usually determined by the degree of demand substitutability, meaning the extent to which particular goods and services are seen as substitutes by consumers. However, where relevant, the CMA will also consider supply-side factors, meaning the extent to which firms supplying non-substitute products have the capabilities and assets to redirect production to goods and services that would be substitutes for those in the market.

3.4 As set out in our Guidelines for market investigations, market definition is a useful tool but not an end in itself, and identifying the relevant market involves an element of judgement. The boundaries of the market do not determine the outcome of our competitive assessment of a market in any mechanistic way. The competitive assessment takes into account any relevant constraints from outside the market, segmentation within it, or ways in which some constraints are more important than others.[112] Market definition and the assessment of competition are not distinct chronological stages of an investigation but rather are overlapping and continuous pieces of work, which often feed into each other.[113]

3.5 Our starting point for assessing market definition is the set of products and services identified in the terms of reference for this investigation, namely the supply of mobile browsers and mobile browser engines in the United Kingdom.[114]

3.6 This section considers in turn the product and geographic dimensions of market definition. In doing so, we consider the most important competitive constraints relevant to the supply of mobile browsers and mobile browser engines and provide

---

[110] CC3 (Revised), Guidelines for market investigations: Their role, procedures, assessment and remedies, paragraph 132.
[111] CC3 (Revised), Guidelines for market investigations: Their role, procedures, assessment and remedies, paragraphs 26 and 131.
[112] CC3 (Revised), Guidelines for market investigations: Their role, procedures, assessment and remedies, paragraph 133.
[113] CC3 (Revised), Guidelines for market investigations: Their role, procedures, assessment and remedies, paragraphs 94 and 95.
[114] Terms of reference.

emerging views on the appropriate relevant market for the analysis of the issues set out in our issues statement.[115]

3.7 The remainder of this section is structured as follows.

(a) The first sub-section provides an overview of the available evidence relevant to the product market definition, considering both demand-side and supply-side substitutability.

(b) The second sub-section considers the geographic dimension of market definition.

(c) The third sub-section provides a summary of our emerging findings in relation to market definition.

Product market definition

3.8 To assess whether products are substitutes, the CMA may consider product characteristics, relative price levels (when applicable), sales volumes, responses from customers, competitors and interested and informed third parties and firms' own views of the products.[116]

3.9 The boundaries of the relevant product market are generally determined by reference to demand-side substitution alone. However, there are circumstances where the CMA may consider that several narrow relevant markets should be aggregated into one broader market based on supply-side considerations. For example, this may be the case when: (i) firms routinely use their existing production assets to supply a range of different products that are not demand-side substitutes and there is evidence that firms in practice shift their existing capacity between these different products depending on demand for each; and (ii) the same firms compete to supply these different products and the conditions of competition between the firms are the same for each product.[117]

3.10 The rest of this section provides an overview of the available evidence on the following questions:

(a) the extent of competition between mobile browsers and browser engines;

(b) the extent of competition between mobile browsers on iOS and mobile browsers on Android devices;

---

[115] Issues statement.
[116] CC3 (Revised), Guidelines for market investigations: Their role, procedures, assessment and remedies, paragraph 143.
[117] Merger Assessment Guidelines, paragraph 9.8.

(c) the extent of competition between mobile and desktop browsers; and

(d) the extent of competition between mobile browsers and other native apps, particularly app stores, search apps and apps incorporating in-app browsers.

Competition between mobile browsers and browser engines

3.11 This section considers the extent to which mobile browsers and browser engines compete and therefore should be in separate relevant markets or the same relevant market. We first consider demand-side substitutability, then supply-side substitutability, to the extent it is relevant.

3.12 As explained in Section 2, browser engines are the technology underpinning browsers and are responsible for transforming website source code into web content that people can see and engage with. On top of the browser engine sits a branded user interface which has user-facing functionality such as favourites, browsing history and storing the user's data such as passwords and payment details.

3.13 As a result, from a user's perspective, a browser engine is not substitutable but rather a complement to the browser product that is built on top, as both elements are needed for the user to navigate the web. Therefore, while the two products tend to be used together, there is limited demand-side substitutability between them from a functional perspective, as the browser engine is not typically used instead of the browser but rather in conjunction with it.

3.14 From a supplier's perspective, there are similarities in the competitor set – indeed, the largest providers of browser engines (Apple and Google) are also the largest browser providers, and it is arguably relatively easy for a provider of a browser engine to also provide a browser.

3.15 However, the opposite may not be true, as it is not easy for browser vendors who do not also provide an engine to enter the supply of browser engines. This is consistent with evidence we have seen from browser vendors and browser engine providers, suggesting that providing and maintaining a browser engine is costly and requires significant effort. Indeed, the supply of browser engines has become more consolidated over the past few years,[118] with modern browser engines rarely being proprietary and instead relying (at least to a certain extent) on the open-source community.

[118] For example, Opera used a proprietary engine (Presto) until 2013 while Microsoft transitioned to Blink (from Trident and EdgeHTML) in 2018. See MEMS final report, Table 5.1.

3.16 Therefore, while we consider supply-side substitutability to be asymmetric, meaning higher from browser engines to browsers than vice versa, this is overall relatively limited.

3.17 As a result of the above, our emerging thinking is that mobile browsers and browser engines should be regarded as separate markets.

Competition between mobile browsers on iOS and Android devices

3.18 This sub-section considers the extent to which browsers on iOS devices compete with browsers on Android devices (in other words, the extent to which mobile browsers on different operating systems compete) and therefore should be in separate relevant markets. We first consider demand-side substitutability, then supply-side substitutability, to the extent it is relevant.

3.19 As explained in Section 2, users can either obtain mobile browsers as pre-installed on their mobile devices or download a mobile browser suitable for the operating system on their device (whether iOS or Android). Therefore, the answer to the extent to which browsers on iOS devices compete with browsers on Android devices depends, from the user's perspective (ie on the demand side), on:

(a) The extent to which mobile devices running on different operating systems compete – which was considered in the CMA's MEMS report; and

(b) The extent to which specific apps influence users' choice of (and potentially switching away from) a specific mobile device or operating system.

3.20 Firstly, the CMA's MEMS report set out detailed evidence that competition is limited between mobile ecosystems. In particular:

(a) A survey carried out for the purposes of the CMA's MEMS report suggests that users typically purchase one 'personal smartphone' which they use as their primary mobile device and this purchase is relatively infrequent.[119]

(b) The same survey identified that 90% of iOS users' previous phone was an iPhone and 91% of Android users' previous phone was an Android phone.[120]

(c) Additionally, significant barriers exist in switching devices, including the perceived cost of learning how to use a new operating system, and the fact that consumers own other devices within the same ecosystem as their mobile device. Further, to switch between ecosystems many users would need to buy a new mobile device.[121]

[119] Accent, Consumer purchasing behaviour in the UK smartphone market.
[120] Accent, Consumer purchasing behaviour in the UK smartphone market.
[121] Accent, Consumer purchasing behaviour in the UK smartphone market, pages 39 to 41.

(d) Overall, the CMA's MEMS report concluded that Android and iPhone operate in two different market segments – higher-priced and lower-priced devices.[122]

3.21 Secondly, the CMA's MEMS report found evidence suggesting that many factors influence a consumer's initial choice of device, and the availability and range of mobile apps is not particularly significant. According to the survey carried out for the purposes of the CMA's MEMS report, the most mentioned factors were brand (particularly for iOS), screen size and quality, overall price, battery life and camera. On the other hand, the range and quality of mobile apps available on the device and price of subscriptions/content for apps available on the device were among the least mentioned factors across both Android and iOS – ie 15% or fewer users across iOS and Android considered the range or quality of apps in their phone choice.[123] This suggests that native apps generally (among which are mobile browsers) are not a strong parameter of competition between mobile ecosystems.

3.22 These findings are consistent with qualitative consumer research conducted by Verian for this market investigation, which noted the topic of browsers on users' smartphones was a low salience topic that had rarely been considered, if noticed at all, by respondents.[124] This supports the view that the availability of specific browsers and browser engines on a mobile device and their quality likely plays a limited role in users' decisions to purchase mobile devices (and in driving competition between mobile ecosystems).

3.23 When looking at the supply side, as described in Section 2, we have seen evidence consistent with some monitoring between iOS and Android. For example, Apple's internal documents indicate that it benchmarks Safari against Chrome and Firefox when it comes to privacy features.[125] This suggests that there may be some competitive interaction, at least indirectly, among providers of mobile browsers which are active on different operating systems (ie on the supply side).

3.24 However, the extent to which any monitoring and benchmarking would be aimed at encouraging users to switch between ecosystems (eg because they are not happy with their browser experience) is unclear. This benchmarking may be more general in nature, such as monitoring key developments in other browser features.

3.25 When considering supply-side substitutability, and particularly the presence of mobile browsers and browser engines across iOS and Android, we note that native apps, including mobile browsers, are largely operating system-specific and need to be developed separately for iOS and Android. Furthermore, browser engines are also operating system-specific, due to the current restriction in place

[122] MEMS final report, Chapter 3.
[123] Accent, Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystem Market Study, page 17.
[124] Verian Group UK (2024), Mobile Browsers Qualitative Consumer Research, slide 10.
[125] Apple's internal document [✂].

on iOS which does not allow browser engines other than WebKit.[126] The latter implies that mobile browsers using Blink on Android must build an entirely different product for iOS, which is confirmed by the evidence we have seen from browser vendors that, even when mobile browsers are present across ecosystems, their products are different and tend to require different work. Indeed, browser vendors generally told us that they have separate teams focussing on iOS and Android respectively. As a result, we consider supply-side substitutability to be limited.

3.26 Overall, the availability of specific browsers and browser engines on a mobile device and their quality is likely to play a limited role in users' decisions to purchase mobile devices, particularly given the evidence of low user engagement and also given that mobile browsers are only one type of app amongst many that users access via their device. Further, any supply-side substitutability also appears to be relatively limited.

3.27 On this basis, it is our emerging thinking that the supply of mobile browsers on iOS and Android should be considered as two separate product markets.

Competition between mobile and desktop browsers

3.28 Desktop browsers are not included within the scope of the market investigation reference.[127] However, given potential similarities between mobile and desktop browsers, particularly from the perspective of browser vendors (ie the supply side), we are considering the extent to which browsers on mobile devices compete with browsers on desktop. We first consider demand-side substitutability, then supply-side substitutability, to the extent it is relevant.

3.29 Smartphones and tablets are both covered by our definition of 'mobile devices' in the context of this market investigation given similarities among them. Indeed, albeit browsing on smartphones likely occupies a larger proportion of users' overall time spent in browsers,[128] shares of supply for mobile operating systems considering smartphones and tablets jointly and separately reveal a similar picture.[129] We note that in 2019 Apple introduced iPadOS and labelled it specifically for Apple tablets (which were originally powered by iOS instead), but its browser policies (including for example the WebKit restriction)[130] appear to

[126] Paragraph 2.5.6 of Apple's App Store Review Guidelines restricts browser and native apps to use a WebKit-based browser or in-app browser. This will be covered in further detail in 'WP2 - The requirement for browsers operating on iOS devices to use Apple's WebKit browser engine'.
[127] Consultation on proposed market investigation reference, paragraph 2.11.
[128] Specifically, Ofcom's 2022 Online Nation report found that consumers use smartphones for an average of 3 hours daily, compared to just over 30 mins for tablets. Online Nation 2022 Report, Figures 1.4 and 1.6.
[129] MEMS final report, Chapter 3.
[130] Paragraph 2.5.6 of Apple's App Store Review Guidelines restricts browser and native apps to use a WebKit-based browser or in-app browser. This will be covered in further detail in 'WP2 - The requirement for browsers operating on iOS devices to use Apple's WebKit browser engine'.

apply uniformly across the two products but not to macOS, which is the operating system powering Apple's laptop and desktop devices.

3.30 Some browser vendors consider that their mobile and desktop browser are substitutes from the users' perspective, on the basis that they have similar features and functionality and that users are (in theory) able to switch between the two. For example:

(a) Google submitted that desktop and mobile browsers offer similar functionality, and that the majority of browsers are present on both desktop and mobile, because once a developer has invested in the first version of their browser, making the same services available on a different platform requires considerably less incremental investment. Google also submitted that browsers compete for users on a cross-platform basis.[131] Further evidence from Google suggests that users may look for the same features in a mobile and desktop browser.[132]

(b) In 2021, Apple submitted that [✂]. Indeed, it stated that Safari is marketed as a web browser, not a mobile browser or desktop browser.[133] Apple has also submitted that it generally replicates feature sets across platforms when it makes sense for the user experience for the type of platform. It stated that, to the extent that desktop and mobile devices have unique characteristics and features (such as screen size and whether they utilize keyboards or touch screens), features may be designed differently for each use case. For example, the keyboard shortcuts on Mac can be used on iPad if the user connects it to a keyboard, but it is far less likely that a user would connect a keyboard to an iPhone, so Safari on iOS is oriented instead towards touch.

3.31 However, we have also seen evidence suggesting that mobile and desktop browsers may be complements, on the basis of different use cases, and therefore competing in separate markets. For example:

(a) Mozilla stated that it considers mobile browsers and desktop browsers to be separate product markets but that, notwithstanding this, in Mozilla's case, [✂]. Mozilla also stated that, to the extent that providing a browser on desktops helps (or has helped) to attract users on mobile devices, it is not clear that this will continue to be the case as global internet traffic moves to increasingly being accessed via mobile devices.[134]

(b) Consumer research conducted by Microsoft indicates that mobile browsers are used differently than desktop browsers.[135] Additionally, in its market

[131] Google's response to the CMA's RFI [✂].
[132] Google's response to the CMA's RFI [✂].
[133] Apple's response to the CMA's RFI [✂].
[134] Mozilla's response to the CMA's RFI [✂].
[135] Microsoft's response to the CMA's RFI [✂].

investigation RFI response, Microsoft submitted that: 'Desktop is often seen as a space for more time to be spent in a learning and productive mindset, while consumers tend to interact in shorter bursts such as searching for an answer or checking for updates on things like sports/news on mobiles.'[136]

3.32 The view that mobile and desktop browsers are largely complements rather than substitutes is consistent with consumer research [✂] received during the CMA's MEMS which suggests that the use case differs between desktop and mobile,[137] as well as with qualitative consumer research commissioned as part of this market investigation and conducted by Verian, which found that respondents typically had preferences for completing certain tasks on their smartphone compared to their desktop.[138]

3.33 This view is also consistent with decisional practice in other jurisdictions. For example, in its Google Android investigation, the European Commission found that desktop browsers do not belong to the same product market as mobile browsers.[139]

(a) With respect to the demand side, it noted that desktop browsers and mobile browsers rely on different technology and provided examples of different browsing experiences between the two (eg greater processing power on desktops).[140]

(b) With respect to the supply side, it found that switching between developing desktop and mobile browsers takes significant time and substantial investments.[141]

3.34 To further understand the extent of supply-side substitutability, we considered whether browser vendors can easily switch from providing a desktop browser to providing a mobile one. This would be the case, for example, if being present in desktop provides advantages to enter mobile, such as due to desktop providers being able to easily leverage their position and strengths to expand into mobile.

3.35 Browser vendors generally considered having a desktop browser makes it easier to enter mobile browsing.[142] However, Mozilla, for example, recognised that despite this, there were additional costs involved in developing and maintaining different browser engines (eg to launch on iOS) and duplication cost from

---

[136] Microsoft's response to the CMA's RFI [✂].
[137] [✂] response to the CMA's [✂].
[138] Verian Group UK (2024), Mobile Browsers Qualitative Consumer Research, slide 12.
[139] Google Android Decision, paragraph 369. Google appealed the European Commission's decision to the General Court. This particular aspect of market definition did not form part of the subject-matter of the appeal (Judgment of 14 September 2022, Google LLC (and others) v European Commission Case T- 604/18, EU T:2022:541). Google has in turn appealed the General Court's judgment, which largely upheld the European Commission's decision, to the Court of Justice in Case C-738/22 P.
[140] Google Android Decision, paragraph 370. See footnote 139 for further relevant information about this decision.
[141] Google Android Decision, paragraph 371. See footnote 139 for further relevant information about this decision.
[142] Responses to the CMA's information requests [✂].

programming in languages provided by the mobile vendors such as Kotlin (Android) or Swift (iOS).[143]

3.36 We also asked browser vendors about the extent to which development was shared between mobile and desktop browsers. The evidence is consistent with some degree of supply-side substitutability between mobile and desktop browsers when these are based on the same browser engine, as browser vendors can share a large proportion of the codebase between their desktop and mobile browsers. However, this is limited by the fact that desktop and mobile still require distinct support, with most browser vendors having separate teams working on desktop and mobile, although some submitted that their teams work cross-functionally. In particular:

(a) Apple submitted that it [✂].[144] Apple estimates that the shared codebase between Safari on iOS and Safari on Mac amounts to [over 50%]. If limited to Safari app code only (excluding the WebKit Engine and other frameworks), Apple estimates that [less than 50%] of Safari app code is shared between Safari on iOS and Safari on Mac.

(b) Google stated that the extent to which code is shared between desktop and mobile browsers 'depends in large part on whether the same browser engines are available and used'.[145] Google estimates that Chrome on desktop and Chrome on Android share [over 50%] of their code, whereas [less than 50%] of the code underlying WebKit-based Chrome on iOS is unique to that platform and not used for Blink-based Chrome on either Android or desktop (including macOS). Google further submitted that it has [✂].

(c) Mozilla submitted that Firefox for iOS is 'entirely different' from its desktop browser, due to the iOS browser engine restriction. However, it estimated that around 96% of the Firefox for Android codebase is shared with desktop, as Mozilla is able to use its Gecko browser engine. It also stated that its mobile development teams are largely separate from those that work on the desktop version of Firefox. [146]

(d) Vivaldi stated that the main difference between its desktop browser and Android browser is the user interface, which represents roughly 10% of their code base.[147]

[143] Mozilla's response to the CMA's information request [✂].
[144] Apple's response to the CMA's information request [✂].
[145] Google's response to the CMA's information request [✂].
[146] Mozilla's response to the CMA's RFI [✂].
[147] Vivaldi's response to the CMA's RFI [✂].

3.37 Finally, certain Google internal documents indicate that Google sets different targets for [✂].[148]

3.38 Overall, there may be a degree of supply-side substitutability between desktop and mobile browsers, with browser vendors finding it helpful to be present in desktop for entering mobile and sharing code between the two versions of these products. However, these are distinct products which may be subject to different requirements (eg browser engine rules, optimisation for certain screen size and type of device). Therefore, supply-side substitutability appears overall relatively limited. This is confirmed by browser providers themselves often having separate teams for each product.

3.39 From a demand side perspective, their use case ultimately differs, with mobile browsers more widely used 'on-the-go' browsing and users preferring to use one or the other depending on the task, which means that they are more likely complements than substitutes.

3.40 As a result of the above, our emerging view is that mobile and desktop browsers should be regarded as separate markets.

Competition between mobile browsers and other native apps

3.41 In addition to mobile browsers, users access web content on mobile devices via native apps. There are three key questions relating to the extent to which mobile browsers compete with other native apps:

(a) The extent to which mobile app stores (and native content more generally) compete with mobile browsers;

(b) The extent to which search apps compete with mobile browsers; and

(a) The extent to which in-app browsers compete with mobile browsers. We provide some background on this topic in this paper but will cover further detail in 'WP4 - In-app browsing within the iOS and Android mobile ecosystems'.

3.42 Below, we present our emerging views based on the review of the available evidence set out in the CMA's MEMS report and that obtained in this market investigation to date. We first consider demand-side substitutability, then supply-side substitutability, to the extent it is relevant.

[148] Google's internal document [✂].

Mobile app stores, native content and mobile browsers

3.43 While there may be commonalities between mobile browsers and app stores as gateways to content on mobile devices (web and native content respectively), they are ultimately different products as the former allows users to navigate the web and access web content, and the latter allows users to download native apps and as a result access native content. Therefore, we consider demand-side substitutability to be limited between mobile app stores and mobile browsers. From a supply-side perspective, while it is the case that some market participants (including for example Apple and Google) provide both mobile browsers and mobile app stores, they are regarded as serving different purposes within their broader ecosystem.

3.44 Individual native apps available through mobile app stores are also not likely to be substitutes to mobile browsers, given the latter have a very specific use case and functionality – navigating the internet. We note that certain apps may be used to access web content under certain specific circumstances, for example these include search apps and native apps incorporating an in-app browser.

3.45 More generally, we note that there are certain use cases for which downloading a specific native app from an app store and using it to access specific native content may sometimes be seen as a substitute to browsing the web for similar content. This depends on the extent of substitutability between native apps and web apps, both from a user's perspective and from a developer/content provider's perspective, for that specific content.

3.46 Evidence from the CMA's MEMS report suggests that substitutability between native apps and web apps/websites is seen as relatively limited from a user's and developer's perspective, given websites and native apps are accessed by users in different ways (the former typically via an app store which may contribute to their discoverability) and tend to offer different content and functionality. Further, native apps and web apps also differ in terms of their development process.[149]

3.47 This is also consistent with the qualitative web developer research conducted by Jigsaw Research, commissioned as part of this market investigation, where respondents indicated that the main perceived benefit of building a web app or website as opposed to a native app was that developers only had to build once, rather than build separate apps in separate code for different Apple and Android devices and ecosystems.[150]

[149] MEMS final report, Chapter 4, 5 and 6.
[150] Jigsaw Research (2024), Qualitative Research with Developers on Mobile Browsers and Mobile Browser Engines, page 21.

3.48 On the other hand, Google's internal documents indicate that native apps may to some extent pose a competitive constraint to mobile browsers. For example:

(a) Google submitted an internal document stating that [✂].[151]

(b) [✂].[152]

(c) [✂]. The document states [✂].[153]

3.49 Overall, based on the evidence we have seen so far, our preliminary thinking is that app stores and mobile browsers are different products and generally not substitutable, from either a supply-side or a demand-side perspective. Therefore, they should be regarded as separate markets.

3.50 When looking at whether native content can exert a constraint on web content accessible via mobile browsers, we note that this appears relatively limited and likely case specific. As a further cross check, in the section below, we assess in search apps and in-app browsers in further detail as they do access web content under certain circumstances and so may be more similar to mobile browsers.

Mobile browsers and search apps

3.51 Overall, evidence on the extent to which search apps exert a competitive constraint on browser apps is mixed. While mobile browsers and search engines are different products with ultimately different functionality, we have seen evidence that search apps may exert some form of constraint on mobile browsers, as the distinction between the two services is not always clearcut from the users' perspective.

3.52 Starting from demand-side substitutability, based on the evidence we have seen to date, search apps may be perceived as to some extent substitutable to standalone browsers by users. Indeed, the qualitative consumer research conducted by Verian for this market investigation suggests that browsers and search apps are seen as interchangeable by most respondents.[154] This suggests that the two may be seen to work similarly by users, as an access point to the internet.

3.53 While search apps and browser apps are technically different and have different functionality, with mobile browsers being used to navigate the web, and search apps to interrogate the web for relevant content based on search queries, mobile

[151] Google's internal document [✂].
[152] Google's internal document [✂].
[153] Google's internal document [✂].
[154] When identifying logos and their function, most users were not aware of any differences between browsers and search apps and so grouped them as one and the same. This was even among those who had reported and demonstrated high digital confidence. See Verian Group UK (2024), Mobile Browsers Qualitative Consumer Research, slide 21.

browsers can be seen as an access point to search services. This may contribute to both being potentially seen as access points to the web.

3.54 From a supply-side perspective, we note that, while there may be providers which offer both, the vast majority do not.

3.55 Evidence from browser vendors on the extent to which they see their browser app as competing with search apps is somewhat mixed:

(a) DuckDuckGo submitted that it competes with pure search engines (eg Google) with its search product, and separately it competes with pure browsers (eg Chrome) with its browser product.[155]

(b) Vivaldi stated that it views search apps as direct competitors to the Vivaldi browser, unless the search app utilises the user's browser of choice (ie the 'default' browser) to display search results. It submitted that: 'If these apps do not launch Vivaldi to show the search result, even when Vivaldi is set as the user's default browser, it's reasonable to expect that users might use Vivaldi less frequently over time.'[156] We understand this to refer to the fact that search apps can either display weblinks to the user via an in-app browser, or re-direct the user to a standalone browsers which they have installed on their device. We explore the relationship between search apps and in-app browsers in greater detail in 'WP4 - In-app browsing within the iOS and Android mobile ecosystems'.

(c) Ecosia (a search engine operator) submitted that its product can be considered to compete with browsers.[157]

(d) Brave submitted that there is 'no fundamental difference between browsers and search apps'.[158]

3.56 Based on evidence seen so far, our emerging view is that there is some evidence pointing towards search apps likely being in a separate market to mobile browsers – as mobile browsers and search apps are distinct products and supply-side substitutability is limited between the two. We continue to investigate this topic further, including in 'WP4 - In-app browsing within the iOS and Android mobile ecosystems'.

Mobile browsers and in-app browsers

3.57 Like a dedicated browser, some native apps have an in-app browser which allows users to open links to view web content. We are still considering the extent to

[155] Note of meeting with DuckDuckGo [✂].
[156] Note of meeting with Vivaldi [✂].
[157] Note of meeting with Ecosia [✂].
[158] Note of meeting with Brave [✂].

which certain native apps, particularly those which include an in-app browser, exert a competitive constraint on standalone mobile browsers (and vice versa) and whether the two should be considered in the same relevant market. This issue is considered further in 'WP4 - In-app browsing within the iOS and Android mobile ecosystems'.

3.58 The extent to which native apps with in-app browsers can be considered as substitutable to standalone mobile browsers from a demand-side perspective appears limited. Indeed, native apps with in-app browsers have a fairly specific use case, with in-app browsers often used to view just one or two websites before returning to the native app, whereas dedicated browsers are used to navigate the web. Further, in-app browsers typically lack certain browser functionalities, for example they generally do not have a URL bar or a search function, cannot access browsing history or sync it with the user's history on a standalone browser, and do not have password saving features or tabs.

3.59 During this market investigation, some browser vendors expressed the view that in-app browsers do not compete closely with dedicated browsers. In particular:

(a) Apple submitted that Safari competes most directly with other dedicated browsers.[159] It explained that dedicated browsers are designed differently from native apps and that users who want to generally browse the internet, rather than engage in a specific activity like playing a game, typically choose a dedicated browser rather than non-browser apps. It further explained that users generally seek certain overall features and functionality for their web browsing experience that non-browser apps do not provide.

(b) Google explained that dedicated browser apps such as Chrome serve different purposes to other native apps.[160] It stated that: 'In-app browsers are necessarily limited to navigating web content accessed as part of experiencing the native app, in contrast to Chrome, which is designed to facilitate general web browsing.'

(c) DuckDuckGo stated that it viewed in-app browsers as more of a functionality of the browser, rather than a separate product.[161]

(d) Microsoft submitted that Edge does not compete with 'knock-off browser' in-app browsers presented to users by native app developers.[162]

[159] Apple's response to the CMA's RFI [✂].
[160] Google's response to the CMA's RFI [✂].
[161] Note of meeting with DuckDuckGo [✂].
[162] Note of meeting with Microsoft [✂].

3.60 Similarly, in the European Commission's Google Android investigation, Sony submitted 'The market expectation and compliance requirements stipulate that mobile products must include a [dedicated] browser'.[163]

3.61 Browser vendors broadly considered that their browsers can access a wider array of content than native apps and have more complex functions than native app in-app browsers, so they are sufficiently different.[164] Smaller browser vendors responded that they had no firm opinion on the question of whether they compete with native apps.[165]

3.62 However, other browser vendors submitted in the CMA's MEMS that in-app browsers can pose a constraint under some circumstances, such as when a user opens a link within a non-browser app and views the link's content within the non-browser app's in-app browser. In particular:

(a) Mozilla submitted that: 'From Mozilla's perspective, the role of in-app browsing is often overlooked when it comes to the relationships between browser and non-browser apps.' And that 'affiliated browsers opened by non-browser apps and websites opened in non-browser apps do pose a constraint on the use of mobile browsers and engines and have a domino impact on web compatibility.'[166]

(b) Vivaldi submitted that: 'non-browser apps in some cases are substitutes to mobile browsers. For example, when a user clicks on a link within a non-browser app, the app in some cases displays the linked page content within the app instead of opening a browser app. In that situation, non-browser apps are substitutes to mobile browsers.'[167]

3.63 Additionally, there is some evidence that in-app browsers within certain apps in particular may exert some form of constraint on dedicated mobile browsers. For example:

(a) A Google internal document from the CMA's MEMS shows that it [✂].[168]

(b) Google submitted during the CMA's MEMS that: 'as a result of the increased time end-users generally spend on their mobile devices (and by proxy, in Apps), [✂]. This includes non-browser apps incorporating Custom Tabs (where the app developer essentially uses a Browser to display information within that app – eg, Twitter, LinkedIn, and Slack) and WebView (where the app developer builds and maintains its own in-app browser – eg, Facebook,

[163] European Commission Initial Judgment, paragraphs 378 and 379. Note in the General Court appeal these findings were not contested by Google so were not reconsidered in the General Court judgment.
[164] Responses to the CMA's information requests [✂].
[165] Responses to the CMA's information requests [✂].
[166] Mozilla's response to the CMA's information request [✂].
[167] Vivaldi's response to the CMA's information request [✂].
[168] Google's response to the CMA's information request [✂].

Instagram, Naver, Kakao, and GoJek). In both scenarios, an end-user does not need a standalone browser app. This has the effect of increasing competition between browsers and non-browser Apps on mobile devices.'[169]

(c) An app developer noted that apps with good in-app browsers pose competitive constraints on standalone browsers like Safari, to the same or larger extent than rival standalone browsers.[170] It pointed to examples in China where apps are less constrained and in-app browsers can support "Mini Apps" that combine native and web experiences. The same app developer said that apps like these, whose in-app browsers are fully featured and better integrated with the operating system, are able to more directly compete with Safari. The same app developer further noted that having a URL bar is an arbitrary condition to qualify as a browser. The same app developer considers that it currently competes with [✂].

3.64 From a supply-side perspective, we consider there to be some substitutability between native apps incorporating an in-app browser and standalone browsers. Indeed, we note that several standalone browsers also provide the in-app browser functionality which native apps incorporating in-app browsers use, and therefore in-app browsers could be seen as an extension of mobile browsers themselves.[171] However, we also note that in the case of native apps incorporating an in-app browser, browser vendors are not providing their product to users directly, but to app developers for them to incorporate it into their native apps.[172]

3.65 Based on evidence seen so far, we consider it likely that in-app browsers should be regarded as either separate markets to standalone mobile browsers, or a sub-segment of a wider mobile browsing market. We explore this topic in greater detail in 'WP4 - In-app browsing within the iOS and Android mobile ecosystems'.

Geographic market definition

3.66 The geographic market is an area covering a set of firms or outlets which compete closely because enough customers consider them to be substitutes.[173]

3.67 As noted above, our market investigation terms of reference concern the supply of mobile browsers and mobile browser engines in the UK. Based on the evidence we have seen so far, both in submissions and internal documents, while mobile browsers and browser engines are typically made available on a global basis, companies consider the specific country where their product is being used when

[169] Google's response to the CMA's information request [✂].
[170] Note of meeting with an app developer [✂].
[171] Indeed, some browser vendors told us that they see offering in-app browsing as a way to further support their users. We explore this in greater detail in 'WP4 - In-app browsing within the iOS and Android mobile ecosystems'.
[172] We explore this topic in greater detail in 'WP4 - In-app browsing within the iOS and Android mobile ecosystems'.
[173] Guidelines, paragraphs 145.

designing it and making it available to users. Therefore, for the purposes of this investigation, our emerging view is that the scope of the geographic market to be the UK.

Summary of emerging findings on market definition

3.68 In summary, the evidence we have seen to date suggests that:

(a) Browsers and browser engines should be regarded as separate markets, as they are complements from a user's perspective and, while there may be some supply-side substitutability among the two products (more from browser engines to browsers than vice versa), this is overall relatively limited.

(b) Mobile and desktop browsers should be regarded as separate markets, as they are largely complements from a user's perspective given mobile browsers being used 'on-the-go'. While there may be some supply-side substitutability among the two, this is overall relatively limited and browser providers often have separate teams for the two.

(c) Mobile browsers on iOS and mobile browsers on Android should be regarded as separate markets, as the extent of competition between Android and iOS is limited, and the availability and quality of specific browsers and browser engines on a mobile device likely plays a limited role in users' decisions to purchase a mobile device. Further, even when mobile browsers are present across ecosystems, their products are different and tend to require separate work (including due to different browser engine rules).

(d) Mobile browsers and mobile app stores should be regarded as separate markets, as they are different products, with the former allowing users to navigate the web and access web content, and the latter allowing users to download native apps and therefore access native content. While there may be certain use cases for which native content can exert a constraint on web content accessible via mobile browsers, substitutability between native apps and web apps/websites appears relatively limited from a user's and developer's perspective.

(e) Mobile browsers and mobile search apps are likely to be in separate markets. This is because, while they may be perceived as interchangeable by some users, they are technically different products and have different functionality and supply-side substitutability is limited between the two.

(f) Mobile browsers and native apps incorporating an in-app browser are likely to be either in separate markets to standalone mobile browsers or a sub-segment of a wider mobile browsing market. This is because, while demand-side substitutability is fairly limited, as in-app browsers' use case is quite

specific, there is some degree of supply-side substitutability, given certain in-app browsing implementations can be offered by mobile browsers themselves, and therefore in-app browsers could be seen as an extension of mobile browsers themselves. We explore this topic in greater detail in 'WP4 - In-app browsing within the iOS and Android mobile ecosystems'.

(g) The scope of the geographic market should be the UK.

4. Mobile browser and browser engine shares of supply

1.2 This section covers information on shares of supply in those we consider corresponding more closely to the markets we are proposing to define, as described in Section 3.

4.1 More specifically, we present: (i) browser shares of supply on mobile devices (which comprises both smartphones and tablets), combined across operating systems (ie across both iOS and Android); and (ii) browser and browser engine shares of supply on mobile devices, split by mobile operating system (ie split between iOS and Android). The latter aligning more closely with those we consider as most appropriate relevant market(s).

4.2 As shown below, Apple's Safari and Google's Chrome are the largest browsers on mobile devices in the UK, with Safari being the largest browser on iOS devices and Chrome being the largest browser on Android devices (and the second largest on iOS devices). The available data shows that the combined share of these two browsers on mobile devices across iOS and Android in the UK amounts to 89% in 2024, with Safari having a share of supply of 45% and Chrome a share of 44%. Apple and Google also have the largest browser engines, with a combined share of almost 100% on mobile devices across iOS and Android in the UK.

Mobile browser shares of supply

4.3 Publicly available data from Statcounter does not provide browser market share estimates in the UK split by operating system. However, it provides browser market share estimates in the UK on 'mobile' (which comprises both smartphones and tablets across iOS and Android), as well as, separately, 'smartphone' and 'tablet' devices, again across iOS and Android for the period 2012 to 2014.[174]

4.4 The figure below presents the evolution of shares of supply for browsers on mobile devices in the UK from 2012 until 2024. In particular:

(a) Safari's share of supply on mobile devices has remained relatively stable over time, although it has been decreasing slightly since 2012. It ranged between 45% and 58% from 2012 to 2024.

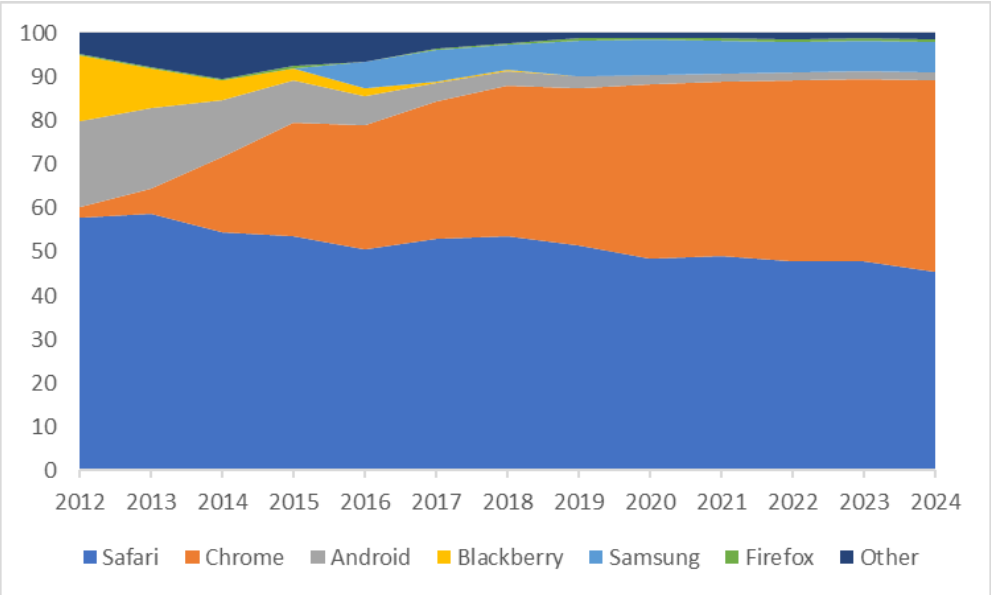
(b) Chrome's share of supply on mobile devices has increased substantially, from 2% in 2012 to 44% in 2024.

(c) Samsung Internet is the only other browser with a share of supply above 5% on mobile devices – although we note that Samsung Internet it is only

[174] Statcounter, Mobile & Tablet Browser Market Share United Kingdom.

available on Android and not on iOS.[175] It gained share significantly in 2016 and has remained at around 6% to 8% since.

Figure 4.1: UK browser shares of supply (mobile) – 2012 to 2024



Source: Statcounter, Mobile & Tablet Browser Market Share United Kingdom. Notes: (i) Mobile refers to both smartphones and tablets; (ii) Android refers to AOSP-based browsers developed on top of the web browser apps made available through the Android Open-Source Project. European Commission, Google Android Decision, footnote 1034.

4.5 When considering the evolution of shares of supply for browsers on smartphone devices alone and, separately, tablet devices, the picture is similar, with Safari and Chrome being the largest browsers on each.[176]

Mobile browser and browser engine shares of supply by operating system

4.6 As explained in Section 3, our emerging view is that mobile browsers on iOS and Android should be treated as two separate markets. We have therefore assessed shares of supply for browsers and browser engines by operating system as these correspond more closely to the markets are proposing to define. As set out in Section 2, Apple and Google have an effective duopoly in relation to mobile operating systems, therefore we have limited our assessment to iOS and Android. Below, we refer to a range of evidence on browser and browser engine shares of supply by operating system in order to obtain a more complete picture, including: (i) App Annie data on estimates of browser usage minutes provided by a browser vendor; and (ii) publicly available data on browser market shares from Cloudflare.

[175] See Frequently asked questions about Samsung Internet.
[176] In particular, on smartphone devices: (i) Safari's share of supply has remained relatively stable over time at around 46%; (ii) Chrome's share of supply has increased substantially, from 0.6% in 2012 to 45% in 2024; and (iii) Samsung Internet is the only other browser with a share of supply above 5% - it gained share significantly in 2016 and has remained at around 7% to 10% since. On tablet devices: (i) Safari's share of supply has declined substantially, from 87% in 2012 to 45% in 2024; and (ii) Chrome's share of supply has increased over time, from 5% in 2012 to 36% in 2024. See Statcounter, Mobile Browser Market Share United Kingdom.

App Annie

4.7 The App Annie data provided by a browser vendor includes estimates of usage minutes for each mobile browser on:[177]

(a) iOS for the period January 2018 to April 2024. This data is categorised as: 'iOS All Devices' (which we understand to comprise data related to both iPhones and iPads); 'iPhone' (which we understand to comprise data related to iOS smartphones – ie iPhones); and 'iPad' (which we understand to comprise data related to iOS tablets – ie iPads); and

(a) Android for the period January 2015 to April 2024. This data is categorised as: 'Android all devices' (which we understand to comprise data related to both Android smartphones and tablets); 'Android Phone' (which we understand to comprise data related to Android smartphones); and 'Android Tablet' (which we understand to comprise data related to Android tablets).

4.8 As illustrated in the table below, we used the App Annie data to estimate mobile browser and browser engine shares of supply on Android in 2023. These estimates were calculated based on each browser's total usage minutes in 2023 on 'mobile' devices (ie smartphone plus tablets), as well as 'smartphone' and 'tablet' devices separately. However, we were not able to use App Annie data to estimate shares of supply in 2023 on iOS, as it does not record data on usage minutes for Safari on iOS after September 2021.[178]

4.9 For Android, as the table below illustrates:

(a) Chrome is the largest browser on Android in the UK, with a share of supply of 77% on mobile devices in 2023.

(b) Samsung Internet is the largest browser after Chrome on Android, with a share of supply of 13% on mobile devices in the UK.

(c) Firefox and Brave have a share of 3% each. Other browsers like Opera, Edge and DuckDuckGo have a share between 1% and 2%.

(d) Shares of supply are very similar between mobile, smartphone and tablet devices.

(e) While mobile browsers on Android can be built on any browser engine, almost all use Google's Blink browser engine, resulting in Blink holding a share of at least 95% in 2023. The one exception is Firefox, which uses

[177] [✂] response to the CMA's RFI [✂].
[178] For UK mobile browser and browser engine share of supply by operating system in 2021, see MEMS final report, Chapter 5, Table 5.2.

Mozilla's Gecko browser engine and accounted for 3% of the supply of browser engines on Android in the UK in 2023.

Table 4.1: UK browser and browser engine share of supply by usage minutes on Android in 2023

Browser	*Browser engine*	*Mobile*	*Smartphone*	*Tablet*
Chrome	Blink	77%	77%	78%
Samsung	Blink	13%	13%	11%
Firefox	Gecko	3%	3%	3%
Brave	Blink	3%	3%	3%
DuckDuckGo	Blink*	2%	2%	2%
Opera	Blink	1%	1%	2%
Edge	Blink	1%	1%	1%
Other	Other/unknown	1%	1%	0%

Source: App Annie browser usage data provided by a browser vendor. Notes: (i) mobile refers to both smartphones and tablets; (ii) figures are calculated based on estimates of usage minutes data from App Annie submitted by a browser vendor; (iii) Other/unknown includes small browsers such as Vivo Browser, Turbo Browser, and Aloha Browser; and (iv) shares of supply for mobile and smartphone do not sum to 100% due to rounding.
** DuckDuckGo's browser engine (OS's WebView) is counted as Blink on Android.*

Cloudflare

4.10 Publicly available data from Cloudflare provides browser market share estimates by operating system and by country for the first quarter of 2024.[179] In particular, it estimates browser shares of supply on iOS and Android in the UK for January 2024, February 2024, and March 2024.

1.3 For iOS, the table below shows that:

(a) Safari is the main browser on iOS devices, with a share of supply of 88% in March 2024.

(b) Chrome is the second largest browser on iOS, with a share of supply of 11%.

(c) Given that Apple requires all browsers on iOS to use Apple's WebKit browser engine, WebKit on iOS has a share of supply of 100%.

Table 4.2: UK browser and browser engine share of supply on iOS in March 2024

Browser	*Browser engine*	*Share*
Safari	WebKit	88%
Chrome	WebKit	11%
Smaller browsers (e.g. DuckDuckGo, Edge, Opera)	WebKit	1%

Source: Cloudflare Radar, see Market Share by Country and OS. Note: smaller browsers include DuckDuckGo, Edge, Firefox, Aloha, Ecosia, Vivaldi, Yandex, Opera and UC.

4.11 For Android, the table below shows that:

(a) Chrome is the main browser on Android devices in the UK, with a share of supply of 78% in March 2024.

[179] Cloudflare Radar

(b) Samsung Internet is the largest browser after Chrome on Android, with a share of supply of 17% in March 2024.

(c) Blink is the largest browser engine on Android, with a share of supply of at least 97%.[180]

4.12 When comparing the App Annie and Cloudflare Android shares of supply estimates, we find that these are very similar for the Chrome browser (ie Chrome's share is 77% based on the App Annie data and 78% based on the Cloudflare data). The results differ more for smaller browsers, such as Samsung Internet, Firefox and Brave.

Table 4.3: UK browser and browser engine share of supply on Android in March 2024

Browser	*Browser engine*	*Share*
Chrome	Blink	78%
Samsung	Blink	17%
Firefox	Gecko	1%
Brave	Blink	1%
DuckDuckGo	Blink*	1%
Egde	Blink	1%
Opera	Blink	1%
Smaller browsers	Unknown	1%

Source: Cloudflare Radar. Notes: (i) smaller browsers include Aloha, UC, Huawei, Oculus and Ecosia; and (ii) shares of supply do not sum to 100% due to rounding.
**DuckDuckGo's browser engine (OS's WebView) is counted as Blink on Android.*

[180] This figure does not include DuckDuckGo's browser engine (OS WebView).