Appendix J: Apple's and Google's privacy changes

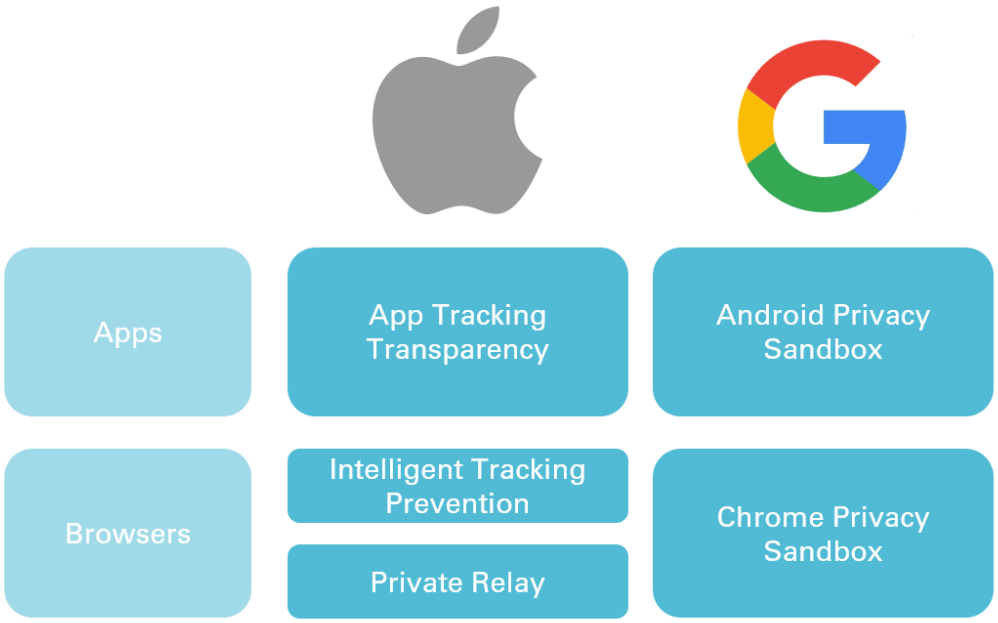
Introduction

1. This appendix discusses a number of policies that Apple and Google have implemented or announced in recent years aimed at protecting user privacy within their mobile ecosystems.

2. Both Apple and Google have developed policies to restrict the sharing of user data between third parties by a) apps in their respective operating systems and b) websites in their respective browsers. These policies are:

   - Apple's App Tracking Transparency (ATT)
   - Google's Android Privacy Sandbox (APS)
   - Apple's Intelligent Tracking Prevention (ITP)
   - Google's Chrome Privacy Sandbox (CPS)
   - Apple's iCloud Private Relay (APR)

Figure J.1: Apple and Google's privacy changes



Source: CMA.

3. We share the view of the ICO that developments that empower individuals and enable them to have meaningful control over the use of their personal data can bring about positive change, both for consumers and competition more broadly. We also recognise that strong data protection and privacy is a

key measure of a healthy market in the digital sector, and we have been working in close partnership with the ICO to ensure that our regulatory approaches work together to benefit the UK.

4. However, in designing and implementing policies on data protection, Apple and Google may face incentives to advantage their own businesses (whether in advertising or elsewhere within their mobile ecosystems), which could result in harm to competition. We have therefore considered in this appendix both the privacy benefits brought about by these policies and the potential ways in which they could harm competition.

5. We first set out a brief explanation of how advertising works on mobile devices. We then consider the above policies in turn, with the exception of Google's Chrome Privacy Sandbox, as this policy has been the subject of a separate CMA investigation which resulted in the CMA accepting commitments from Google to address its competition concerns.[1] We have considered ATT in the most depth, as this has been a greater focus of our study, than the other two policies: APS was announced recently and is still in development, so we have not been able to analyse its effects with any certainty; we heard mixed views regarding the impact of ITP (and we have been able to refer to our earlier exploration of many of the relevant issues in our investigation of Google's Chrome Privacy Sandbox). With respect to Private Relay, we highlight a series of concerns that have been raised with us, on which we will continue to engage with Ofcom.

Mobile advertising sector

6. This section provides a brief overview of mobile advertising and the actors in the mobile advertising sector, and how personalised mobile advertising works.

Background

7. With the term 'mobile advertising sector' we refer to the collection of businesses which facilitate advertising on mobile devices. The sector is broadly divided into three sets of participants: publishers who want to sell advertising space, advertisers who want to buy that space, and a range of ad tech businesses in the middle, facilitating the process of buying and selling advertisements. As set out in the Online Platforms and Digital advertising

[1] In January 2021 the CMA launched an investigation over concerns that Google's Privacy Sandbox proposals would cause online advertising spending to become even more concentrated on Google, weakening competition and so harming consumers who ultimately pay for the cost of online advertising. In February 2022, the CMA accepted commitments which included the involvement of the CMA and the ICO in the development and testing of the Privacy Sandbox proposals. CMA, Decision to accept commitments offered by Google in relation to its Privacy Sandbox Proposals, 11 February 2022.

market study, Google is present in ad tech with a series of products and has increased its presence over the years with a series of acquisitions.[2]

8. Advertisers often outsource the advertising process to mobile ad networks that develop and run the ad campaigns for them. They may also employ independent Mobile Measurement Partners (MMPs) to manage, analyse, and report on ad attribution data to 'validate' the work of the ad network (thus acting like a trusted and impartial referee).[3,4]

9. To link user-level data across apps and to aggregate it as data related to the same user, mobile advertisers require some form of user-level identification.[5] Typically, mobile advertisers use the mobile advertising identification number (MAID) which is unique to each mobile device. This is known as the ID for Advertisers (IDFA) on iOS, and Android Advertising ID (AdID) on Android.[6]

10. On mobile devices user-level tracking is largely facilitated by software development kits (SDKs). Third-party SDKs refer to third-party code that developers can choose to embed in their apps.[7] As such, SDKs are packages of development tools which can be added to apps to enable specific functionality.[8] The mobile advertising sector depends on advertising and analytics SDKs to run ads within apps and to measure their performance.

11. The CMA found in its market study into online platforms and digital advertising that 85% of the most popular apps on the Google Play Store used SDKs provided by Google and 40% had Facebook SDKs.[9] As Meta and Google have ad-based business models, their SDKs are largely focused on providing support to app developers for advertising and analytics.[10] In this context, an SDK will track a user's behaviour within the app where the SDK is installed.

Advertising on mobile devices[11]

12. On mobile devices, advertisers can reach users with a variety of types of advertising through browsers, app stores and apps. In this section we

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[2] See Online Platforms and Digital advertising market study, paragraphs 5.231-5.234.
[3] AppsFlyer, MMP (Mobile measurement partner) | AppsFlyer mobile glossary.
[4] For example, Meta points its ad network users to MMPs that can provide independent performance metrics (including attribution) and aggregate measurements across several ad networks. See Facebook for Developers, FAQ - Facebook App Ads.
[5] For clarity, the term advertisers here refers to those parties responsible for placing and measuring ad campaigns. This includes third-party intermediaries such as ad networks and MMPs.
[6] This is also known as Google Advertising ID (GAID).
[7] CMA (2020), Online Platform and Digital Advertising Market Study, Final Report, Appendix G.
[8] For example, apps might embed analytics SDKs (eg Google Analytics) or user authentication SDKs (eg Facebook login).
[9] CMA (2020), Online Platform and Digital Advertising Market Study, Final Report, Appendix F.
[10] See Facebook Developer Docs | Facebook APIs, SDKs & Guides and Android Developers.
[11] For further detail on advertising services on mobile, see CMA (2020), Online Platform and Digital Advertising Market Study, Final Report, Appendix G.

describe the two key aspects of digital advertising on mobile devices, namely targeting and attribution, and the different media where mobile ads can be placed (ie browsers, apps and app stores).

Targeting and attribution

13. **Targeting and attribution are two key building blocks of advertising within the mobile advertising sector.** With targeting, advertisers use information on a user's activity to target (or tailor) the ads served to them, while via attribution, advertisers measure the effectiveness of ads by linking users' actions from viewing or clicking on an ad to taking certain actions in response, eg downloading an app or making a purchase within an app.

14. There are various types of targeting, meaning that digital advertising can be targeted to mobile device users in several ways. These include:

- **contextual**: in this case the targeting of the advertisement is driven by the surrounding content, including the nature of the medium and the user's activity at the time of seeing the ad (for example, advertising for sports equipment served on sports-related apps);
- **intent-driven**: the advertisement is targeted based on the user's action indicating an intent or interest (for example in response to a user's query in an app); and
- **personalised (or behavioural)**: the advertisement is based on the information known about the user or device to which the advertisement is served, individually or as part of an aggregate group.

15. As mentioned above, attribution is the process of determining the user actions that led to the desired outcome, establishing a causal link between an 'impression' (ie ad view), or a click on an ad (ie ad click), and a 'conversion'.[12] Examples of what may qualify as a conversion are an app install, adding an item to the shopping basket and making an in-app purchase. Attribution is needed for advertisers to measure the effectiveness of their ads, as this allows them to optimise their spending on a given ad campaign. Moreover, being able to observe the actions taken by a user as a result of seeing an ad further enriches the information which can be used for targeting, thus improving the targeting accuracy and in turn the ad's effectiveness.

16. Attribution is particularly important for 'direct response advertising', which is the type of advertising designed to get an instant response by encouraging

[12] CMA (2020), Online Platform and Digital Advertising Market Study, Final Report, Appendix O.

users to take a specific action and whose payoff comes as a result of that action taken directly in response to an ad. This is different from 'brand advertising' which is aimed at establishing brand recognition and longer-term relationships with consumers.[13]

Advertising via browsers, apps and app stores

17. Ads can be served on different media on mobile devices, namely web browsers, apps and app stores.

18. In browsers, there are two main types of web advertising: search advertising and display advertising.[14] Search ads rely only in a limited way on personalisation,[15] rather they are primarily targeted to match key search terms entered on search engines (ie the 'search query'), which typically provides most of the information needed to serve a relevant ad. Display ads are served on a publisher's webpage, for example as a banner, and often involve personalised targeting.

19. In apps, ads can promote products and services including the promotion of other apps. For app developers mobile advertising serves two broad purposes:

- **User acquisition,** which is the process whereby app developers reach potential users and encourage app downloads and is mostly done through developers **buying app install advertising**[16] This typically needs to rely on personalised rather than contextual advertising, as knowing a user's behaviour and preferences is key to targeting the right app to a given user or to identifying users who will most likely exhibit 'valuable behaviours' (for example, those who engage in in-app purchases or frequently use the app).

- **App monetisation**, which is how app developers fund their apps and services to users and typically involves **selling in-app advertising**, meaning selling ads to be served to users within the app.[17] In-app advertising typically relies on a mix of contextual, intent-driven and personalised advertising. Personalisation in this case helps the

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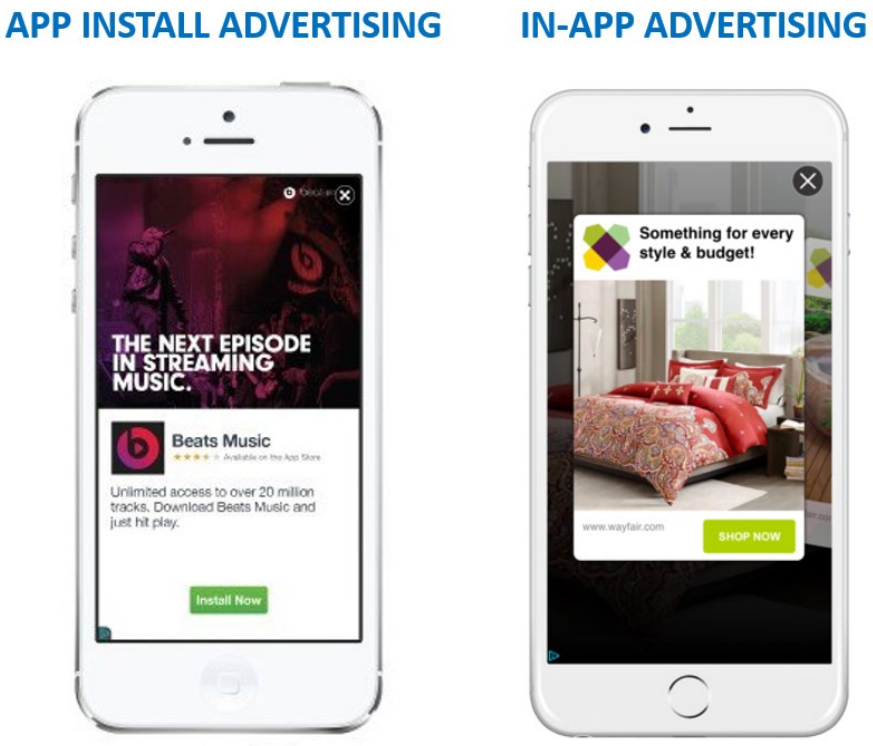
[13] See What Is Brand Advertising & Why Should You Use it? and Snap Earnings, Attribution and Targeting, The Supply Chain – Stratechery by Ben Thompson.
[14] CMA (2020), Online Platform and Digital Advertising Market Study, Final Report.
[15] Search ads shown to a consumer may be influenced by some limited personal data such as their location at the time of the search.
[16] Within mobile app install advertising, a publisher app (app P) typically publishes an ad encouraging the user to install the advertised app (app A). For example, a news app may publish an ad for a gaming app. This type of advertising is very common on social media where the ad advertising the app contains a link (generally called 'Install now' or 'Download now') that usually directs the user to an app store download page or an app website.
[17] App developers can monetise via selling in-app advertising instead of or in addition to monetising through in-app purchases.

advertisers to identify users who will most likely engage with the served ad.

20. App install advertising and in-app advertising are not mutually exclusive as one developer may sell in-app advertising space in the form of app install advertising for another developer. See Figure J.2 below for examples of in-app and app install advertising.

Figure J.2 – Examples of app install and in-app advertising



Source: Techlomedia and SiteProNews.

21. On app stores, there are typically two broad types of ad placements, usually assigned to specific apps through a bid auction mechanism:

- **Search ads**, which are ads served in response to key words entered by a user to search for apps. For instance, Apple sells search ads that are served along with organic search results when users search in the App Store, as part of its Apple Search Ads (ASA) offering.

- **Display ads for 'suggested' or 'featured' apps**, which are ads displayed on the search tab or on the app store home page before a user searches for any key words.

Personalisation via device identifiers

22. This section includes a description of how personalisation via mobile device identifiers worked before the introduction of the App Tracking Transparency (ATT) policy by Apple, what the IDFA is and what its main use cases are.

Ad targeting and attribution via the IDFA

23. Before the introduction of the ATT policy by Apple, it was by default technically possible for mobile advertisers (including app developers) on iOS to access the unique device identifier (IDFA) for each user.[18] The IDFA could then be shared with advertising networks and used to match the same user across different apps accessed by the user. In this way, developers could combine information collected from apps owned by different companies and use it to target ads to users, personalise these ads with that information and measure their effectiveness by tracing what users who were shown those ads did afterwards.

24. As briefly mentioned above, the IDFA and AdID identifiers are used by advertisers to individually identify a user, follow their behaviour on the device and match the same user across multiple apps without using personal information such as their name, email address, or phone number to do so.

25. This section focuses on Apple iOS and the IDFA to understand the impact of Apple's new privacy policy ATT on mobile advertising and, in particular, on app developers using mobile advertising for user acquisition and monetisation as well as any potential harm to competition. However, the overall description of the role of the IDFA will largely also apply to Android and the AdID. Further below, we set out an overview of Google's mobile advertising services and cover its announcement of a Privacy Sandbox on Android.

26. The IDFA has given mobile advertising an advantage over other digital advertising in terms of personalised advertising capabilities as it provides a more consistently accurate identification of individual users than is technically possible on a desktop or laptop.[19]

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[18] Before the introduction of ATT, user consent to access the IDFA would still have been a legal requirement under the Privacy and Electronic Communications Regulations 2003 (PECR). PECR requires a subscriber's or user's consent, of the standard laid out in the GDPR, to store or access information on their device (including to set any cookies or similar technology) except when this is strictly necessary to provide a service the subscriber or user has requested.

[19] Compared to mechanisms in use in desktop or laptop settings, the IDFA improves accuracy and efficiency for three key stages of mobile advertising: (i) user-level targeting; (ii) aggregating 'events', meaning user interactions generated by users across apps (ie 'events attribution'); and (iii) linking a specific ad campaign with a resulting app install (ie 'install attribution'). Mobile Dev Memo (2020), IDFA deprecation: winners and losers | Mobile Dev Memo by Eric Seufert.

27. First, as with the wider digital advertising sector, mobile advertising uses behavioural targeting to target individual users with ads determined to be especially relevant to them based on their previous behaviours (eg purchases on other apps, clicks on ads, etc). As mobile phones are predominantly used by a single person, the IDFA allows for accurate targeting of individual users.

28. Second, the IDFA allows advertisers to build a profile of a user based on their behaviour within and across different apps, as the availability of the IDFA can be used to follow the user across a range of third-party apps, if the advertiser (or one of its partners) has a presence in those apps. For instance, it could be used to observe whether an ad in a given app led to the installation of another app.[20] This behavioural profile can then be used to further improve ad targeting and measure ad effectiveness.

29. Another characteristic of the IDFA is that it allows direct access to the data described above in real time. Within a matter of hours, the advertiser can target a user with a specific ad format (eg images, videos, audio, etc), observe the extent the user engages with it, and optimise and potentially re-deploy the ad.[21]

User controls over device identifiers

30. Prior to the ATT's introduction, and since 2012, iOS users who were aware of this type of tracking and wanted to prevent it, meaning advertisers no longer accessing their IDFA, could do so by turning on 'Limit Ad Tracking' which sets the IDFA to a string of zeros (thus rendering it non-unique). This, in practice, turned off personalised advertising across all third-party apps for such users.

31. This meant that users were by default opted into personalised advertising across all apps and had to go to the centralised iOS settings to turn on the 'Limit Ad Tracking' option. It has been reported that roughly 20% of iOS users could not be tracked using the IDFA because they had enabled Limit Ad Tracking.[22]

32. Google announced that as part of the Google Play services update in late 2021, users could use a central setting to instruct apps not to use the AdID to build profiles or show personalised ads to them.[23] In particular, in cases where a user opts out of interest-based advertising or ads personalisation,

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[20] For example, when a user is shown an ad for app A in app P, the advertiser can access data collected by SDKs in those apps, use the IDFA to check that the data is from the same user, and follow the user's journey from encountering the ad in app P, through installing and downloading app A and even observing how the user interacts with app A.
[21] Such real-time optimisation of ad campaigns is only possible because advertisers, or the ad networks representing them, can combine data from a range of third-party sources with minimal time delay via the IDFA.
[22] Adjust, What is an Apple IDFA? Why is the IDFA important? | Adjust.
[23] Google, Advertising ID - Play Console Help (google.com).

any attempts to access the AdID will receive a string of zeros instead of the identifier. This Google Play services phased rollout began in late 2021, affecting apps running on Android 12, and as of March 2022, [a limited portion] of Android devices had received the updates. Google told us that its plan was to expand the rollout to affect apps running on all devices that support Google Play starting on April 1, 2022. Google told us that this update was being introduced 'to respect users' desire to prevent cross-app tracking.' Google has also said it will provide an alternative solution to support essential use cases such as analytics and fraud prevention by developing a new first-party identifier.

33. Before this change Android users did not have an option to set the AdID to a string of zeros. Instead, Android let them reset their AdID to a new value, which remained unique.[24] As a result, unless a user refreshed their AdID regularly, it could still be used to target ads at them and measure ad effectiveness.[25]

34. As discussed further below, Google has also recently announced Android Privacy Sandbox, a 'multi-year initiative' with the goal of introducing 'new, more private advertising solutions' which will operate without cross-app identifiers such as the AdID. However, Google stated that it would maintain the existing ads platform features for at least two years and intended to provide substantial notice ahead of any future changes. This means that developers will still be able to access the AdID until at least February 2024 in any event.[26]

Apple's Identifier for Vendor (IDFV)

35. Apple provides each third-party company engaging in mobile advertising within iOS with an Identifier for Vendor (IDFV) which can be used by the relevant app developer (or 'vendor'), to monitor a user's behaviour and activity across the apps owned by that same vendor.

36. Therefore, the IDFV is to data owned by the same corporate entity (first-party data) what the IDFA is to data collected across distinct apps and services owned by different companies (third-party data). Any developer operating multiple apps can use the IDFV to monitor the actions of a user across its own

[24] CMA (2020), Online Platforms and Digital Advertising Market Study, Final Report, Appendix G.
[25] We understand that, while earlier Android users could opt-out of the use of the AdID for personalised ads, developers were still able to access the users' AdID for analytics purposes such as measuring app usage. See CNBC, Google follows Apple's lead and makes it harder for advertisers to track users on Android | cnbc.com.
[26] Google, Introducing the Privacy Sandbox on Android, February 16 2022.

apps, combine information from these different apps and use it to serve personalised ads to users and measure ads effectiveness.[27]

Apple's App Tracking Transparency (ATT)

37. This section of the appendix examines the effects of Apple's new privacy framework for apps, which is called 'App Tracking Transparency' (ATT). This policy requires apps to show a specific prompt (the ATT prompt) to request users' permission for the app to 'track' them.

38. The section explores whether and to what extent ATT undermines the current model of advertising to users of mobile devices by exploring its effect on ad targeting and measurement and resulting impact on the ability of app developers to acquire new users and to monetise their apps. It also analyses the choice architecture[28] of the ATT prompt screen and of Apple's own prompt screen it uses to request consumers' consent to be served with Apple's personalised advertising within Apple-owned apps.

39. Further, the section assesses whether ATT may benefit Apple's own advertising services and reinforce its position in app distribution – in particular whether, by undermining user acquisition by app developers via mobile advertising, ATT might reinforce the role of the App Store as a source of discoverability for apps on iOS.

40. We first describe Apple's advertising services, then we explain the changes brought about by the ATT framework and the resulting impact on the advertising sector and on app developers relying on mobile advertising. Finally, we assess the extent to which these changes have the potential to harm competition.

41. We note that that Apple's stated rationale for implementing the ATT framework is consistent with the shared view of the CMA and the ICO that more competitive markets will deliver the outcomes that consumers care about most, which increasingly includes enhanced privacy and greater control over personal data. We recognise that there are benefits to consumers as a result of ATT in relation to privacy and personal data protection, and our

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[27] For example, Meta could use the IDFV to do this across its family of apps, ie Facebook, Instagram, Messenger and WhatsApp.

[28] Choice architecture describes the contexts in which users make decisions and how choices are presented to them. In online or digital settings, choice architecture refers to the environment in which users make choices, including the presentation and placement of choices, and the design of user interfaces. Examples of choice architecture are the ordering of options available to users, the user interface design for changing default settings, presentation of search results etc. See Thaler, R. H., Sunstein, C. R., & Balz, J. P. (2013). Choice Architecture. In E. Shafir (Ed.), *The Behavioral Foundations of Public Policy* (pp. 428-439). Princeton University Press for details on choice architecture.

primary concerns relate to the specific design and implementation of the framework by Apple, rather than its introduction per se.

Apple's advertising services

42. This section describes Apple's advertising services, comprising of its search advertising services within the App Store, Apple Search Ads (ASA) and its display advertising services within Apple News and Stocks. It also discusses how Apple conducts its personalised advertising, including using its first-party data, and how this is served to Apple users.

43. While, as Apple told us, it 'is not an advertising-based company' and described its advertising business as 'extremely limited', this is expanding in size and already generates significant revenue. In particular, Apple's advertising business generated 2021 revenues of approximately £[2.5-3] billion globally and £[150-200] million in the UK – this is up from £[1-1.5] billion globally and £[100-150] million in the UK in 2020 – and is primarily made up of search ads that are served along with organic search results when users search in the App Store. We further note that Apple also makes money from advertising indirectly, which is not reflected in the amount above. In particular, Google's estimated payments to Apple for search default status on Safari were £[1-1.5] billion in 2021 for the UK.

44. The Apple Search Ads (ASA) service is offered exclusively to developers of apps in the App Store – in other words, Apple's search ads are a form of app install advertising for developers distributing via the App Store. Apple also offers display advertising in its News and Stocks apps, which typically takes the form of ads that appear around or within news articles or other content accessed through those apps, but [over 90%] of Apple's advertising revenue in the UK and worldwide came from search ads within its App Store.

Apple's Search Ads in the App Store

45. Apple Search Ads (ASA) allows advertisers to promote their apps directly within the App Store via placement on either the search tab or at the top of search results.[29]

46. Apple makes use of its users' personal data for targeting its search ads. Apple told us that its advertising platform has been 'carefully designed to adhere to Apple's own high privacy standards' and that its ASA offering does not engage in micro-targeting of users, but instead relies on a 'privacy-by-design' on-device solution that only uses a limited number of first-party data points to

[29] Apple's website, Apple Search Ads.

group users into segments of at least 5,000 users before ads can be displayed to them in the App Store.

47. To create these segments, Apple said it uses random, scoped identifiers, and leverages an 'on-device protocol' that is designed to prevent any 'server-side link' between the identity of a user and the random, scoped identifiers.[30] Apple told us that this is done in a manner that is not visible to Apple and is protected by end-to-end encryption technology. Apple said it does not know what ads an individual consumer receives.

48. To group users into segments, Apple uses data such as account information (eg birth year, gender, location), app and content downloads and purchases from its own apps (eg Apple Music, Apple TV, Apple Books) and third-party apps (segmented by App Store category) and the types of news stories users read on Apple News. Apple told us that ads on the App Store do not access consumer data from other Apple services like Apple Pay, Maps, Siri, iMessage, and iCloud or data from devices through services and functions such as the Health app, HomeKit, email, contacts, or call history. Apple also said a number of its apps implement 'differential privacy', a technique that protects personal privacy while allowing Apple to gain insight into user behaviour at an aggregate level.[31] [32]

49. For campaigns run through ASA, Apple enables attribution for advertisers through its Apple Search Ads Attribution API.[33] This allows advertisers purchasing search advertising from Apple to measure the number of app installs for the App Store and attribute them to specific Search Ads campaigns.[34] The Apple Ads Attribution API includes granular install attribution data that is not available through attribution tools for campaigns happening outside the App Store on iOS such as SKAdNetwork API (SKAdNetwork). This is discussed in further detail below.

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[30] We understand this to mean that the assignment of a user to a targeting segment is done on a user's device, so that more granular identifiers, that could potentially be linked to the identity of a user, are not shared with an Apple server.
[31] Differential privacy is a 'security definition which means that, when a statistic is released, it should not give much more information about a particular individual than if that individual had not been included in the dataset. The differential privacy definition allows one to reason about how much privacy is lost over multiple queries.' See Royal Society (2019) Protecting privacy in practice: the current use, development and limits of Privacy Enhancing Technologies in data analysis.
[32] Apple told us that Apple's apps remove device identifiers before the data leaves the user's device encrypted. In a second step the anonymized data for different users is collected, metadata is removed, and characteristics permuted among the different users to make it impossible for Apple to track individuals. This anonymised data is then used to compute summary statistics, and only those statistics are shared with Apple teams to preserve user privacy.
[33] Apple Ads Attribution API was introduced with iOS 14.3 and supersedes Apple Search Ads Attribution API.
[34] Apple's website, Attribution API - Help - Apple Search Ads.

Apple's display advertising

50. Apple also offers display advertising services on Apple News and Stocks, albeit these account for a much smaller share of Apple's advertising revenue. To personalise such ads, Apple uses a range of user information such as the types of contents people consume on News and Stocks, App Store activity, Apple account information, and device location, provided the 'Location Services' setting is enabled, and the user has granted permission to the App Store or Apple News apps to access their location.[35]

51. The effectiveness of app install ads running on Apple News and Stocks can be measured using Apple Ads Attribution API.[36]

Apple's Personalized Ads prompt

52. Since September 2021, Apple controls users' opt-in to Apple's own personalised advertising services via the Apple's Personalised Ads prompt.[37] Prior to this, Apple's ad personalisation was enabled by default and a user had to navigate the device Privacy Settings to disable it. We analyse Apple's Personalised Ads prompt and how it compares with the ATT prompt further below.

53. Apple told us that the main reason for introducing this was to increase transparency and provide users with control over how their data is used and that Apple is 'leading the industry, by expressly obtaining user permission to use first-party data to deliver Personalized Ads'. We recognise that this prompt introduces greater choices for Apple users on whether and how their data is used by Apple for personalised advertising purposes. However, below we consider how this prompt compares with the ATT prompt in terms of its choice architecture, including any inconsistency in design and language.

[35] Apple also uses the music, movies, books, TV shows and apps a user downloads, as well as any in-app purchases and subscriptions. However, Apple says it does not allow targeting based on downloads of a specific app or purchases within a specific app (including subscriptions) from the App Store, unless the targeting is done by that app's developer. See Apple's website, Legal - Apple Advertising & Privacy - Apple.
[36] Apple's website, AdServices | Apple Developer Documentation.
[37] Benjamin Mayo, iOS 15 now prompts users if they want to enable Apple personalized ads, after it was previously on by default - 9to5Mac.

Changes introduced by ATT

54. ATT is Apple's new privacy policy enforced on iOS 14.5 in April 2021.[38] As noted in the ICO's recently published Commissioner's Opinion,[39] ATT is one of a number of initiatives that seek to address the privacy risks that online advertising poses and shift towards less intrusive tracking and profiling practices.

55. In agreement with the ICO, we consider that there are privacy benefits associated with the introduction of ATT as it enhances users' privacy and control over their personal data and generally improves compliance with data protection law by app developers. In particular, ATT has forced an improvement in practices when it comes to collecting consent when compared to previous practices (as described above). As a result, we consider that any changes to the implementation of ATT should protect or enhance these benefits.

56. As further discussed below, we are concerned that the current implementation of ATT does not maximise comprehension by users, who might not understand the meaning of the prompt and the scope of the ATT policy framework, and might place Apple's own data processing at an advantage compared to data processing conducted by third parties which are subject to the ATT framework. We are also concerned by ATT's effect on app install advertising and the resulting reinforcing of Apple's market power in app distribution and that it might lead to a shift in the way that app developers monetise their apps.

57. The ATT framework requires apps to show a specific prompt to request users' permission for the app to 'track' them, defined by Apple in this context as accessing app-related data, including the IDFA, to follow a user's activity across apps and websites owned by other companies.[40] As a result, a user on version iOS 14.5 or higher can no longer be served personalised ads in one app based on their behaviour in another app owned by a separate organisation until they have explicitly opted into 'tracking' for both apps.

58. Without consumers opting into this prompt, developers cannot access their IDFA which as noted above is typically used to monitor users' activity across apps. Apple's App Review Guidelines also state that app developers should

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[38] In October 2020, the French competition authority (Autorité de la concurrence) received a request for interim measures by players of the online advertising sector contesting the ATT implementation. Although it rejected this request in March 2021, it continues the investigation into the merits of the case, to verify whether the implementation of ATT may amount to discrimination or self-preferencing. Autorité de la concurrence, Marche 2021.
[39] ICO (2021), Data protection and privacy expectations for online advertising proposals.
[40] Apple's website, App Tracking Transparency | Apple Developer Documentation.

not engage in any other form of 'tracking' if users do not opt-in when shown the ATT prompt.[41] As further detailed in the annex to this appendix, users can also opt-out of being shown ATT prompts centrally, by disabling 'Allow Apps to Request to Track' in the device privacy settings to stop developers from surfacing the ATT prompt.

59. Apple has provided a replacement for IDFA-based attribution and measurement in the form of SKAdNetwork API, a free tool Apple makes available to developers and ad networks. Apple told us that SKAdNetwork APIs hold advertising data on-device separate from apps, 'allowing advertising conversion measurement to be reported without users being tracked.' However, we have heard concerns from app developers, ad networks and industry commentators that SKAdNetwork is an inferior alternative – with regards to attribution effectiveness – not only to IDFA-based attribution and measurement which was available pre-ATT but also to the Apple Search Ads Attribution API Apple makes available to users of its own advertising services. This is because SKAdNetwork gives developers less granular data and sends them information on users' conversions with a delay compared to Apple Ads Attribution API. We describe SKAdNetwork and how it compares to Apple Ads Attribution API in more detail below.

60. While the ATT framework clearly introduces privacy benefits, it has been reported that companies subject to it may not respect users' choices and it may be difficult for Apple to fully enforce this.[42] In particular, we understand that there are no obvious technical means for Apple to know what data ad tech companies use (apart from the IDFA that it does not provide), whether they might be doing 'fingerprinting',[43] and what technical workarounds they might find in the absence of IDFA.[44]

61. Indeed, a study by privacy software developer Lockdown found evidence of a number of apps that seemed to continue to engage in third-party tracking when users opted out from the ATT prompt.[45] Similarly, research from the

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[41] App Store Review Guidelines, 5.1.2 (i)-(iii).
[42] Apple said that developers are responsible for ensuring they comply with users' choices and that violations may come to the App Review's attention in the form of complaints by other developers, users and privacy advocates.
[43] Fingerprinting refers to a process that advertisers may use to gather information about users who have interacted with their ads to identify their unique device. It works by combining certain publicly available attributes of a user's device, location, and more to create a unique identifier or 'fingerprint' of their device. The attributes that are collected to identify a user's device may include their computer or mobile hardware, operating system, IP address, web browser, and more. See What is fingerprinting? The online tracking you can't avoid.
[44] The New York Times (2021), To Be Tracked or Not? Apple Is Now Giving Us the Choice. - The New York Times (nytimes.com).
[45] The study selected ten of the top apps on Apple App store and tested each app twice, first by choosing the opt-out choice button on the ATT prompt ("Ask App Not to Track") and next, by choosing the opt-in button ("Allow"). The results showed that regardless of the ATT choice, there was no difference in the total number of active third-party trackers and the number of tracking attempts was only slightly lower when the opt-out choice was selected. See Study: Effectiveness of Apple's App Tracking Transparency | Transparency Matters (lockdownprivacy.com)

Department of Computer Science at the University of Oxford found that, while Apple's new privacy measures introduced with iOS 14, including ATT, prevented the collection of IDFA, the number of tracking libraries, on average, remained the same for the studied apps.[46]

62. Apple submitted that it has limited visibility over whether fingerprinting may still be used by developers despite the ATT framework as it cannot audit developers or mobile measurement partners and needs to rely on its own research and public information to identify apps that engage in fingerprinting. In this respect, Apple submitted that it undertook an exercise to research and classify fingerprinting-capable SDKs being used by apps in the App Store using public information with the objective of removing from the App Store those in violation of its guidelines.[47]

63. Based on the above, we consider that, while the ATT framework offers substantial privacy benefits to users by offering them greater control over whether and how their personal data is used for personalised advertising, companies subject to the ATT framework may not respect users' choices, with users not necessarily realising that this could happen. Related to this, as discussed below, we have concerns over whether users fully comprehend the actual scope of the ATT prompt.

Apple's definition of tracking

64. Apple offered the following definition of 'tracking' which it said was consistent with that of the World Wide Web Consortium (W3C):

> 'Tracking refers to the act of linking user or device data collected from your app with user or device data collected from other companies' apps, websites, or offline properties for targeted advertising or advertising measurement purposes. Tracking also refers to sharing user or device data with data brokers.' [48]

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[46] The study looked at 1,759 iOS apps from the UK Apple App store and looked at versions of the same app before and after the introduction of iOS 14. The analysis also covers another of Apple's privacy initiatives, namely Privacy Nutrition Labels aimed at increasing transparency over the types of data used by various apps, and finds that they can be inaccurate and mislead consumers about apps' actual privacy practices. See Konrad Kollnig, Reuben Binns, Nigel Shadbolt response to our Interim Report (publishing.service.gov.uk).

[47] As a result of this exercise, Apple notified apps containing SDKs Apple confirmed offered or advertised device fingerprinting functionalities they were in violation of Guideline 5.1.2 of the App Store Review Guidelines and required them to remove the fingerprinting functionality and any related code that supported fingerprinting before the app's next update, or it would be rejected.

[48] The W3C defined tracking as 'the collection of data regarding a particular user's activity across multiple distinct contexts and the retention, use, or sharing of data derived from that activity outside the context in which it occurred. A context is a set of resources that are controlled by the same party or jointly controlled by a set of parties'.

65. Apple told us that what it does in terms of personalised advertising does not fall within its definition of tracking and therefore its apps are not required to show the ATT prompt. In particular, Apple told us that it does not:

- link user or device data collected from one developer with user or device data collected from other companies' apps, websites, or offline properties for targeted advertising or advertising measurement purposes;
- use the IDFA for targeting and measurement purposes;
- buy consumers' personal data from, or share its consumers' personal data with, other companies; or
- share its user or device data with data brokers.

66. Related to the above, Apple told us that the Personalised Ads prompt and the ATT prompt relate to fundamentally different data usage and that the differences in their formulation are thus justified given their 'entirely different nature'.

67. While Apple's data processing for personalised advertising purposes is performed under one single corporate ownership and thus factually differs from third-party developers linking user data across apps owned by different companies, Apple does use its first-party data from across multiple Apple apps for advertising purposes. For instance, Apple processes a user's App Store purchase history, together with other demographics, to personalise App Store Search Ads and advertising displayed in the News and Stocks apps.[49] Further, what Apple considers as 'first-party data' for personalised advertising purposes includes data on App Store downloads, purchases and in-app purchases for all third-party apps, segmented by App Store category.[50]

68. In response to our interim report, a group of researchers from the Department of Computer Science at the University of Oxford expressed concerns that Apple appears to base its definition of tracking on the W3C definition while there are prominent differences between the two.[51] [52] In particular, while Apple differentiates between first-party and third-party data collection (with the former covering its own) the W3C's definition does not draw such distinction. Further, the researchers noted that Apple considers only third-party data

[49] Apple told us that, like Apple, every other developer may use first-party data across their properties to provide personalised ads through their apps and, indeed, Apple provides the IDFV to developers to facilitate this.
[50] Apple's website, Legal - Apple Advertising & Privacy - Apple.
[51] Response: Konrad Kollnig, Reuben Binns, Nigel Shadbolt (publishing.service.gov.uk).
[52] See User Privacy and Data Use - App Store - Apple Developer and Tracking Compliance and Scope (w3.org).

collection to be harmful, when in fact, the impact on individual privacy from both first-party and third-party data collection can be similar.

69. Moreover, while the W3C definition of tracking refers to users' activity across multiple 'distinct contexts' and does not refer to companies, Apple's distinction between collection of data within first-party and third-party properties seems to be based on corporate ownership, which may favour large companies operating several first-party services and apps, including Apple itself. In this regard, the joint statement of the CMA and the ICO on the relationship between competition and data protection highlighted specifically the risk of data protection law being interpreted by large integrated digital businesses in a way that unduly favours them over smaller, non-integrated suppliers.[53] Similarly, a recent opinion published by the UK Information Commissioner confirmed that 'data protection law does not inherently favour the concept of a first party over that of a third party within the meanings web standards bodies or data categorisations give to those terms'.[54]

70. With regard to tracking, the opinion explained that 'from a data protection perspective, online tracking is a term that describes or refers to different processing activities, undertaken by different means, for different purposes' and that a variety of organisations can undertake it, from single businesses to large corporate entities. For example, a large organisation that operates multiple online services, or many smaller organisations sharing information between them'.

71. The opinion goes on to say that, in principle, online tracking can be considered as 'processing activities involving the monitoring of individuals' actions, especially over a period of time (including the behaviour, location or movements of individuals and their devices)' with specific reference to this being for the purpose of offering goods and services to them, evaluating the effectiveness of services they use, and analysing or predict their personal preferences, behaviours and attitudes.[55]

72. It should be noted that data protection law does not define "tracking". It is the organisation's activities that will determine what its obligations under data protection law are, rather than whether it calls those activities "tracking" or not.

73. Our assessment is that Apple's own processing of its users' personal data is no less consistent with the description of tracking (as set out by the UK's data protection authority and the W3C) than what third-party developers do. More specifically, Apple's cross-app processing activities are similar to those of

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[53] ICO/CMA joint statement.
[54] ICO (2021), Data protection and privacy expectations for online advertising proposals, page 36.
[55] ICO (2021), Data protection and privacy expectations for online advertising proposals, page 14.

third-party developers aside from the fact that the latter are conducted under separate corporate ownership. As such, we do not consider there to be a justification for the differences between, on the one hand, how the two activities are described to users in terms of language used respectively in Apple's own prompt and in the ATT prompt to characterise such activities – Apple claims explicitly on its personalised advertising prompt that 'Apple does not track you' – and, on the other hand, the design of the ATT prompt and Apple's personalised ad prompt.

Apple's stated rationale for ATT

74. Apple told us that 'the goal of ATT is to empower consumers by giving them greater transparency and ability to control the sharing of their own data' and that this policy strengthens this ability by giving users the choice, on a developer-by-developer basis, of whether to allow developers to 'track' them across other companies' apps, websites, or offline properties using users' IDFA. Apple also mentioned several stakeholders, including consumer protection associations and privacy advocates, which welcomed ATT as a positive development for the industry.

75. For instance, Apple submitted that:

- Amnesty International, Human Rights Watch and the Electronic Frontier Foundation openly supported and advocated for the ATT changes;
- Privacy International and The Center for Democracy and Technology respectively described the change as helping people 'assert control over the invisible leakage of their data' and 'rebalance the ecosystem'; and
- Mozilla 'applauded' Apple's decision and publicly campaigned to discourage delay of ATT implementation.

76. We share the view of the ICO that developments that empower individuals and enable them to have meaningful control over the use of their personal data can bring about positive change, both for consumers and competition more broadly. **ATT has clearly introduced a greater degree of choice and control to users than they were afforded previously over whether and how their personal data is used for personalised advertising.** To this extent, ATT has benefits to consumers with regard to their privacy.

Box J.1: Engagement with the ICO on ATT

We have engaged with the ICO on ATT over the course of our market study, with our discussions highlighting that we and the ICO are aligned on the following:

- **The privacy benefits of ATT**: ATT enhances user privacy and control over personal data, while improving compliance with privacy law by app developers. Any future changes to the implementation of ATT should protect or enhance these benefits.
- **Choice architecture:** the choice architecture of user prompts should be balanced and designed in a way that maximises user control and effective decision making. The objectives of any interventions relating to prompt design should be outcome neutral.
- **User comprehension and testing:** the design of choice architecture is best informed through testing of user comprehension and experience. Such testing in future by Apple on the ATT prompt and its personalised advertising prompt could reveal whether the current choice architecture is optimised.
- **Use of the term tracking:** while data protection law does not provide a legal definition of tracking, the CMA and ICO consider that Apple is conducting processing activities that can be characterised as tracking as described in the ICO Commissioner's Opinion on online advertising expectations. However, rather than focusing too much on specific terminology, the objective of any interventions should be to optimise user comprehension across both the ATT and Apple's Personalised Ads prompts.
- **Incentives:** the offering of incentives in return for a user's consent to the processing of their personal data is not in principle in contravention of data protection law. However, this approach needs to be pursued with caution so that the consumers that do not consent are not – or do not appear to be – penalised for doing so.[56] The data controller is ultimately responsible for assessing this risk, which would be best assessed on a case-by-case basis.

77. We also recognise that strong data protection and privacy is a key measure of a healthy market in the digital sector, and we have been working in close partnership with the ICO in recent years to ensure that our regulatory approaches work together to benefit the UK. As part of this, we both want to ensure that:

[56] The ICO's consent guidance states that 'it may still be possible to incentivise consent to some extent. There will usually be some benefit to consenting to processing. For example, if joining the retailer's loyalty scheme comes with access to money-off vouchers, there is clearly some incentive to consent to marketing. The fact that this benefit is unavailable to those who don't sign up does not amount to a detriment for refusal. However, you must be careful not to cross the line and unfairly penalise those who refuse consent'. See What is valid consent? | ICO.

- people are empowered and have effective choice over the service or products they prefer, with a clear understanding of how and by whom their data will be used; and

- businesses compete on an equal footing to attract customers, with transparency in the way they operate and the provision of meaningful choice across the market.

78. However, we do not consider that either of these conditions has been fully satisfied by the design and implementation of ATT. In particular, we are concerned that:

    - Apple has chosen a choice architecture for the ATT prompt, without conducting any user testing of the design, that may not maximise user comprehension and thus may not help consumers to make effective choices;

    - such choice architecture could unduly influence some consumers to refuse data sharing in a way that may be inconsistent with their preferences; and

    - Apple is not applying the same standards to itself as to third parties forced to show the ATT prompt when it comes to seeking opt in from consumers for personalised advertising.

79. We discuss these concerns in more detail in the following sections.

Potential harm to competition

80. In this section we assess how Apple has designed the ATT framework, whether and how the ATT prompt's design may be influencing consumers' choice, and the framework's effects on developers using mobile advertising for their app monetisation and user acquisition.

81. We then consider the following ways in which the changes brought about by ATT may harm competition and consumers by:

    - unfairly advantaging Apple's own advertising services, and particularly its search advertising business on the App Store;

    - increasing barriers to entry for app developers by making it more difficult to use advertising to acquire users;

    - making 'ad-funded' apps less attractive and therefore pushing developers on iOS to monetise their apps through direct purchases offered within the app for features and content; or

- protecting Apple's market power in app distribution by undermining the use of mobile advertising as a means for app discovery.

Impact of choice architecture on users' choice to opt in

82. Choice architecture refers to the contexts in which users make decisions and how choices are presented to them.[57] The CMA's final report on the online platforms and digital advertising market study, discussed the importance of the choice architecture of data privacy choice screens and the underlying psychological mechanisms which influence user behaviour.[58] The CMA also proposed certain choice architecture principles ('Fairness by Design') for the design of choice related to users' personal data by digital advertising platforms with strategic market status, to enhance user control over their data.[59,60] Choice architecture is also of great importance under data protection law, for example with regards to the transparency requirements of the GDPR and in terms of whether an individual has provided valid consent.

83. In this section we describe the choice architecture of the ATT prompt and concerns about its potential influence on user decision-making and thereby opt-in rates. We then compare the choice architecture of Apple's Personalised Ads prompt, which seeks permission for data sharing with Apple's own first-party apps, to that of the ATT prompt.

84. In Chapter 8, we discuss some potential remedies including the need to better understand and potentially improve user comprehension, including by conducting appropriate user testing.

85. Figure J.3 illustrates the basic design of the ATT screen. Key elements of the ATT prompt choice architecture include:

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[57] The literature on behavioural economics and psychology provides extensive evidence supporting the impact of choice architecture elements such as framing, pre-set defaults and ordering of options on an individual's decision-making. For example, see Mertens, S., Herberz, M., Hahnel, U., & Brosch, T. (2022). The effectiveness of nudging: A meta-analysis of choice architecture interventions across behavioral domains. Proceedings of the National Academy of Sciences of the United States of America, 119(1), e2107346118. Specifically, with regards to data privacy, there is empirical evidence supporting the role of choice architecture in influencing users' privacy choices. See Adjerid, I., Acquisti, A., & Loewenstein, G. (2019) Choice Architecture, Framing, and Cascaded Privacy Choices. *Management Science* 65(5):2267-2290 and Ioannou, A., Tussyadiah, I., Miller, G., Li, S., Weick, M. (2021) Privacy nudges for disclosure of personal information: A systematic literature review and meta-analysis. *PLoS ONE* 16(8): e0256822.
[58] CMA (2020), Online Platform and Digital Advertising Market Study, Final Report, Appendix Y.
[59] CMA (2020), Online Platform and Digital Advertising Market Study, Final Report, Appendix Y.
[60] Furthermore, since the CMA published its digital advertising market study report, others have conducted work considering how data privacy choices can be presented to consumers. For example, a set of experiments conducted by the Behavioural Insights Team (BIT) and Centre for Data Ethics and Innovation (CDEI) tested different ways of presenting privacy and personalisation settings in online contexts. See Behavioural Insights Team (2021) Active Online Choices: Designing to Empower Users. Those experiments found that varying choice architecture elements could substantially impact users' comprehension of consequences and feelings of control.

- Developers who wish to access users' IDFA to serve them with personalised advertising have to surface the ATT prompt individually for each app, asking for permission to 'track' users. Developers are able to include their own language in the ATT prompt that explains why they would like to access the users' data. However, they are barred from using this to offer incentives for opting into the ATT prompt by Apple.

- Developers can display the prompt only once per app at a time of their choosing. For example, developers can choose to display the ATT prompt the first time the app is launched, or they can display it after the user has spent some time using the app and thus, better understand how the app functions and how the developer might use their data.

- The ATT choice screen includes:

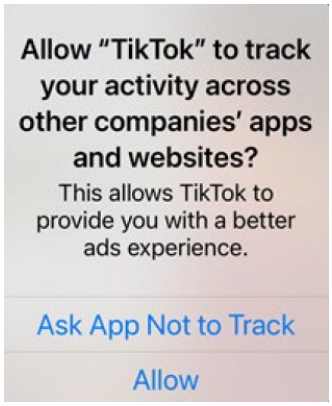
    - a non-customisable prompt in bold text which is set by Apple;

    - below this is a purpose string in non-bold text which can be customised by the third-app party developers; and

    - then the choice buttons to either opt out or into data sharing.

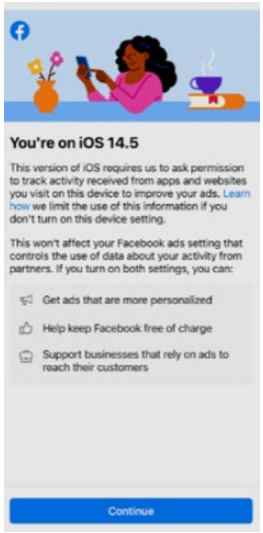
- In addition to the ATT screen itself, developers are allowed to show their own screens to users in advance of the ATT prompt to describe the purpose and implications of the ATT prompt and why the developer would like to get access to the user's IDFA. These screens are not managed by the operating system, and developers have discretion with respect to when, how, and with what frequency they display their own screens (as long as those are otherwise in compliance with the App Store Review Guidelines and Apple developer agreement), subject to compliance with the law. However, as described below, we have received evidence from developers indicating that Apple has the final say on the content of the pre-prompt screens and can impose certain restrictions. Figure J.4 provides an example of such a 'pre-prompt' screen.

Figure J.3: ATT prompt example



Source: Apple (screenshot taken in July 2021).

Figure J.4: Pre-prompt screen shown by Facebook before displaying the ATT prompt



Source: Apple (screenshot taken in July 2021).

86. Apple has provided limited evidence on its rationale for the design and choice architecture of the ATT prompt, including its wording and layout such as the ranking and visual presentation of choices. Apple provided internal documents showing it has considered several versions of the prompt with different wording or choice highlighting, but it is unclear how it landed on its final choice. In particular, a document submitted by Apple indicated that Apple had considered alternate designs of the ATT prompt, including designs with different ordering and framing of the choice options, and different language and ordering of choice buttons [✂]. We consider that these alternatives would have represented meaningful changes to the ATT prompt with likely impacts on the opt-in rate for personalised advertising. Furthermore, some of the options considered by Apple would alleviate potential concerns about the ATT prompt as discussed in our analysis of the present ATT prompt format.

87. Apple told us that there was no user testing of the prompt, but that it had gathered feedback on the prompt from app developers and that this feedback fed into the final decision on the design of the prompt.

88. Below we offer an examination of the choice architecture of the ATT prompt, including the language employed in the prompt and the ordering of the choice options. We also explore the potential influence of the pre-prompt screen on user decision-making. In our assessment, we have considered the evidence submitted and literature on behavioural science and psychological mechanisms.

89. Further below, we discuss our concern that third-party developers cannot offer incentives to users in return for opting into sharing their data including in the ATT prompt.[61]

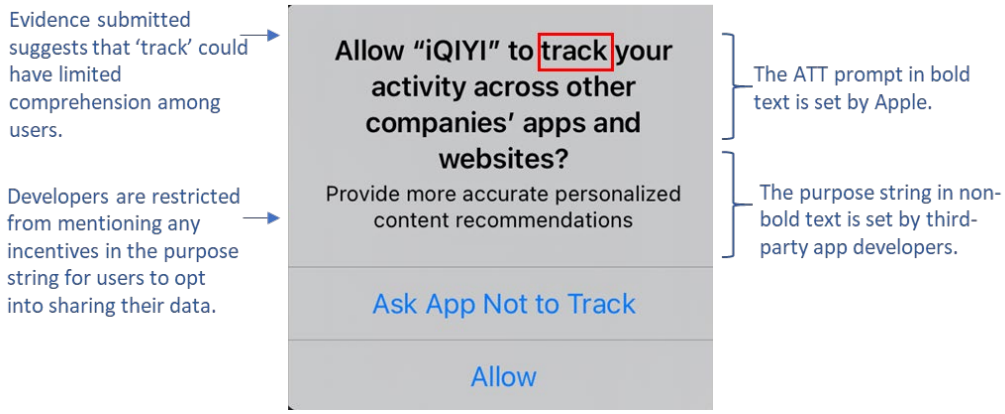
90. We also discuss below the opt-in rates for both the Apple's Personalised Ads prompt and the ATT prompt, based on information submitted to us by Apple and app developers. We note that, overall, the differences in choice architecture between the two prompts do not seem to have resulted in a significant difference in opt-in rates, albeit the methodology used to calculate the two figures might limit their comparability.

ATT Prompt Language

91. As was described by the CMA's market study into online platforms and digital advertising, the language and description provided to users who are called to make decisions are highly relevant elements of a data privacy and personalised advertising prompt.[62] Figure J.5 shows the key areas of language identified within the ATT prompt.

[61] As per App Store Review Guidelines, 3.2.2 (vi).
[62] CMA (2020), Online Platform and Digital Advertising Market Study, Final Report, Appendix Y.

Figure J.5: Language employed in the ATT prompt



Note: Screenshot taken on iPhone XR running iOS 15.1 in November 2021.

92. We recognise that Apple's use of the word 'track' in the ATT prompt aligns with the ICO's definition of online tracking.[63] However, we have received evidence that the language used in the ATT prompt can lead to users misunderstanding the scope of the ATT framework.[64] Overall, given the lack of user testing conducted by Apple, we are concerned that the prompt language might not maximise user comprehension.[65]

93. Particularly, in response to our evidence gathering, we have heard the ATT prompt framing is potentially unhelpful as users may not comprehend how the developer will use their data if they choose to opt into sharing their personal data with the developer, and may equate 'tracking' with surveillance which includes access to location, voice, video, etc. As described below, [one app developer] submitted that user testing it conducted for pre-prompt screens (ie the screens shown before the ATT prompt) revealed that the variant with the lowest opt-in rate contained the word 'tracking.'

94. Apple, on the other hand, argued that the word 'tracking' is commonly used and understood by users to describe the process of identifying and following users across apps and websites. Apple also argued that it has built brand recognition and understanding for the word 'tracking' among Apple users owing to the Intelligent Tracking Prevention feature in Safari, introduced in 2017. However, a document submitted by Apple suggests that it considers the term 'tracking' may have a negative connotation. In particular, the document suggests the term [✂].

95. Further, Apple submitted that, while the ATT prompt, in bold text, is non-customisable, third-party app developers have the option of including a

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[63] ICO (2021), Data protection and privacy expectations for online advertising proposals.
[64] Also, as discussed above, companies subject to the ATT framework may not respect users' choices, with users not necessarily realising that this could happen based on the ATT prompt language.
[65] As discussed in Chapter 8, we consider that data privacy prompts like the ATT prompt should be subject to adequate user testing to maximise user comprehension.

customisable purpose string or byline in the non-bolded narrative text portion of the ATT prompt to explain their reason for requesting access to user data. Apple told us that there is no character limit on the purpose string for the ATT prompt, although their Human Interface Guidelines recommend that developers should concisely explain why the app needs to access users' data 'typically in one sentence'.

96. While the non-customisable ATT prompt is in bold text, the customisable purpose string is in non-bold text. This could raise issues related to salience as users are more likely to focus on what is salient and immediately visible.[66] Salience of text may be important because, under conditions of limited attention, users tend to rely on the most salient behavioural cues to make decisions.[67]

97. We received evidence suggesting that developers may not consider the purpose string effective to inform users in a way that will enable them to make an effective choice. Some developers reported not conducting any testing of the purpose string due to its limitations or flagged that Apple ultimately has the final say on what they can include in that and rejected their proposed variants. For instance:

- [one app developer] submitted that it focussed testing on the pre-prompt screen instead due to the limited space and flexibility for personalisation in the purpose string as well as the fact that it was presented below 'loaded and prejudicial language' in the main ATT prompt.

- King submitted that it did not do testing of the purpose string due to the lack of ability to A/B test the results, given that Apple did not provide the capability to support multiple versions of an app release.

- Further, Daily Mail Group (DMG) told us that it submitted various purpose strings to Apple that were initially rejected. For instance, several of the purpose string text variants they submitted to Apple, such as "keep the app free" and "get better ads", were rejected for being misleading to users and Apple suggested softening the language to "*help* keep the app free" and "get *more relevant* ads".[68] DMG also told us that it has not changed or updated its ATT prompt purpose string language since it went live, partly due to the strict parameters that Apple asks publishers to abide by

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[66] Tiefenbeck, V., Goette, L., Degen, K., Tasic, V., Fleisch, E., Lalive, R., & Staakee, T. (2018). Overcoming salience bias: How real-time feedback fosters resource conservation. *Management Science, 64*(3), 1458–1476.
[67] Mann, T., & Ward, A. (2007). Attention, Self-control, and Health Behaviors. *Current Directions in Psychological Science, 16*(5), 280–283.
[68] Related to this we note that the CMA in its online markets and digital advertising market study final report raised concerns about the use of unrelated positive descriptions of sharing data (eg being served with 'relevant' advertising). See CMA (2020), Online Platform and Digital Advertising Market Study, Final Report, Appendix Y.

and the fact that there is little scope to test different language to try and increase consent rates.

98. As mentioned above, Apple also told us that the ATT framework imposes some restrictions on developers seeking user authorisation to track them, including that developers cannot incentivise users (eg with offers of additional in-app content or features) to persuade them to allow tracking. In addition, the ATT prompt, including the purpose string, and any screens developers display in advance of displaying the ATT prompt, must comply with App Store Review Guidelines and Apple developer agreement, meaning that they cannot mention incentives for opt-in. Apple told us that the reason for this restriction was that 'gating' functionality in this way could be seen as contradicting various privacy guidance around the world.[69]

99. Given that developers benefit from users opting-in as it increases the effectiveness of their user acquisition and monetisation, we consider that allowing them to offer incentives would enable them to share some of that value with users. This would potentially benefit both users and developers, while maintaining user choice. As the ICO's guidance makes clear, providing consent to tracking should not be a condition of general access to content and organisations must be careful to ensure that offering incentives does not cross the line into penalising those who do not consent to tracking.[70] However, incentivising opt in is not in itself banned by UK data protection law and it may still be possible to incentivise opt-in to some extent as long as doing so does not unfairly penalises those who opt-out.

100. Several developers submitted that if it was permitted for developers to incentivise user opt-in to the ATT prompt, they would consider it as a means of increasing user opt-in. Particularly, [one app developer] submitted that if allowed, it would consider incentivising opt-in with exclusive rewards or perks such as in the form of cashbacks or other benefits offered on purchases made by customers who have opted in.[71] Further, DMG submitted that it is considering the option of incentivizing opt-in by reducing the number of ads for users that opt into the ATT prompt but that it is not sure Apple would allow this and thus has not run any trials on it.

101. Overall, with regards to incentives, our view is that incentivising opt-in could be beneficial to both users and developers. Incentives can illustrate the value of users' data, allowing users to make an effective decision by offering them

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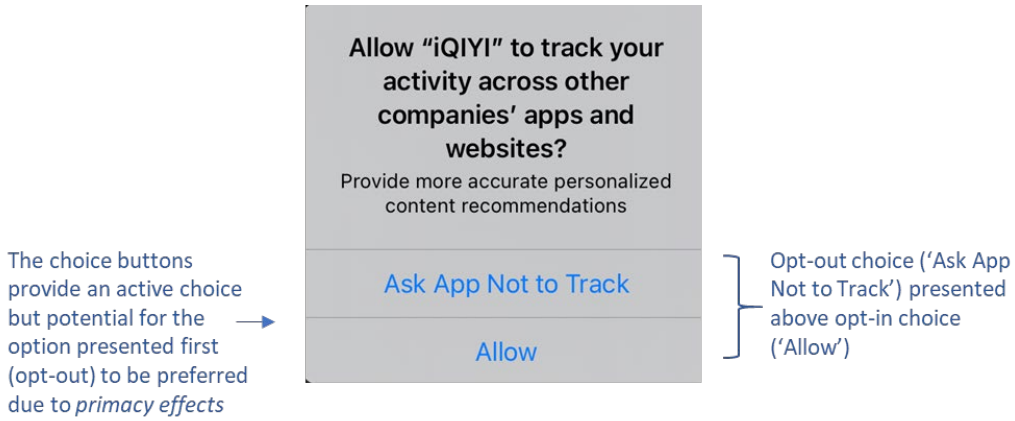
[69] It cited in particular European Data Protection Board guidance on GDPR and a statement by the Dutch data protection agency on 'cookie walls'.
[70] What is valid consent? | ICO.
[71] In particular, the same developer submitted that consumer opt-in is valuable because it increases the effectiveness of the services that it provides to advertisers and being able to offer incentives to consumers for opt-in would enable it and other developers to share some of that value.

the opportunity to benefit from opting into the ATT framework. As mentioned in the CMA's Online Platforms and Digital Advertising market study, although consumers are receiving 'free' digital services in exchange for their attention and data, which are then monetised through personalised advertising, in a well-functioning market, consumers might be offered a reward for their engagement online.[72] Therefore, allowing developers to offer incentives could unlock this alternative model where greater competition is promoted in ad-funded markets and users can benefit from it.

ATT choice options

Figure J.6 Choice options in the ATT prompt



Note: Screenshot taken on iPhone XR running iOS 15.1 in November 2021.

102. The ATT prompt provides an active choice to users with no pre-selected or highlighted option as shown in Figure J.6. However, in the vertical list of choice options, the opt-out choice ('Ask App Not to Track') is presented first. This could lead to ordering effects, where the order in which the choices are presented to users can influence their decision. Users can display a bias towards selecting the first option ie primacy effect. This can be due to reasons such as cognitive fatigue or serial-position effects on memory ie when likelihood of recalling an item depends on its position in the list.[73,74] Also, as discussed below, the ordering of choice buttons in the ATT prompt contrasts with that in the Personalised Ads prompt for Apple's own apps, where the opt-in button is placed vertically above the opt-out button.

[72] CMA (2020), Online Platform and Digital Advertising Market Study, Final Report, paragraph 11.
[73] Feenberg, D., Ganguli, I., Gaulé, P., & Gruber, J. (2017). It's Good to Be First: Order Bias in Reading and Citing NBER Working Papers. The Review of Economics and Statistics, 99(1), 32-39.
[74] Users may also display a bias towards the last choice option ie recency effect. However, there is evidence supporting that when faced with a binary choice (such as opt-out vs opt-in choices in the ATT prompt), the choice which is presented first by the choice architecture, and is thus more reachable, is likely to be favoured. See Bar-Hillel, M., Peer, E., & Acquisti, A. (2014). "Heads or tails?"—A reachability bias in binary choice. Journal of Experimental Psychology: Learning, Memory, and Cognition, 40(6), 1656–1663.

103. The choice buttons in the current format of the ATT prompt differ from some of the alternatives considered by Apple we described above. Also, in evidence submitted to us, [one app developer] noted that Apple changed the order of the choice buttons in the ATT prompt around February 2021, meaning previously the opt-in choice was placed above the opt-out choice. These choice architecture alternatives could have resulted in different implications for user behaviour as compared to the current design.

104. Further, we received evidence from Apple setting out that the form of the ATT prompt is consistent with Apple's standard operating-system-level alerts that are available to developers to request access to other user data and resources. In particular, having shorter or smaller text in the choice buttons allows the options to be placed side-by-side instead of stacked on top of each other in standard operating-system-level-alerts on Apple devices.

105. Side-by-side placement or horizontal orientation of the choice options could be an alternative orientation of options. As discussed in Chapter 8, future trialling of new or different versions of remedies can be an important tool for understanding the impacts.

ATT pre-prompt

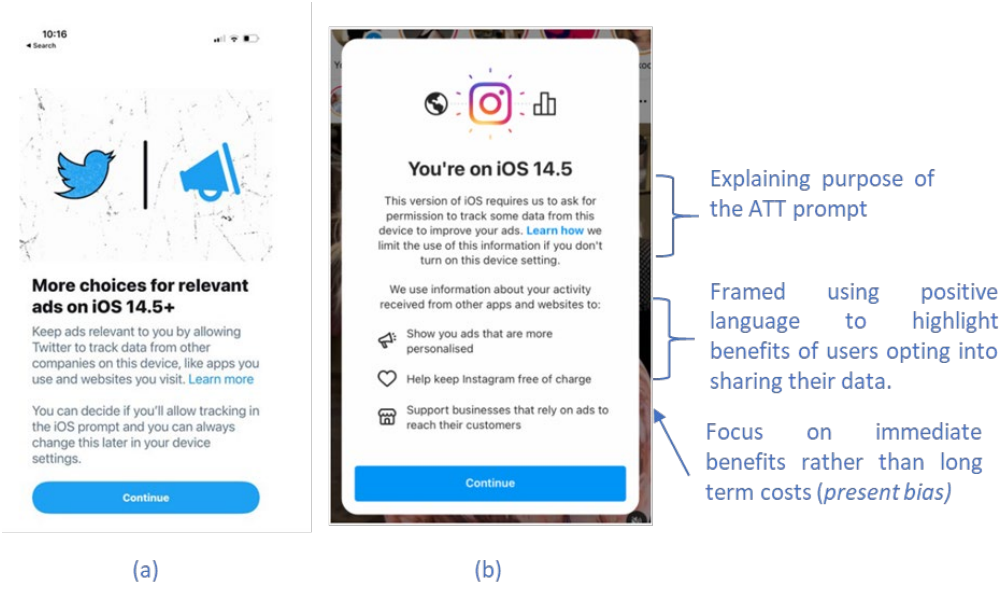
106. Prior to showing the ATT prompt, developers can display their own screen ie a 'pre-prompt' which can be used to explain why they are requesting access to users' data. Developers have discretion over the content of these pre-prompts, how they display them and also the number of times they choose to display them, subject to compliance with Apple App Store Review Guidelines and Apple developer agreement.

107. We note that the pre-prompt screen can be customised by developers, short of offering incentives, to explain the purpose of the ATT prompt, which can to some extent mitigate our concerns about limited user comprehension described above. While the pre-prompt can provide useful information to users to help them make effective decisions, it could also potentially be used to highlight the immediate benefits of opting in by using unduly positive language. However, evidence from developers shows that Apple has the final say over the pre-prompt screen content, which limits developers' customisation abilities. Overall, the evidence we received indicates that pre-prompts can influence opt-in rates to the ATT framework in either direction.

108. For example, as shown in Figure J.7(a), Twitter in its pre-prompt states that allowing tracking will ensure that users are shown relevant ads. Figure J.7(b) illustrates a further pre-prompt screen captured by the MyTracker blog and it has been illustrated with the choice architecture used. As depicted in the

figure, pre-prompts can be used to explain the purpose of the ATT prompt. The pre-prompt can be framed positively (using words such as 'relevant') to describe the benefits of users opting-in and to highlight the immediate benefits of opting-in with no reference to ongoing implications of opting-into personalised advertising. This could reinforce present biased preferences (ie the tendency to attach greater relative weight to costs and benefits that are closer to the present)[75] which can then cause users to focus on the immediate benefits of divulging data and overlook any future implications.[76] Further, the CMA in its online markets and digital advertising market study final report raised concerns about the use of unrelated positive descriptions of sharing data (eg being served with 'relevant' advertising).[77]

Figure J.7 Choice architecture of ATT pre-prompt



Source: (a) Apple (screenshot taken in July 2021) and (b) MyTracker[78]

109. Notably, Audiomack, a music streaming app, tested a variant of a pre-prompt screen which mentioned that users opting-in will allow the platform to remain free, resulting in a 64% opt-in rate.[79] We also received evidence from developers on user testing conducted on different variants of pre-prompt screens and the estimated impact on ATT opt-in rates. Developers also

[75] O'Donoghue, T., & Rabin, M. (1999). Doing It Now or Later. *American Economic Review, 89*(1), 103-124.
[76] John, L. (2015). The Consumer Psychology of Online Privacy: Insights and Opportunities from Behavioral Decision Theory. In M. Norton, D. Rucker, & C. Lamberton (Eds.), *The Cambridge Handbook of Consumer Psychology* (Cambridge Handbooks in Psychology, pp. 619-646).
[77] CMA (2020), Online Platform and Digital Advertising Market Study, Final Report, Appendix Y.
[78] How to Optimize Your iOS 14.5 Update Strategy with Pre-Permission Prompts | MyTracker Blog
[79] Here's How Music App Audiomack Got 64% Of its Users To Opt Into iOS Ad Tracking | AdExchanger.

shared their experiences of interacting with Apple to seek approval for implementing their pre-prompt design.

110. On Apple's involvement in determining the content of the pre-prompt [one app developer] submitted that Apple had the final say over the pre-prompt design, that it imposed limits on what the pre-prompt could do, for example, over what call to action buttons were or were not acceptable and that they had to compromise on the variant they ultimately shipped and did not necessarily use the one delivering the highest opt-in rate in order to avoid conflict with Apple.[80] In particular, they told us that the pre-prompt variant with lowest opt-in rate contained the word 'tracking' while the one with the highest tested opt-in rate referred to 'ads personalisation' (which is very similar language to that of Apple's own prompt).

111. We also received evidence confirming Apple's enforcement of their bar on using incentives in the pre-prompt by requesting changes to the pre-prompt screen to omit mention of anything that that could be interpreted as incentivising opt-in. Particularly, King noted that Apple interpreted some pre-prompt language submitted by them to Apple for consideration as incentivising user opt-in, although that was not intended by King, and requested revisions.[81,82]

112. Several other developers also reported having conducted user testing of pre-prompt screens and observing an increase in ATT opt-in rates.[83] Some developers also observed a negative overall effect of pre-prompt screens on ATT opt-in rates and thus decided not to show a pre-prompt screen before surfacing the ATT prompt. Some developers noted that the friction or

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[80] The same developer noted that testing certain optimisations made to the pre-prompt screen – such as changes to the header or overall framing, content and ordering of choice buttons, number of steps in the user flow, and whether the pre-prompt could be dismissed - led to a statistically significant impact on ATT opt-in rates. It told us that its pre-prompt testing showed that most customers see the pre-prompt header and make quick, heuristic-based decisions and that the average user would not spend enough time with the pre-prompt to review the text below the header carefully, much less to understand the value propositions presented. Further, it also found that a "Not Now" or "x" option led to most users dismissing the pre-prompt and exiting the choice flow. However, it noted that Apple does not allow deferring the choice to a later point in time.

[81] King told us that Apple required them to change the text on the call to action button on the pre-prompt screen from 'Continue to allow tracking' and also required revisions to the text in the pre-prompt screen which initially said "Get more relevant ads and keep earning rewards by tapping "Allow Tracking" on the next screen."

[82] We also received evidence on developers using prompts to ask opted-out users to reconsider their choices, which resulted in a small increase in opt-in rates. DMG submitted that they had tested the performance of two 'soft prompts'. The first one was to ask users who had previously opted out of ATT (by selecting 'Ask App Not to Track') but had 'Allow Apps to Request to Track' switched on in device settings, to reconsider their choice, which resulted in an overall global conversion rate of 5.7%. The second one was to prompt users who had 'Allow Apps to Request to Track' switched off to change their settings, which resulted in a 1.2% global effective conversion rate. Our view is that while these screens to prompt users to reconsider their preferences can result in increased opt-in rates, they can also create additional burden on users. King also submitted that they had designed a prompt to engage users who had declined the ATT prompt previously to change their tracking settings, but did not conduct any live tests.

[83] For example, King found that a 'gamified' look of the pre-prompt screen led to an increase in ATT opt-in rates. Spotify submitted that 'shorter and more user-friendly' text in the pre-prompt screen led to higher opt-in rates.

additional steps introduced by the pre-prompt was the reason that users didn't respond favourably to it.

113. Across examples of pre-prompt screens, we observed that:

- They can provide useful information to users to help them make effective decisions. However, they could potentially be used to highlight the immediate benefits of opting-in by using unduly positive language, with no reference to ongoing implications of opting into personalised advertising.
- Evidence from developers shows that Apple is involved in determining the content of the pre-prompts, including the language used and their design.
- Depending on the choice architecture, pre-prompt screens can influence opt-in rates to the ATT framework in either direction, meaning that the screens can be effective at increasing the opt-in rates or alternatively, decreasing them (for instance, due to the additional friction introduced in the user journey). We also note that the increased user burden from facing the additional screen can potentially reduce user engagement with the ATT prompt.[84]

114. In summary, the ATT choice screen provides users with an active choice to opt into sharing their data with third-party app developers. This is a step towards enhancing users' control over their data. We do, however, have concerns that the current choice architecture of the ATT prompt and pre-prompt, may not maximise user comprehension and thus limit the extent to which ATT empowers users to make effective choices about their data. We also note that developers being able to provide incentives to users to encourage opt-in is not in principle in contravention of data protection law and, as long as caution is exercised so that the consumers that do not consent are not penalised for doing so, this could allow developers to share with users some of the value they get from their data.

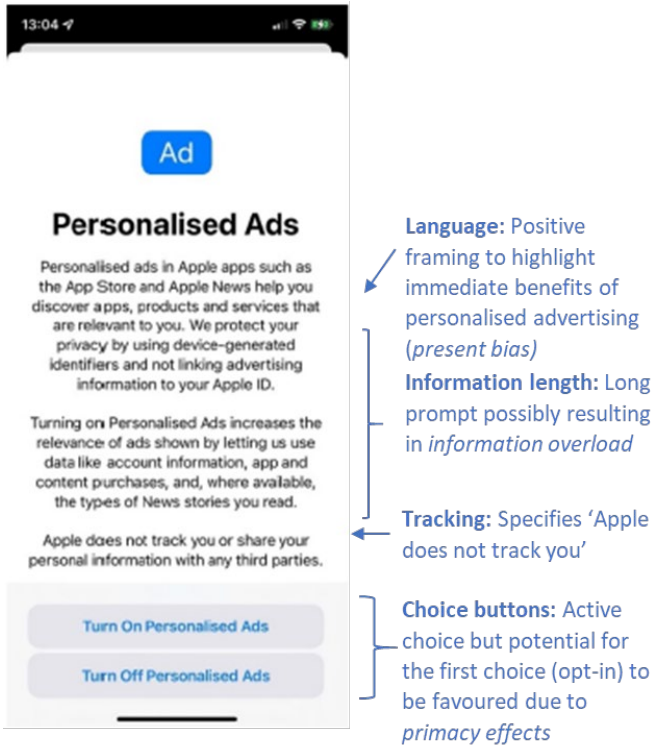
115. Further, we note that iOS users can also centrally disable (or alternatively, enable) apps from showing the ATT prompt. This arguably gives them a further element of choice, albeit involving multiple steps and therefore potentially creating unnecessary barriers and deterring users from changing the default setting. We illustrate this user journey in the annex to this appendix.

[84] Thus, it is important that the choice architecture of pre-prompt screens is optimised, based on user testing results, to maximise user comprehension, without them unduly biasing users towards either the opt-in or the opt-out choice.

Comparison of the Personalised Ads prompt with ATT prompt

116. As discussed above, with the launch of iOS 15, Apple has started surfacing a choice screen to users asking permission to enable personalised ads for their Apple ID.[85] Opting into personalised ads will allow Apple to show personalised advertising in the App store as well as Apple News and Stocks apps. Personalised ads was previously enabled by default for Apple owned apps, unless the user had enabled Limit Ad Tracking before iOS 14.[86] The choice architecture of the Personalised Ads prompt is illustrated in Figure J.8.

Figure J.8: Choice architecture of Apple's Personalised Ads prompt



Source: Apple; Analysis: CMA.

117. We welcome Apple's introduction of the personalised ads screen as potentially empowering users to make choices on data privacy. We, however, have the following specific concerns:

[85] iOS 15 now prompts users if they want to enable Apple personalized ads, after it was previously on by default - 9to5Mac.
[86] Starting with devices running iOS 15, the Personalised Ads prompt is displayed to new users when the App Store is launched for the first time. For existing users, whose devices is set to personalised ads on, the prompt is displayed when App Store is launched after updating their device to iOS 15. In later iOS 15 releases, the Personalised Ads prompt will surface upon first launch of the News or Stock apps, if the user has not launched App Store before that.

- The choice architecture of the personalised ads screen may have features that seek to influence users to opt into data sharing and therefore does not empower users to make effective choices.

- The choice architecture of the personalised ads screen is significantly different to the choice architecture we describe for the ATT prompt and there is inconsistency between the language used to characterise the data processing enabled by each prompt – in particular, Apple's own prompt says 'Apple does not track you' while Apple's processing of its users' personal data is no less consistent with the description of tracking (as set out by the UK's data protection authority and the W3C) than what third-party developers do.

- Apple has provided little explanation on how the Personalised Ads prompt design was finalised including confirming that 'No research or user testing and A/B testing related to these design features was carried out'.

- The user journey for changing the personalised ads settings (as illustrated in the annex to this appendix) is around 6 steps including scrolling which may create a barrier to users revisiting their choice in either direction.

118. Apple's Personalised Ads prompt employs a different choice architecture compared to the ATT prompt. Apple told us that 'The Personalized Ads prompt does not look like the ATT prompt because Apple does not engage in tracking to deliver Personalised Ads'. In response to our interim report, various stakeholders expressed concerns over the differences in choice architecture between the two prompts, highlighting the lack of equal treatment between first and third-party apps.[87]

119. In Table J.2, we highlight the differences in choice architecture between the ATT and Apple's Personalised Ads prompts. Specifically, we identify choice architecture differences which we would expect to influence users to opt into sharing data for Apple's own apps whilst potentially influencing users to opt-out from sharing data within the ATT prompt. Overall, our concerns about the differences in choice architecture and thereby potential impact on choices for opting in or out are primarily:

    - The ordering of options in the two privacy prompts differ from each other. In the ATT prompt, the option to opt-out from personalised advertising is presented at the top vertically. In Apple's Personalised Ads prompt, the option to opt into personalised advertising is presented at the top

[87] For example, see responses by European Publishers Council, Pinterest, Professional Publishers Association and DMG Media

vertically. As discussed above, primacy effects suggest that the option presented at the top may be favoured by users.

- The format and content of the text shown in the prompts are unlike each other and these differences may materially influence choice and may not maximise user comprehension.

Table J.2: Summary of differences in the choice architecture of the ATT prompt and Apple's personalised Ads prompt

	ATT prompt	Personalised Ads prompt
Ordering effects	The opt-out choice ('Ask App Not to Track') is presented above the opt-in choice ('Allow') which could possibly enhance users' likelihood to opt-out due to primacy effects.	The opt-in choice ('Turn on Personalised Ads') is presented above the opt-out choice ('Turn off Personalised Ads') which could possibly enhance users' likelihood to opt-in due to primacy effects.
Framing	The prompt is framed as providing a choice on whether to allow an app to 'track' the users. Evidence submitted to us suggests users may not comprehend the meaning of the language used, particularly the word 'track'.	The prompt is framed as allowing users a choice on 'personalised advertising' and then describes the benefits of personalised advertising. The prompt also specifies that 'Apple does not track you'.
Information overload	The information provided in the prompt is brief. While succinct information can increase readability for users with limited attention, prompt length and content should be optimised to maximise user comprehension of the purpose and scope of the prompt.	The prompt is substantially longer. Thus, it is possible for users to miss key details due to information overload.[88]
Salience of key messages	The non-customisable prompt presented in bold text is likely to draw the user's attention more than the customisable purpose string below the prompt due to salience.	All the text presented except for the title is equally salient.

Opt-in figures

120. We have received a wide range of estimates for opt-in rates for the ATT prompt from Apple, ad networks and app developers. Most of these estimates were based on only a partial adoption of iOS 14.5 where the ATT prompt was rolled out and therefore might not be representative of longer-term rates.

121. Apple told us that it does not have user level opt-in data due to privacy protections. Based on Apple's internal assessment conducted at the prompt-level [✂] [a significant number] of the ATT prompts displayed were accepted by users to allow third-party tracking, based on data from users who opt in to

[88] See Persson, P. (2018). Attention manipulation and information overload. *Behavioural Public Policy, 2*(1), 78-106.

share analytics data with Apple. Given this estimate is based on users who have already opted into sharing analytics data with Apple, meaning users who have shown they are willing to share data with Apple, we consider that the estimate may overestimate the actual opt-in rate across all users.[89]

122. Estimates of opt-in rates for the ATT prompt, meaning the percentage of users who selected “Allow” when shown the ATT prompt, we received from app developers are varied, with several ranging around 20-30%. Public estimates we have seen from third-party providers for the UK and worldwide are also varied and range from around 20% to 40%, approximately eight to ten months after the introduction of the ATT policy.[90]

123. With regards to the ATT opt-in rates we received, we note that, in some cases, developers provided us with the opt-in rates only for users who were shown the prompt and noted that this did not account for users who had centrally disabled the ATT prompt in device settings, meaning that the actual opt-in rate was lower. Indeed, when we received both the opt in for all users and that for users who were shown the prompt the latter was materially lower.

124. Moreover, we note that IDFA-based advertising relies on users opting in for ATT across multiple apps in order for targeting and attribution to take place, more specifically, users need to opt-into both the publisher’s app selling the advertising space and the advertiser’s app buying that space (see Figure J.9 below).[91] Therefore, each developer’s estimate of their users’ opt-in rate is likely higher than the actual proportion of their users for which they can use the IDFA for advertising. Some developers confirmed this and told us that the opt-in rates they provide may overstate the degree to which they can share data with any advertiser due to this ‘double opt-in’ requirement.

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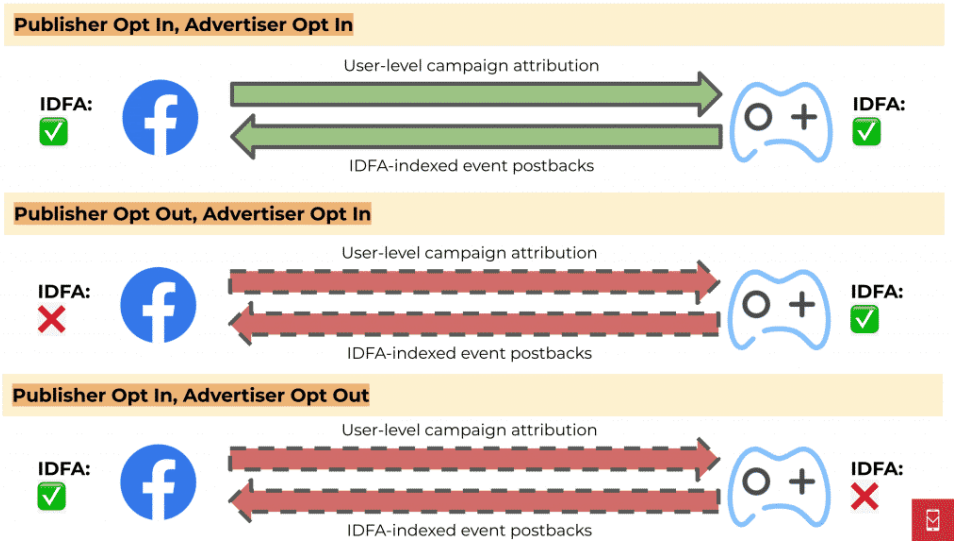
[89] Consistent with this, Apple told us that data from an opt-in population may be 'subject to substantial selection effects' (with those most likely to be comfortable and frequent users of Apple’s products and services being the most likely to opt-in to the data collection) which 'render it unsuitable as a dataset from which to draw any conclusions regarding aggregate population usage’, and when asked Apple agreed that its ATT opt-in estimates may also be subject to similar biases.

[90] For instance, estimates from AppsFlyer suggest that, as of 21st December 2021, 41% of UK users who have seen the ATT prompt opted in. See iOS 14 & ATT benchmarks [Report] | AppsFlyer (based on 83% iOS 14.5 user adoption rate). Differently, estimates from Flurry suggest a worldwide weekly opt-in rate of 25% across apps that have displayed the prompt in February 2022 with the figure generally increasing from the launch of ATT (when it was around 11%) and being relatively stable around 20-24% over the past six months.. See App Tracking Transparency Opt-In Rate - Monthly Updates.

[91] Mobile Dev Memo, ATT opt-in rates are irrelevant | Mobile Dev Memo by Eric Seufert.

Figure J.9: IDFA-based advertising relies on users opting in for ATT across apps



Source: ATT opt-in rates are irrelevant.

125. Despite the differences in the figures we have received from various developers and seen in media reports, we note that most of the estimates we have seen are significantly lower than the opt-in rate suggested by Apple.

126. We recognise that this outcome will to some extent reflect the views among many consumers regarding the collection and use of their personal data. However, we note that opt-in rates are likely to be influenced by the design and layout of the ATT prompt, including when and how the choice is presented to users as well as the language used (as set out above).

127. In terms of how the ATT opt-in rates compare to the opt-in rates for Apple's own Personalised Ads prompt, Apple reported that for users with versions of iOS 15.0 or later, where the Personalised Ads prompt was shown, the opt-in rate for the prompt was [10-20]% in January 2022 in the UK. Apple argued this is comparable to (or even lower than) the average ATT opt-in rates and that this is inconsistent with the notion that the two prompts are having a distortionary effect on users' choices in a way that disadvantages third-party developers over Apple. We note that this estimate suggests that the differences in choice architecture between the ATT prompt and the Personalised Ads prompt have not thus far resulted in as significant a difference in opt-in rates as expected.

128. However, we also note that this opt-in rate for Personalised Ads prompt is not a user level measure. More specifically, Apple told us that it does not have user level data for Personalised Ads rates due to privacy protections in iOS, and that the measure reflects the percentage of App Store searches which originated from devices with Personalised Ads set to 'On', among devices with iOS version 15.0 or later versions. This limits the direct comparability of this

measure to the estimates of opt-in rates for the ATT prompt provided to us by developers given the latter are user-level while the App Store search volume can reflect multiple searches from the same user.

Impact of ATT on app developers

129. As set out above, the ATT framework is likely to impact app developers engaging in mobile advertising in two main ways:

- by undermining developers' ability to acquire users through **buying app install advertising**; and
- by undermining developers' ability to monetise their app through **selling in-app advertising**.

130. This is as a result of the reduced capabilities for targeting and attribution when advertisers cannot track users' activity across apps. More specifically:

- Without accurate targeting of customers, app developers monetising via in-app advertising cannot use information gathered across third parties' properties to refine the ad personalisation, which makes the value of ad inventory lower and so advertisers are willing to pay less for in-app advertising.[92] At the same time, app install advertising is less effective as it as it cannot follow users beyond a developer's first-party apps and properties, and thus is unable to target 'high-value' customers (eg customers who make frequent in-app purchases);[93]
- Without accurate attribution, advertisers cannot measure the effectiveness of their ad campaigns and formats so cannot optimise their ad spend by allocating their budget to the most effective ads (eg ads which are more effective at encouraging the desired outcome). This makes both app install advertising and in-app advertising less effective as observed conversions cannot be used to enrich the user's profile, such that ads can be better targeted to that user in the future.[94]

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[92] The fact that app developers monetising via in-app advertising can only rely on consumers' activity in their own properties for personalisation is particularly problematic for small developers with a limited or niche audience. As a result, developers monetising via in-app advertising generate lower revenue from advertising, which might push them to consider alternative monetisation models.

[93] Meta told us that for advertisers the costs per impression (CPMs) for users on iOS 14.5+ were on average [✂]% higher than CPMs for users on iOS 14.4 or below (pre-ATT). When considering CPMs for app install campaigns alone, the increase reaches [✂]%. This illustrates that ATT particularly impacted app install advertising, and that developers have had to pay higher costs to advertise their apps.

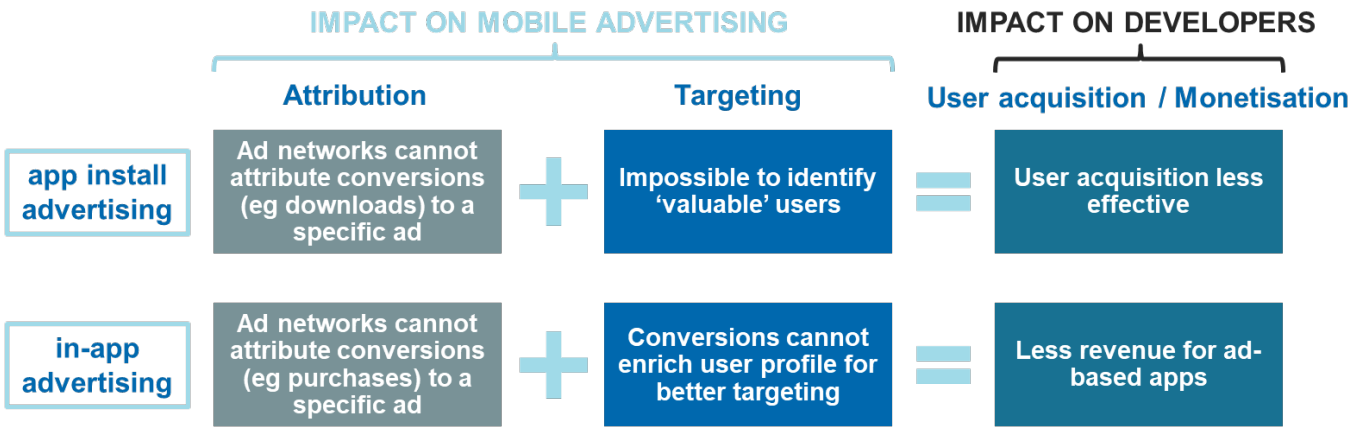
[94] For instance, if a user enables access to the IDFA: (i) when the user clicks on an ad on Facebook they are redirected to either a website or an app and Facebook may observe how they interact with these properties, either through a pixel present on the website or through a Facebook SDK integrated into the app; (ii) Facebook may then record this information using the IDFA linked to the Facebook ID to match what it gets from the

131. Therefore, the impact on attribution further affects app install and in-app advertising, as it not only makes it more difficult for developers to allocate budget to advertising effectively, but also makes ad targeting less efficient.

132. As a result of the above, developers monetising via in-app advertising generate lower revenue from advertising, which might push them to consider alternative monetisation models, and app install advertising becomes a less effective means for acquiring users, which might push developers to rely more on the App Store.

133. Figure J.10 presents a summary of the ATT impact on app install advertising and in-app advertising and in particular what worse attribution and worse targeting for each means in terms of impact on developers' monetisation and user acquisition.

Figure J.10: Impact of ATT on mobile advertising



Source: CMA analysis

Impact on developers' monetisation and user acquisition

134. In this section, we cover evidence from developers regarding ATT's impact on their revenue and user acquisition.

135. Several developers told us that they have seen a negative impact on advertising performance on iOS and on the effectiveness of their user acquisition. For instance:

- [An app developer with multiple apps] told us that ATT impacted its revenue and customer acquisition strategy in relation to a minority of its apps and that, where this was the case, it increased either the proportion

destination property with a specific user (ie the pixel sending data linked to the Facebook ID, or the app sending the IDFA attached to the conversion events) and then use this to enrich the user's profile; (iii) this means Facebook knows more about what the user likes and can use this to serve better ads to them based on what they are most likely to click on and interact with, including making purchases.

of its total iOS advertising spend allocated to ASA, or its spending on Android compared to iOS or both. The same developer also told us that it saw a decline in monthly app first starts for one of its apps due to advertising on social media apps generating fewer app installations than expected, in part due to the implementation of attribution via SKAdNetwork.

- [a developer] told us that ATT reduced iOS retargeting audience size by around 50% and that it stopped mobile app install campaigns (MAI) on iOS given limitations in measurement and attribution there.[95] The same developer told us that it materially reduced its iOS campaign budget after the introduction of ATT, such that its ratio of spend went from 60%/40% (Android/iOS) to about 90%+/<10% (Android/iOS).

- [One app developer] told us that the introduction of ATT has skewed its advertising spend even more heavily towards Android and, as advertising on iOS has been demonstrating poor performance in reaching iOS users as effectively.

- [One app developer] told us that it has pivoted many channels towards Android, including Google's App campaign product for user acquisition for its android app and that this has resulted in a 40% decrease in iOS audiences.[96]The same developer also told us that it has recently started using Apple Search Ads API installs as a proxy to make decisions and spend more confidently in Apple search ads.

- King told us that, as a result of ATT, its overall share of marketing spend on iOS has declined as it cannot track installs and optimize towards ROI.

- Google told us that [✂].

136. Despite the recent introduction of the ATT framework meaning that it may be too soon to estimate its impact on developers and ad platforms revenue (as Apple itself has argued) some developers provided some initial estimates of the ATT's negative impact on their advertising revenue – with some submitting that they are changing their monetisation strategy as a result of it. In particular:

- [One developer] provided an internal assessment of ATT's impact on its ads revenue on iOS which shows an estimated decline in revenue of 27%.[97] The same developer also told us that the fact it will be restricted

[95] It also told us that it has not integrated with SKAdNetwork yet [✂].
[96] The same developer told us that with iOS we are not able to run measurable campaigns and are currently defining measurement frameworks to scale iOS user acquisition strategy.
[97] This was based on a 63% adoption of iOS 14.5 where the ATT prompt was rolled out.

from combining data across properties to target ads means advertisers will likely place lower value on its advertising services on iOS, reflected in declining CPMs (costs per impression). The same internal assessment contains an estimate for such decline which is over 50% (albeit with regional differences).

- Meta told us that ATT negatively impacted its revenue and that it is working on possible mitigations, including long term ones. In particular, Meta told us that ATT drove a decline of [✂] in its 2021 third quarter revenue and that its [✂] decelerated by at least [✂]. Meta told us that reported Cost Per Action (CPA) on iOS have increased by [✂] in aggregate since the launch of ATT and this has been in part driven by Meta's under-reporting iOS web conversions.

- Focusing on the impact on Meta Audience Network (MAN) (previously, Facebook Audience Network or "FAN"), used by developers to advertise on third-party properties and monetise by displaying third-party ads in their apps, Meta told us that:

  - It will be more expensive for app developers to acquire users with average cost of mobile app install ads increased by [✂] for campaigns on iOS 14.5 and above versions.

  - CPMs might drop by an average of [✂] across all iOS impressions when iOS 14.5 adoption increases.

  Moreover, due to Apple's limitations on alternative measurement tools on iOS (as further explored in the section below) Meta told us that MAN stopped the delivery of certain campaign types on iOS which were particularly relied upon by small app developers and, as a result, revenue from MAN now accounts for only [✂] of the overall revenue Facebook gets from iOS users (down from [✂] pre-ATT).[98]

- [One app developer] told us that its preliminary analysis of the impact of ATT indicated that it had resulted in a reduction of around 30% in its ad revenue. As this was less than 2% of its global revenue, however, it told us that it does not expect to change its revenue generation strategy as a result of ATT.

- [One app developer] told us that ATT has adversely impacted its ability to measure the effectiveness of advertisements on its app, which has

[98] Finally, to proxy the effect on ATT on publishers' revenue, Meta provided the results of an experiment pre-ATT launch comparing the revenues earned by FAN publishers when using personalised and non-personalised advertising and estimated a revenue loss of over 50% with the latter. This was due to loss of personalisation only in the ranking as opposed to in targeting.

resulted in reduced demand and pricing for its advertising products. It also told us that to mitigate the significant impact of ATT on its business, it has developed various monetisation strategies, including [✂] and that, if such alternative solutions do not become widely adopted by its advertisers, ATT will continue to negatively impact its revenue.

- [One gaming app developer] submitted an analysis showing that ATT lowered significantly its revenue per user which sharply declined around May 2021 and kept declining until February 2022. The same analysis shows that decline in revenue has been over 40% since September 2021.

- DMG told us that it observed a significant decline in CPMs for iOS versions subsequent to 14.5 (where ATT was introduced) compared to previous ones and that programmatic advertising revenue across their iOS app was generating around [✂] per day in May 2021 and closer to [✂] per day in February 2022. It also told us that the effect of ATT is clear when comparing daily revenue between their iOS app and Android app, with the former suffering a 56% year-on-year decrease between fourth quarter of 2020 and 2021 and the second a 66% increase at the same time, in part due to DMG's optimization efforts and in part to buyers shifting spend from iOS to Android. Further, DMG told us to have tested various initiatives to improve app revenue but none has been significant enough to materially recover revenue from the ATT hit.

137. We note that several companies which significantly rely upon mobile advertising, have publicly announced that their revenue has been severely hit by Apple's ATT. For instance:

- Snapchat said in an earning call that its revenue in 2021's third quarter was lower than expected and that it anticipates growth will further slow because of Apple's ATT changes.[99] In the same earning call, Snapchat said that SKAdNetwork worked less well than expected.[100]

- Facebook blamed Apple's ATT for its slower sales growth in the same quarter and warned investors of further uncertainty for its advertising business.[101] It announced it is working to address ATT's challenges in relation to measurement and targeting, with the latter requiring a multiyear effort and re-building its systems.[102]

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[99] Snap's Stock Plummets as It Blames Apple's Privacy Changes for Hurting Its Ad Business - WSJ.
[100] Snap Inc. (SNAP) CEO Evan Spiegel on Q3 2021 Results - Earning Call Transcript | Seeking Alpha.
[101] Facebook Posts Slower Sales Growth With Apple Privacy Policy - WSJ.
[102] Facebook said that it estimated to be underreporting iOS web conversions compared to sales and app installs actually happening due to less accurate measurement post-ATT and it expected to improve this for its clients in

138. Other companies announced they were also affected by ATT changes, albeit to a lesser extent. For instance:

- Twitter said it was less affected by Apple's policies than other companies because it relies more on contextual and 'brand advertising' rather than 'direct response advertising'[103] meaning the type of advertising whose payoff comes as a result of an action taken in direct response to an ad.[104]

- Google stated that ATT had a 'modest' impact on YouTube revenues, (primarily in relation to direct response advertising) and that it has been investing in privacy-preserving technology to support developers mitigate ATT's impact on their businesses.[105]

139. In summary, although it may be still relatively early to quantify the longer-term impacts of ATT on app developers in terms of revenue loss, the impacts seem to be material, particularly for developers which rely heavily on mobile advertising for user acquisition and monetisation. Furthermore, the impacts seem likely to persist at least in the immediate term and to require significant investment from developers to adjust their processes and technology to the changes brought about by ATT and mitigate its effects.[106]

140. We note that some of these reduced capabilities may be the result of users' preferences with respect to whether and how they want their data to be used for advertising purposes. However, as detailed further below, we have concerns with Apple's implementation of ATT and its resulting impact on app developers aside from our concerns on choice architecture (which is untested and applied inconsistently). These include limited engagement with industry participants by Apple, for instance on SKAdNetwork, the replacement tool it makes available to third parties for ad attribution and sudden changes to it.

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the relatively short term. It also said that ATT's effect on targeting was a longer-term challenge as several Facebook's ad products are built on user level conversions and, as a result of ATT, Facebook cannot see the same level of conversion data. Therefore, Facebook said it has to rebuild its targeting and optimization systems to work with less data and that this is a multiyear effort. See FB Q3 2021 Earnings Call Transcript (q4cdn.com).

[103] See Twitter Earnings Transcript. See also Snap, Facebook, Twitter and YouTube lose nearly $10bn after iPhone privacy changes | Financial Times.

[104] With 'contextual advertising' the targeting of the advertisement is driven by the surrounding content, including the nature of the medium and the user's activity at the time of seeing the ad (for example, advertising for sports equipment served on sports-related applications); , meaning a type of advertising designed to get an instant response by encouraging people to take a specific action and whose payoff comes as a result of an action taken directly in response to an ad; 'brand advertising' on the other hand is aimed at establishing brand recognition and longer-term relationships with consumers over time. See What Is Brand Advertising & Why Should You Use it?.

[105] Google Q3 2021 Earnings Call Transcript, page 9.

[106] This is in part due to concerns around the extent to which SKAdNetwork is an adequate substitute to IDFA-based attribution, as explained in more detail in the 'Self-preferencing of Apple's advertising' section below.

Self-preferencing of Apple's own advertising

141. We have heard concerns that, through the ATT implementation Apple might be favouring its own advertising services over third parties', by giving its services advantages in terms of both targeting and attribution. Below, we cover how Apple may be advantaged in ad targeting and attribution as well as evidence on the impact of ATT on its advertising business.

Advantages in targeting

142. We consider that Apple's personalised advertising, which we describe in detail in the section on Apple's advertising services above, is likely to be favoured compared to personalised advertising performed by third parties. This is happening because:

- on the one hand, Apple's personalised advertising is being presented differently to users compared to advertising performed by third parties subject to the ATT framework, both in terms of language (ie Apple's process behind it serving personalised advertising not qualifying as 'tracking') and design and choice architecture elements; and

- on the other hand, Apple's personalised advertising is able to use a wide range of data, potentially coming from a range of Apple's different apps and services as well as from user activity within third-party apps.

143. As mentioned above, Apple's definition of tracking appears to favour large companies operating several first-party properties, including but not limited to Apple, which can easily rely on first-party data, including account information, app and content downloads and purchases to perform personalised advertising.

144. Google's choice of not showing the ATT prompt following the introduction of ATT is consistent with the fact that large companies operating various first-party services will have an advantage. In particular, given Google operates several apps and services under common corporate ownership, it is able to combine data gathered via those distinct apps and services without the need to access the IDFA to be able to link information to users and thus without being required to show the ATT prompt. The lesser impact on Google compared to other companies engaging in advertising is also illustrated by the lower revenue loss it experienced.[107]

145. In terms of data used by Apple for personalised advertising, even though it told us it only uses 'a limited set of first party data', based on its description of

[107] See public announcements by Google and Twitter mentioned above.

the data processing it performs to serve personalised advertising, it actually uses a wide range of information, including personal data which relates to the user's device, data relating to Apple's own apps and services, and data on downloads, purchases and in-app purchases for all third-party apps (since this is treated as transaction data within Apple's first-party App Store).[108]

Advantages in attribution

146. Another way in which Apple's advertising campaigns within the App Store might be favoured over campaigns happening outside, including within third-party ad networks, is the difference in measurement and attribution capabilities available to each of these.

147. As mentioned above, Apple has provided a replacement for IDFA-based attribution and measurement in the form of the free tool SKAdNetwork,[109] which Apple makes available to developers and ad networks.[110] At the time SKAdNetwork was first introduced (March 2018), and even when SKAdNetwork 2.0 was released in September 2020, there was limited incentive for its use over other third-party attribution systems, such as those using Google or Meta SDKs. However, given the limitation introduced by the ATT rollout to third-party attribution systems, more market participants are now using SKAdNetwork.

148. Adoption of new SKAdNetwork versions is becoming an increasingly important factor as Apple has been adding more and more features in each new release.[111,112] Indeed, Apple told us that it has heard various external feedback from developers and ad players on SKAdNetwork APIs and has responded to such feedback introducing major advancements for SKAdNetwork.[113]

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[108] In response to questions to market participants, we have heard that Apple treats "all data within the App Store as being their first party data" and therefore it does not need to display the ATT prompt.
[109] The 'SK' refers to StoreKit, a set of developer tools to support in-app purchases and interactions with Apple's App Store.
[110] A very first version of SKAdNetwork (1.0) with limited functionality was introduced in March 2018 as a privacy-enhancing API for the measurement of mobile ad campaigns for iOS apps. See Dataseat, The Evolution of SKAdNetwork – Dataseat Ltd.
[111] AppsFlyer, iOS 14 & ATT benchmarks [Report] | AppsFlyer.
[112] Dataseat, The Evolution of SKAdNetwork – Dataseat Ltd.
[113] These include: (i) View-through attribution, which allows the distinction between view-through impressions and click-through impressions, meaning respectively impressions which are only viewed by a user and impressions on which the user actually clicks. This is only supported starting from version 2.2, while version 3.0 also supports multi-touch attribution, involving the monitoring of multiple touchpoints (as opposed to the last click only for instance) in a user's journey to a conversion, with the aim to identify which touchpoint was determinant in leading to the conversion. See AppsFlyer, iOS 14 & ATT benchmarks [Report] | AppsFlyer; (ii) Private Click Measurement, an iOS feature separate from SKAdNetwork which allows ad networks to measure the effectiveness of advertisement clicks within iOS or iPadOS apps that navigate to a website. See GitHub, privacycg/private-click-measurement: Private Click Measurement (github.com) (iii) Multiple postbacks, which are the signals coming from an advertiser telling an ad network and developer whether a conversion was successful.

149. To use SKAdNetwork, the advertised app, ad network, and publisher app must all be registered with Apple.[114] SKAdNetwork provides campaign-level data. When an app is installed and opened for the first time (if this happens within 60 days of installation) SKAdNetwork sends the ad network information in the form of an 'install postback':

- This includes data on the source of the app install (eg the ID of the publisher app),[115] the associated ad campaign, the IDFA on opted-in users, and some limited information about how the user interacted with the app the first time they opened it (ie one specific action captured as a single 'conversion value').[116]

- The postback does not include any personal data, user-level attribution data, or any post-install metrics on how a user engages with the app after the first time they opened it. It also does not contain ad creative[117] IDs, which forces ad networks to use different campaign IDs instead, if they want to measure the impact of ad format (within a limit of 100 campaigns per app per ad network).[118]

150. SKAdNetwork does not support web attribution (ie attribution to an ad displayed on the web), although it was reported nearly 10% of app installs are preceded by a visit to a brand's website.[119] However, as mentioned above, Apple introduced Private Click Measurement as a means to address app-to-web and web-to-web traffic.[120]

151. SKAdNetwork has different timeframe settings compared to pre-ATT measurement tools. In particular, with third-party attribution systems using IDFAs and SDKs, an ad network could determine what maximum period of time between an ad view and app install counted as a conversion. By contrast, SKAdNetwork sets fixed time limits on what is considered a conversion based on the time between the user interacting with an ad,

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Postbacks can now be sent to up to six ad networks (a 'winning' network and five unsuccessful ones); (iv) Starting from iOS 15, developers of advertised apps can opt-in to get copies of the winning postbacks that represent successful ad conversions for their app. Apple referred to some stakeholders praising particularly this last advancement.

[114] Apple, Registering an Ad Network | Apple Developer Documentation.

[115] It has been reported that this App ID makes it possible to determine which app categories (eg gaming) advertises most and with what kind of publishers. See Inside SKAdNetwork: SKAdNetwork insights [Guide] | AppsFlyer.

[116] AppsFlyer, What is SKAdNetwork? | AppsFlyer mobile glossary.

[117] The creative is the format of the ad served to users on a webpage, app, or other digital environment. It can be images, videos, audio, etc.

[118] Stratechery, An Interview with Eric Seufert about the Impact of ATT – Stratechery by Ben Thompson.

[119] AppsFlyer, iOS 14, winds of 2020 and the web comeback | AppsFlyer.

[120] For app-to-web and web-to-web campaigns Apple has introduced Private Click Measurement (PCM) for attribution and tracking. PCM mirrors SKAdNetwork in that it aims to replace pre-ATT real-time user-level tracking with more limited and time-delayed attribution data. PCM does not just apply to advertising but also covers any form of tracking and click attribution between websites. (for more detail, see Introducing Private Click Measurement, PCM | WebKit).

installing the app, and opening the app for the first time. The time limits depend on the level of interaction with the ad:[121]

- If a user views the ad for a minimum of 3 seconds it is considered a 'view through ad'. If the user then installs the app within 24 hours of seeing the view through ad, and also opens the app within 60 days, an install validation postback is sent to the ad network.

- Alternatively, if the user clicks on the ad through to the App Store it is considered a 'StoreKit rendered ad'. If the user then installs the app within 30 days and also opens it within 60 days, a postback is sent to the ad network.

- In all other scenarios, such as if a user downloads an app 25 hours after viewing an ad displayed in another app, and then opens the advertised app, no install validation data is ever sent to the ad network.

152. In addition, with SKAdNetwork, the install validation postback is not sent in real-time, as it was possible pre-ATT, but between 24 to 48 hours after the app is opened.[122] It has been reported that this delay makes it difficult to understand if an ad is performing well or not.[123]

153. As mentioned above, we have heard concerns from app developers, ad networks and industry commentators that SKAdNetwork is an inferior alternative to IDFA-based attribution and measurement and to the Apple Search Ads Attribution API Apple makes available to users of its own advertising services.

154. For instance, evidence we have seen suggests versions of SKAdNetwork to date offer more limited functionality compared to Apple Search Ads Attribution API given they give access to less granular app install attribution data.[124] Furthermore, SKAdNetwork appears to be undergoing frequent changes and updates by Apple and is thus a less mature API compared to Apple Search Ads Attribution API, which may be creating uncertainty for advertisers using it.[125]

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[121] Apple, Receiving Ad Attributions and Postbacks | Apple Developer Documentation.
[122] Apple, Receiving Ad Attributions and Postbacks | Apple Developer Documentation.
[123] Stratechery, An Interview with Eric Seufert about the Impact of ATT – Stratechery by Ben Thompson.
[124] In particular, compared to SKAdNetwork, Apple Search Ads Attribution API includes the date of the ad click and more detailed information about the specific ad format that led to a conversion. This information is key to optimising ad campaigns and selecting the most effective ad format for a given group of users.
[125] Since the ATT roll-out and in the space of a few months, multiple versions of SKAdNetwork have been released by Apple with sudden changes implemented between those. This relates in particular to the so-called "privacy thresholds" rule, based on which Apple hides the conversion values when the number of conversions sharing certain characteristics is too low. We understand that Apple does not disclose the rules governing "privacy thresholds" (eg the characteristics it considers or the threshold that must be reached to be able to see

155. Key differences in output from SKAdNetwork and ASA Attribution API are summarised in Table J.1 below.

Table J.1: key differences in output from SKAdNetwork and Apple Ads Attribution API

	SKAdNetwork	Apple Ads Attribution API
Time delay	24-48h	n/a
Ad click date and time	Not included	Included
Ad creative ID	Not included	Included
Country or region	Not included	Included

Source: CMA analysis based on attributionToken() | Apple Developer Documentation, Verifying an Install-Validation Postback | Apple Developer Documentation and ATT advantages Apple's ad network. Here's how to fix that. | Mobile Dev Memo by Eric Seufert

156. Media reports suggest the additional data Apple makes available via its Apple Ads Attribution API has two key advantages:

- First, it includes data on the specific ad creative in particular the ID of the ad group,[126] and the ID of the set of ad creatives.[127] Ad creative data is a central component of ad campaign optimisation, without it the ad network cannot know which creatives to keep, change, or drop.

- Second, the Apple Ads Attribution API includes the date of the ad click, and attributes app installs as they happen, unlike with SKAdNetwork.[128] This allows for more granular and timely analysis of install attribution.

157. Consistent with the above, we have heard widespread concerns around SKAdNetwork and its limitations and we have seen evidence from developers suffering from these.[129,130] For instance:

- Meta told us that SKAdNetwork significantly reduces the ability of ad networks and ad tech providers to provide ad attribution and analytics metrics to advertisers as with it 'the data is restricted, aggregated, delayed in reporting and can only support a limited number of campaigns.' This reduces the network's ability to measure ad performance and in turn advertisers' willingness to pay for ads.[131]

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conversion values) to other market participants and these appeared to have suddenly changed, creating data losses and uncertainty for advertisers.

[126] An ad group is a collection of criteria used to define who sees your ad in App Store search results: see Ad Groups | Apple Developer Documentation.

[127] Mobile Dev Memo, Apple privileges its own ad network with ATT. What's its privacy endgame? | Mobile Dev Memo by Eric Seufert.

[128] Mobile Dev Memo, ATT advantages Apple's ad network. Here's how to fix that. | Mobile Dev Memo by Eric Seufert.

[129] See Snap Inc. Earning Transcript; See also ATT advantages Apple's ad network. Here's how to fix that.

[130] For instance, some developers are still working on integrating SKAdNetwork and others working on alternative measurement solutions, both first party and in collaboration with external partners

[131] Meta also told us that Apple imposes certain limitations to SKAdNetwork, such as the so-called 'privacy thresholds.' Based on this, when the number of conversions sharing certain characteristics is too low, Apple

- Meta also told us that Apple has made repeated 'breaking changes' to SKAdNetwork (eg on privacy thresholds) with little warning to other industry participants and that the quality of some of its products has deteriorated significantly because of SKAdNetwork. For instance, the impossibility of measuring purchases reliably meant that Meta had to discontinue its optimisation of ads specifically to drive "in app purchases" on Audience Network for iOS. Further, SKAdNetwork's restrictions were so significant that it was no longer possible for Meta to offer a unified product allowing advertisers to run campaigns on both Android and iOS for users on iOS14.5 and above, which increased frictions for advertisers.

- [One app developer] told us that SKAdNetwork is inferior to the mobile measurement solutions that were available prior to the implementation of ATT as it limits the quantity and quality of the ad reporting data that advertisers and competing ad sellers can receive. For example, it imposes a Minimum Conversion Threshold, meaning that an advertiser can only access SKAdNetwork reporting if its ads on a particular app produced at least 75 app installs per day and provides reporting on a time lag of at least 24 hours (which often extends to 48-72 hours).

- [One ads platform] told us that, given SKAdNetwork provides less granular, aggregated data, with measurement limitations on the timeframe during which a user can act after seeing an ad, it has observed a negative impact to its iOS app install ads business (this impact being more negative for circumstances under which users have not opted into the ATT prompt).

- [One app developer] told us that it observes that the Apple Search Ads Attribution API provides additional data granularity compared to SKAdNetwork and, for this reason, it has redirected most of the advertising spend for its own iOS apps to Apple Ads. For instance, in 2021, following the introduction of ATT, the percentage of this developer's own advertising spend on Google App campaigns decreased by 58%, whilst the percentage of advertising spend on Apple Search Ads utilising the Apple Search Ads Attribution API increased by 136%. In 2022, this trend continued with advertising spend on Google App campaigns decreasing by 59% and that on Apple Search Ads increasing by 152% year-on-year.

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hides the conversion values (returning 'null' conversion values). Meta told us that Apple does not disclose the characteristics it considers or the thresholds that must be reached before Apple discloses conversion values, though the characteristics can include information such as publisher app or ad network. This, in Meta's view, places smaller publishers at a clear disadvantage since their lower traffic makes their conversions less likely to pass the threshold.

- King told us that SKAdNetwork's technology is functional, but with many limitations and inconsistencies across marketing channels. Examples of such limitations include low share of installs captured in many channels, the number of conversions being returned as null having increased, and the fact that the obfuscation of geography hinders King's ability to optimize effectively. King further told us that it provided feedback and suggested changes to Apple, but none were actioned.

- Apple itself shared feedback it received from developers and industry participants on the functioning of SKAdNetwork where they outline some of the issues with it. Apple told us that it continues to make significant efforts to address this feedback through continued developments and investment.

- In light of the limitations set out above, we consider that it will be important for Apple to constructively engage with the industry in relation to other alternatives to IDFA-based attribution and support efforts to develop new standards for privacy preserving functionalities. For instance, we are aware of proposals for privacy-preserving attribution from industry players which promise to solve some of SKAdNetwork's limitations.[132]

Evidence of impact on Apple's advertising

158. We have considered whether and to what extent these differences in targeting, measurement and attribution between campaigns inside and outside of the App Store might have pushed developers to increase their spending on search advertising services directly provided by Apple, which are less impacted by ATT.

159. We have seen evidence from developers showing that a few have increased their marketing budget allocated to Apple's search advertising services as a result of ATT. For instance:

- [an app developer with multiple apps] told us that, for one of its apps, the proportion of its total iOS advertising spend allocated to Apple Search Ads almost tripled;

[132] Meta told us that it has been working with the Mozilla Foundation on a new proposal that aims to provide conversion measurement for advertising while providing strong privacy guarantees. This solution is called Interoperable Private Attribution or "IPA" and IPA is still a work in progress. However, according to Meta, if widely adopted, it could potentially provide a longer term solution for ad measurement while also be able to address the shortfalls in Apple's SKAdNetwork, which delays reporting, limits the number of campaigns able to be reported on, and does not enable measurement for cross-device conversions.

- [one app developer] also increased its spend on ASA and submitted that it was forced 'to push Apple Search Ads as an alternative channel as much as possible with spend from other channels' as a result of ATT.

160. However, a few others either told us they are still considering their advertising strategy post-ATT or that they have not materially changed their approach to ASA, with one saying that they decreased the budget instead. The fact that ATT has pushed companies to spend more of their budget on App Store search ads instead of other products is consistent with recent public reports.[133]

161. Apple submitted that [evidence from its advertising business in the UK was inconsistent with ATT leading to benefits to its advertising services]. In particular, a paper submitted by Apple shows that its ASA revenues in the UK were [✂]. The same paper shows that this [✂] revenue trend was explained by a mix of increasing prices and [✂] – costs per tap (CPTs) for Apple Search Ads increased substantially, albeit gradually, after the ATT rollout, while [✂].

162. We consider that the developments in prices, rather than volumes or total revenues, are the most informative for assessing the effect of ATT. Given that the advertising slots within the App Store are limited, we would expect any increase in demand for Apple's advertising services resulting from ATT to affect prices, rather than volumes. We agree with Apple that the trends in volume are not associated with ATT and are likely to be explained by other factors, largely related to the Covid pandemic. We therefore also agree that 'if ATT had a positive effect on Apple Search Ads revenues, this should manifest through some discernible increase in CPTs'. Regardless of how volumes or overall revenues changed, so long as volume trends were unrelated to ATT, an increase in price caused by ATT would imply that ATT had caused Apple's advertising revenues to be higher than they would otherwise have been.

163. The evidence from Apple's data is consistent with this possibility. Apple's CPTs were [30-40]% higher in the 8 months following the introduction of ATT compared to the 8 months prior. Apple argued that increases in prices for ASA can be explained by numerous other factors, including reduction of developers' advertising budgets during the Covid pandemic and the increasing of developers' advertising budgets as Covid restrictions were eased.[134] Apple further argued that CPT growth following the introduction of ATT was lower than pre-ATT growth (when excluding pre-Covid data from

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[133] For instance, see Apple's Eddy Cue Is Shaking up Its Services Business (businessinsider.com).
[134] Apple also argues that CPT trends in the finance category can be explained by trends in cryptocurrency prices, and that CPT trends in the travel category can be entirely explained by Covid restrictions. Excluding these categories, CPTs were still [20-30]% higher in the 8 months following the introduction of ATT compared to the prior 8 months. We therefore do not consider that these category-specific explanations make a material difference to the results.

January-March 2020, which it argued is the correct approach given that Covid had a strong impact on CPT which fell drastically during this three-month period). We accept that the impact of ATT may be difficult to isolate from other trends affecting Apple's advertising business, although we do not agree that pre-ATT CPT growth is necessarily a good guide to how CPT would have continued to grow in the absence of ATT.[135] However, we do not find Apple's alternative explanations convincing – it is not credible to argue that first reductions and later increases in advertising budgets should both result in higher CPTs.

164. We therefore consider that overall, while not conclusive, the evidence on Apple's ASA prices is consistent with a higher demand (and thus willingness to pay) for ASA services after the introduction of ATT given other forms of app install advertising are less effective.

165. Apple also submitted that there was no material increase in the share of app downloads originating from ASA following the introduction of ATT and that ASA's share of downloads has stayed roughly constant since then. We note that ASA's share of total downloads does not directly correspond to ASA's share of app install advertising – if the number of downloads from app install ads from outside the App Store fell as a result of ATT, even if ASA's share of downloads remained constant, its share of app install advertising would increase. Media reports suggest that ASA's share of app install advertising did increase significantly following the adoption of ATT.[136] We have not been able to effectively verify such media reports with Apple's data as Apple could not provide data on sources of app downloads beyond August 2021 due to a 'bug' in their systems, but for the reasons noted above nor do we consider that Apple's submissions contradict these reports.

166. We also consider there to be strong reasons to expect any impact of ATT on Apple's revenue to be gradual and to some extent delayed given the slow roll out of iOS 14.5 and the time needed for developers and advertisers to assess such impact and change their strategies. Indeed, overall evidence from developers suggests that many are still considering how to adjust to ATT and particularly mitigate its impact of ad measurement on iOS (as detailed above). Further, technology commentators have argued that it took until the first

[135] In particular, Apple's argument that the significant impact of Covid on CPT means that pre-Covid data should be excluded when calculating pre-ATT trends also suggests that trends during the Covid pandemic should not be reliably expected to continue.
[136] According to estimates by the mobile measurement company Branch, Apple's Search Ads were responsible for 58% of all iPhone app downloads that result from clicking on an advert in late 2021, up from 17% a year earlier. This more than threefold increase in Apple's share of app install advertising came at the expenses of rivals and particularly Facebook and Snapchat. See Apple's privacy changes create windfall for its own advertising business | Financial Times (ft.com).

quarter of 2022 to see an 'undiluted' impact of ATT and, as explained above, we only received data until August 2021 from Apple.[137]

167. Furthermore, we also note that, despite Apple's advertising business being currently relatively small compared to Apple's other revenue streams and, according to Apple, 'a very limited part of its overall business', this is expanding, and the revenue Apple is earning from it is sizeable and growing very fast. In particular:

- In May 2021, ASA introduced a second non-search advertising placement in addition to the search result one, which appears under the 'Suggested' section of the App Store Search tab.[138]
- In June 2021, Apple expanded ASA to China.
- Financial data submitted by Apple shows that Apple's advertising revenues in the UK more than tripled between 2018 and 2021. Further, Apple told us that, as of February 2022, the forecast for 2022 ASA revenue is £[3-3.5] billion worldwide and £[200-250] million for UK while the forecast for Apple News & Stocks ads is £[50-100] million for worldwide and £[0-10] million for UK.
- Analysts' estimates suggest that Apple's advertising business could reach $20 billion in revenue by 2025.[139]
- Media reports suggest that Apple is considering restructuring its services business to redirect more attention to advertising and refer to an analysis estimating its ad business grew by 238% to $3.7 billion in 2021 when compared to 2020 and will earn $5.5 billion in ads alone this year.[140]

168. Documents submitted by Apple show that at a similar time to when Apple was considering introducing the ATT framework, it was also considering expanding its advertising services to third parties. In particular, Apple's plan for the fiscal year 2021 includes several expansion proposals for its advertising services, including [✂]'

169. Apple's plan for the fiscal year 2022 includes forecasts outlining a strong growth path with projected ad revenue reaching £[5-6] billion globally in 2026

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[137] See An Interview with Eric Seufert About the Post-ATT Landscape – Stratechery by Ben Thompson.
[138] Differently from the traditional ASA which are served in response to a user's query, this new category of ads appears on the App Store Search Tab, prior to the user executing a search query.
[139] See This could be Apple's next $20 billion business. We understand that this estimate excludes the payments Apple gets from Google for setting Google Search as default search engine, including on Apple's browser Safari, which was reported to amount to up to $12bn by the Department of Justice. See Justice Department Sues Monopolist Google For Violating Antitrust Laws | OPA | Department of Justice.
[140] Eddy Cue reportedly has bigger plans for Apple's billion-dollar streaming and ads business - The Verge.

as well as plans for further product development and optimisation of its advertising products and services, including:

- [✂]

170. In summary, based on the evidence we have seen, we consider that ATT has given Apple's advertising services a competitive advantage over rival app install advertising services, and that this has likely contributed to Apple's advertising revenues being higher than they would otherwise have been.

Competitive effects in app distribution

171. In this section we explore potential wider competitive effects as a result of ATT, including around concerns that Apple might be using ATT to reinforce its market power in app distribution and that ATT may cause developers to change their business models by shifting to monetisation models where Apple charges a commission.

ATT reinforces Apple's market power in app distribution

172. As discussed above, ATT undermines the value of app install advertising to app developers seeking to attract new users to their apps, which may be further strengthening the App Store's role as a distribution channel and source of discoverability for apps, and therefore increase developers' reliance on it as a means for acquiring users.

173. Although a majority of app downloads on iOS comes from App Store search results, downloads from app referrals (where a user arrives at the App Store page of an app by clicking a link in another app) appear to be a significant source of discoverability, accounting for approximately [20-30]% of downloads.[141]

174. Given that [40-50]% of app downloads come from direct searches for a particular app (ie navigational searches), app referrals are even more significant for apps accounting for the remaining [50-60]% of downloads, which are not usually installed via navigational searches and thus are in more need for other ways to encourage downloads.

[141] While these figures are indicative of the scale of app install advertising, they may also include other (non-advertising) cases where apps included a link to an App Store page. For example, a developer may include links in one app to its other apps' App Store pages, or a user of a social media app might post a link to an app on the App Store. Conversely, some downloads that directly resulted from navigational searches may be linked to app install advertising, as users may view or click an app install ad without immediately downloading the app but return to the App Store later and search for the app to download it.

175. While using app install advertising does not allow developers to bypass the App Store, it does make the App Store less important for app discovery.[142] As discussed in the section on app discovery through the App Store in Chapter 6, Apple has the ability through its design of choice architecture in the App Store to influence which apps are successful. However, if developers can find users outside the App Store, that ability is diminished. Therefore, by undermining alternative discovery channels through ATT, Apple strengthens its market power in app distribution.

176. Consistent with this and as set out in the section on the impact on developers above, evidence from app developers we have seen supports that app install advertising has been undermined as a result of ATT. Apple submitted that it is 'too soon to draw conclusions on the long-term effects of ATT on app discovery' and that total number of downloads via the App Store overall has not decreased post-ATT, which in Apple's view suggests that ATT has not impacted discoverability for developers.

177. However, we consider total downloads to be too crude a metric to adequately proxy for the effectiveness of app install advertising and also too distorted by exogenous factors such as user downloading behaviour at various stages of the Covid pandemic. More generally, given the number of other factors, including the pandemic, to have likely influenced the sector over the past year, we consider the data on overall downloads not to be determinative of the ATT effect.

178. Therefore, we consider the evidence we have seen to be generally consistent with the fact that ATT has undermined alternative discovery channels to Apple's App Store, thereby strengthening Apple's market power in app distribution.

ATT might cause a shift in the way that app developers monetise apps

179. As described above, ATT undermines ad targeting and therefore reduces the revenues that developers can earn from in-app advertising. This means that the ad-funded business model for apps, on which Apple does not charge any commission for app distribution to developers, will likely generate less revenue for app developers compared to a pre-ATT world.

180. We considered whether developers might start charging for content that they would provide for free before the ATT rollout or turn to alternative ways to

[142] It has been suggested that Apple's role as discovery channel for apps has been weakened by app install advertising and that the App Store has become a "frictional, annoying moment between clicking an ad and installing an app." See An Interview with Eric Seufert about Apple, Facebook, and Mobile Advertising – Stratechery by Ben Thompson.

monetise their apps, such as requiring payments within the app for certain contents or features, or via subscriptions. Given that Apple charges a 30% commission on in-app purchases of digital content through IAP, including additional in-app content or features and on subscriptions (with the commission dropping to 15% in the second year of subscription), we consider Apple has an incentive to encourage such a shift by developers.

181. We note that media reports suggest that app developers are implementing changes in their monetisation model as a result of ATT, with some ad-funded games introducing in-app purchases.[143] Moreover, a recent academic paper found that ATT is accelerating the industry trend towards increased reliance on in-app payments and reversing the preceding negative trend for the presence of paid apps, which are now increasing.[144]

182. As mentioned above, some developers told us that they might change their monetisation strategy as a result of ATT, and we have heard concerns from developers operating in the publishing industry over the impact of ATT on the viability of the ad-funded business model.[145] However, most of the developers we have heard from are still considering what (if any) changes they will implement. While we have not seen a considerable shift in the way that app developers monetise their apps at this stage, we note that this is a change which may materialise in the longer term.

Summary on potential harm to competition

183. As detailed above, although ATT has clearly introduced greater choice and control over whether and how users' personal data is used for personalised advertising, we are concerned with Apple's implementation of it and some of its impacts. In particular, we are concerned with Apple's approach to choice architecture, (including language) which is untested and applied inconsistently, ATT's impact on developers' ability to acquire users and monetise via advertising, the fact that it potentially favours Apple's own advertising services over third parties' and protects Apple's market power in app distribution by undermining mobile advertising as a means for app discovery.

184. In line with the CMA's joint statement with the ICO on the relationship between competition and data protection, we believe that more competitive markets will deliver the outcomes that consumers care about most, which

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[143] Apple's IDFA changes are already changing game design and monetization | VentureBeat.
[144] The paper is based on web-scraped data on over 580,000 apps and uses Google Play Store as a control group. Although the impact it shows is small on average, which the paper notes may also be due to circumventions of the ATT policy, it is more prevalent for apps only present on the App Store as well as for apps that employ user tracking. See The Impact of Apple's App Tracking Transparency on App Monetization.
[145] See DMG Media's response to our Interim Report.

increasingly include enhanced privacy and greater control over personal data. We recognise that ATT is a positive step towards delivering these outcomes, as it gives users more information and granular control over the use of their personal data by app developers than was previously available, and makes this choice easily accessible.

185. **However, we are concerned that Apple's current implementation of ATT is likely to result in harm to competition, make it harder for app developers to find customers and to monetise their apps, and ultimately harm consumers** by increasing the prices or reducing the quality and variety of apps available to them. As discussed in Chapter 8, we consider that there are a number of ways in which the potential competition harms of ATT could be mitigated while retaining the benefits in terms of user choice and privacy.

186. **In partnership with the ICO, we hope to continue the constructive dialogue we have had with Apple on its ATT framework now that our market study has concluded.** In line with the CMA and ICO's joint statement, we are confident that any areas of perceived tension between competition and data protection can be overcome through careful consideration of the issues on a case-by-case basis, with consistent and appropriate application of competition and data protection law, and through close cooperation between our two organisations.

Google's Android Privacy Sandbox (APS)

187. In February 2022, Google announced that it was developing a Privacy Sandbox on Android, with the goal of introducing more private advertising solutions that would limit sharing of user data with third parties.[146]

188. We recognise that this development could bring benefits to consumers with regard to their privacy. However, in this section, we consider whether Android Privacy Sandbox (APS) risks giving rise to competition concerns similar to those raised by ATT. Given the recent announcement of APS and the fact that it is still in early stages of development, our assessment of it is less detailed than our assessment of ATT.

189. We first summarise the mobile advertising services Google provides on Android, before considering the changes that may be brought about by APS and whether these have the potential to harm competition.

[146] Google, Introducing the Privacy Sandbox on Android, February 16 2022

Google's mobile advertising services on Android

190. Unlike Apple, Google is predominantly an advertising business, with [90-100]% of Google's global mobile revenue generated through advertising in 2021. Google offers a wide range of mobile advertising services, including services advertisers can use to purchase mobile advertising inventory on Google and third-party apps or websites, and services publishers can use to show mobile advertising on their apps or websites.[147]

191. Here we focus on the services most relevant to in-app advertising and app install advertising, as these are the types of mobile advertising most likely to be affected by the changes introduced by APS.

192. For in-app advertising, Google's primary offering is AdMob. AdMob is an ad network and a platform that Google offers to app publishers to enable them to sell advertising space in their apps. As an ad network, AdMob connects buyers with publishers, and as a platform AdMob provides mediation services to publishers who want to find buyers for their inventory from multiple ad networks.

193. For app install advertising, app developers can use the Google Ads service to create app campaigns. This allows developers to advertise their apps across a range of Google-owned inventory and third-party inventory. This includes advertising on the Play Store, where Google shows ads in a variety of locations including search results, the 'related apps' section and the Play home page. Developers can bid either on a CPI (cost per app installation) basis or a CPA (cost per performance of a particular in-app action) basis.

Changes introduced by APS

194. Google announced APS as a 'multi-year initiative' with the goal of introducing 'new, more private advertising solutions'. These solutions will operate without cross-app identifiers such as the AdID (which is, as noted above, the Android equivalent of the IDFA on iOS). However, Google stated that it would maintain the existing ads platform features for at least two years, and intended to provide substantial notice ahead of any future changes. This means that developers will still be able to access the AdID until at least February 2024 in any event.[148]

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[147] See Online platforms and digital advertising market study for a more detailed discussion of Google's advertising services and its position in the markets for these services.
[148] Google, Introducing the Privacy Sandbox on Android, February 16 2022

195. Google's initial proposals for APS include features to cover both of the main advertising use cases for device identifiers:

- For **targeting**, Google proposes a Topics API to allow targeting of users based on their interests, which would be derived from their engagement with apps, but would not require tracking of individual users across apps.[149] It also proposes FLEDGE, a system for targeting custom audiences (eg retargeting users who have items left in their shopping cart in one app with adverts in another app) without sharing of identifiers across apps.[150]

- For **attribution**, Google proposes an Attribution Reporting API, which would support 'key use cases' for attribution and conversion measurement while increasing user privacy by providing advertisers only limited information on individual user actions while providing more detailed information aggregated across users.[151]

196. Google has also proposed a new Android operating system feature, SDK Runtime, which would allow for third-party advertising SDKs used within apps to be subjected to a well-defined set of permissions and data access rights that would not be inherited from those in the wider apps they are used in. This would prevent advertising SDKs from accessing unnecessary data that could be used for 'fingerprinting' to track users across apps even if the user's AdID was not accessible.[152]

197. Google has not yet made any statements regarding changes it may make to developers' ability to access the AdID beyond the initial two-year period. However, since Google's design proposals aim to replicate the main use cases for the AdID without relying on it for their functioning, we assume that the intention of APS is to eventually either withdraw the AdID entirely or limit access to it (for example by requiring developers to obtain consent to access the AdID in a similar manner to ATT).

Potential harm to competition

198. In principle, Google withdrawing the AdID on Android could lead to potentially similar harms to competition to those discussed above with regards to ATT. If this change undermined the effectiveness of mobile advertising on Android by

[149] Interest-based advertising with the Topics API | Android Developers
[150] Support custom audience targeting using FLEDGE | Android Developers
[151] Attribution reporting | Android Developers
[152] SDK Runtime | Android Developers.

third parties without undermining the effectiveness of Google's own advertising on Android, this could have the effects of:

- Self-preferencing Google's own advertising services;
- Reinforcing Google's market power in app distribution; and
- Incentivising developers to move from an ad-funded model to charging users for their content.

199. The concern regarding self-preferencing could be more acute for APS than for ATT, given that Google has a much more significant position in mobile advertising than Apple, and is active in many segments and levels of the mobile advertising market. Google would therefore be well positioned to benefit from undermining the effectiveness of its competitors in mobile advertising.

200. Google's approach in developing APS appears to mitigate some of the risks of competition issues arising by aiming to develop alternative tools for targeting and attribution, in consultation with developers and advertisers, before withdrawing existing tools. If these new tools are effective, changes to AdID may not significantly undermine the effectiveness of mobile advertising on Android, and so the competition concerns listed above would not arise.

201. In practice the competitive effects of APS will depend on a number of factors that cannot be assessed at this stage due to its early stage of development. These include:

- How effective the alternative tools Google is developing for key advertising use cases turn out to be;
- The design of choice architecture for any choices made available to users on how their data is used; and
- Whether as a result of the APS changes Google will have better targeting and measurement capabilities relative to third parties (for example, if it would continue to be able to use data that third parties would no longer be able to access).

202. Google has indicated that it intends to apply – on a voluntary basis – the principles of the commitments made to the CMA regarding the Privacy Sandbox on Chrome to its proposed Android Privacy Sandbox. We will continue to monitor this closely and engage with Google and other market participants on the nature and detail of its proposals.

Apple's Intelligent Tracking Prevention (ITP)

203. Currently, some display advertising relies on the ability to identify individual web users and 'track' them across websites by means of third-party cookies and other forms of cross-site tracking. The extensive collection of data through such methods has given rise to concerns about users' privacy and compliance with data protection laws.

204. ITP comprises a set of changes to WebKit that aim to prevent cross-site tracking by default on all websites to address privacy concerns, and which create a set of alternative tools for practices that rely on techniques that can be used for tracking.

205. ITP has some parallels with Google's Chrome Privacy Sandbox proposals which will replace third-party cookies and other tracking functionalities with alternative technologies which better respect user privacy and data protection law.

Implementation of Intelligent Tracking Prevention (ITP)

206. Apple implemented ITP in WebKit in stages between 2017 and 2020. Early versions of ITP merely limited the length of time for which cookies could be used to track a user in third-party contexts (ie on other sites), if the user had not visited the origin domain. However, in 2020 Apple introduced full third-party cookie blocking.[153] We understand that ITP now:

- blocks third-party cookies by default, with certain exceptions such as when the user actively consents;[154] and
- frequently purges data stored in the browser.[155]

207. In contrast to Google's Privacy Sandbox Proposals that are marketed as a set of open standards that make the web more private and secure for users while also supporting publishers, Apple has positioned ITP as a strict privacy

[153] WebKit Blog, Full Third-Party Cookie Blocking and More.
[154] To provide authenticated third-party content (such as federated logins) despite full third-party cookie blocking, the Storage Access API allows embeds to request access to their first-party cookies when the user interacts with them. A user can be prompted at most twice for storage access, and a user's consent ('Allow' in the prompt) is persisted.
[155] Purged data includes (i) all data for domains with cross-site tracking capabilities which have not received user interaction as first party or been granted storage access as third party through the Storage Access API in the last 30 days of browser use, and (ii) a website's script-writable storage (including IndexedDB, LocalStorage, Media keys, SessionStorage, Service Worker registrations and cache) after seven days of Safari use without user interaction on the site.

feature, suggesting that 'unintended' impacts (including on advertisers) may need to be tolerated.[156]

208. Another important difference between Apple's ITP and Google's Privacy Sandbox Proposals is the extent to which they directly impact Apple's and Google's other activities online and ultimately their impact on competition. In particular, Google directly benefits from a distortion in competition in the supply of ad inventory and ad tech services, given its strong presence in both display and search advertising. Apple, on the other hand, does not have as significant a presence in display advertising, such that there is less of a concern of Apple self-preferencing its own display advertising. Apple also lacks as significant a presence in search advertising, though it receives a high share of revenue from Google Search advertising to Safari users.

Potential harm to competition arising from Apple's use of ITP

209. By reducing the information shared with advertisers, ITP improves users' privacy.[157] In this regard, Apple submitted that the goal of ITP is to limit tracking by default while still enabling websites to function normally, and to provide transparency and control over what user data is shared and how it is used. Notably Firefox was the first to implement tracking prevention (in Gecko) and Apple publicly credits it for inspiring ITP.[158]

210. However, ITP also makes online display advertising less effective and user acquisition more expensive, impacting online content providers and app developers through a reduction in revenue. As set out below, most of the 67 app developers and online content providers that we gathered evidence from on this issue reported some impact on their business.[159]

- 15 out of 34 online content providers reported that ITP has significantly impacted their ability to engage in targeted advertising.[160] Similarly, 10 out of the 33 app developers told us that ITP has significantly impacted their business. Only 3 app developers said they had developed workarounds that partially mitigated the impact of ITP on their business.

- 8 out of 34 online content providers reported that ITP has measurably impacted their advertising revenue, half of which are News

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[156] WebKit Documentation, Tracking Prevention Policy.
[157] Tracking of users' online activity is often invisible to users, and their consent is not always sought, or sought in a way that does not comply with the requirements of data protection and privacy law.
[158] WebKit Blog, Announcing the WebKit Tracking Prevention Policy.
[159] Apple submitted that it has not analysed the impact of ITP on the value of digital advertising on Safari or online content providers' choice of advertising channel.
[160] One online content provider also commented on being unable to consistently and accurately identify its own customers within Safari since the shortening of the lifespan of third-party remarketing cookies.

providers.[161,162] For example, one respondent reported a 71% reduction in CPM (cost per thousand impressions, an advertising pricing metric) on Safari over the course of the introduction of ITP, resulting in substantially lower advertising prices on Safari than Chrome. This is consistent with submissions by adtech providers to the CMA's market study into online platforms and digital advertising that they had been significantly impacted by Apple's decision to implement Intelligent Tracking Prevention (ITP) on Safari in September 2018.[163]

211. By making online display advertising less effective and lucrative, ITP could, in principle, harm competition in several ways.[164]

212. First, ITP could reduce the competitive constraint from display advertising on search advertising, including on Google which has a very strong position in search advertising. One online content provider specifically stated that it had switched towards search advertising in response to ITP. Google's advertising rivals Snap and Facebook said that advertisers' responses to ITP changes in 2021 hurt their third-quarter sales, while Google turned out to be immune due to its search engine collecting data on user interests.[165] Google reported a 44% increase in revenues generated on Google Search and other Google owned and operated properties for the third quarter, driven partly by growth in advertiser spending.[166] Apple benefits from higher Google Search revenues through its Revenue Share Agreement with Google, through which it receives a high share of Google Search revenues generated through Safari. For consumers, a loss of competition in advertising can cause harm, for example, by increasing advertisers' costs and causing these to be passed through to consumers.[167]

213. Second, ITP could reduce the viability of the web as a content distribution channel, weakening the constraint this imposes on Apple in the distribution of native apps and ultimately in mobile devices and operating systems, in which

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[161] 12 out of the remaining 26 online content providers reported an unclear impact, mostly due to the lack of data.
[162] A differential impact may be driven by differences in advertising across online content providers. ITP, for example, has impacted Facebook's ad business as it comes mainly from direct response advertising but Twitter's ad business is likely spared as the social networking site is mainly used for less targeted brand advertising (Reuters, Facebook ad revenue seen feeling brunt of Apple privacy changes).
[163] CMA's market study into online platforms and digital advertising, Appendix G: the role of tracking in digital advertising, paragraph 324.
[164] We have heard complaints that Apple uses ITP as an excuse to restrict competition and favour its own advertising services.
[165] See Reuters, Amazon seen triumphing over Apple privacy changes in digital ad business | Reuters and Reuters, Alphabet earns record profit on Google ad surge | Reuters.
[166] Alphabet Earnings (10-Q) for 2021 Q3.
[167] As described in paragraphs 6-15 of the CMA's market study into online platforms and digital advertising , a lack of competition in advertising can (i) inhibit innovation and the development of new, valuable services for consumers, (ii) increase costs to consumers (since free services are paid for indirectly through advertising), (iii) lead to inadequate compensation for consumers' attention and personal data, (iv) reduce the ways in which people can control how their personal data is used and/or (v) cause wider social, political and cultural harm through the decline of authoritative and reliable news media.

Apple has a very strong positions.[168] This loss of competition could harm consumers by ([169]) allowing Apple to raise or defend high in-app payments obligations in the App Store,[170] (ii) allowing Apple to raise the cost of advertising on the App Store (which could ultimately be passed through to the prices faced by users),[OBJ] and ultimately by (iii) allowing Apple to raise or defend device prices.

214. In addition to the above effects on advertisers and online content providers (which impact consumers indirectly), ITP could directly affect consumers negatively:

- In certain cases, ITP could harm users' experiences by breaking web functionality, for example where it deletes stored data.
- ITP could also harm some users' experiences directly by worsening the quality of advertising. Direct user harms of this kind mentioned by online content providers and app developers include higher incidences of less relevant or irrelevant advertising, a reduced ability to cap the frequency of adverts, a reduced ad variety due to lower bid participation rates on real-time bidding auctions.
- In combination with ATT, ITP may reduce the ability of consumers to access free content funded by advertising (which in some cases may be consumers' preference), given that fewer firms may be willing to provide free content if advertising is less effective.

Privacy benefits of ITP

215. ITP's primary impact is that it improves consumers' privacy. The CMA has previously identified concerns about the extent to which users are tracked without their knowledge or consent.[171]

216. ITP represented an early step towards better protection of consumer privacy by a browser vendor, and similar tracker-blocking practices have been

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[168] As described in Chapter 3, the availability of compatible content is a barrier to competition in the supply of mobile devices and operating systems. When web advertising is made less lucrative, some online content providers switch to native apps, reducing the availability of content on the web (which is compatible across operating systems).
[169] One online content provider specifically raised the concern that (together with IDFA) ITP encourages developers to change their business model entirely, moving away from an ad-funded model to a subscription or in-app purchase model that is subject to Apple's 15-30% surcharge. The academics Sokol and Zhu make similar points in their paper 'Harming Competition and Consumers under the Guise of Protecting Privacy: An Analysis of Apple's iOS 14 Policy Updates'.
[170] DMG Media raised similar concerns in its response to the statement of scope: 'While impairing effective digital advertising on iOS, Apple is at the same time expanding its own profitable advertising business […] Apple subjects iOS users to personalized advertising by *default*, that is without obtaining opt-in user consent.' Apple App Store Search Advertising revenues in the UK increased from [£0-100m] in 2017 to [£100-200m] in 2020.
[171] Online Platforms and Digital Advertising market study, Appendix G: the role of tracking in digital advertising.

adopted by other browsers.[172] ITP reduces the risk that third-party cookies are set without the users consent.[173] To the extent that ITP empowers individuals and enables them to have meaningful control over the use of their data, it is a positive development.

Conclusion on ITP

217. While we have identified several ways in which ITP may harm competition, it benefits consumer privacy in important ways. Unlike Google, Apple does not have a significant position in online search and display advertising which could be advantaged by these privacy changes.

218. Apple should continue to engage with the CMA and the ICO, and consider ways in which it can take advantage of privacy-preserving technologies, like those Google is exploring as part of its Privacy Sandbox commitments, which mitigate the potential harms which may result from ITP. We consider that this is an area which could benefit from further dialogue between the ICO, CMA and Apple as new approaches to privacy protection are developed.

[172] ICO, Information Commissioner's Opinion: Data protection and privacy expectations for online advertising proposals, 25 November 2021, page 21. Apple, Response to the Interim Report, paragraph 100.
[173] As mentioned above, PECR require a subscriber's or user's consent, of the standard laid out in the GDPR, to store or access information (including to set any cookies or similar technology) except when this is strictly necessary to provide a service the subscriber or user has requested.

Apple's iCloud Private Relay

Overview

219. The final privacy enhancing policy we cover in this appendix is Apple's iCloud Private Relay, which was introduced as an addition to Apple's iCloud+ service.[174] It was launched in Beta form in September 2021 as part of iOS 15,[175] and is described as helping to protect Apple users' privacy when browsing the web in Safari.

220. According to Apple's support page,[176] when Private Relay is enabled on a device:

- User requests are sent through two separate, secure internet relays.
- The IP address is visible to the Internet Service Provider (ISP) and to the first relay, which is operated by Apple. The Domain Name System (DNS) records are then encrypted so that neither party can see the address of the websites visited.
- The second relay, which is operated by a third-party content provider, generates a temporary IP address. It then decrypts the name of the website requested, and connects the user to the site.

221. This separation of information is designed to protect the user's privacy because no single party can identify who a user is (by reference to their IP address) and which sites they visit. iCloud Private Relay is currently set as 'off' by default, and can be turned on by the user via settings.

Potential concerns regarding iCloud Private Relay

222. As we have highlighted in the case of Apple's ATT framework, we share the view of the ICO that developments that empower individuals and enable them to have meaningful control over the use of their personal data can bring about positive change, both for consumers and competition more broadly.

223. We also understand, as highlighted by Ofcom in its discussion paper on its future approach to mobile markets, that iCloud Private Relay could lead to a significant change to the way in which telecoms providers are able to run their

[174] About iCloud Private Relay – Apple Support (UK)
[175] iOS 15 is available today - Apple
[176] About iCloud Private Relay – Apple Support (UK)

networks and manage traffic through congestion management and network optimisation.[177]

224. While we have not conducted an in-depth assessment of this policy and its implications, we have been made aware of a number of concerns that parties and stakeholders have raised with us through a combination of responses to our consultations and stakeholder meetings.[178] These include both competition and non-competition concerns, with potential effects on a range of parties in addition to mobile device users, including internet service providers (ISPs), mobile network operators (MNOs), advertisers, and developers.[179]

225. We summarise some of the concerns we have heard through the course of our market study below.[180] This is not intended to be an exhaustive list, nor an indication that we have reached a conclusion on the relative strength of validity of these concerns.

226. From a competition perspective, we have heard that Private Relay could:

- Reduce advertisers' ability to secure value for money from display advertising and publishers' ability to generate revenues from display advertising by limiting the ability to target advertising and measure its effectiveness (ie by removing the ability to track a user across multiple websites via their IP address).
- Provide Apple with an advantage in relation to its parental control services (or device-level parental control system) if they still work when used with Private Relay enabled, whilst third-party parental control apps would be rendered ineffective.
- Take away operational flexibility from ISPs and MNOs by intermediating between the end-user and DNS resolution. It may also result in changes to investment incentives and increased costs for ISPs/MNOs as they will have less access to network data to manage their network efficiently.
- Provide Content Delivery Network operators, which partner with Apple by operating the second relay, with a geographical data advantage.

227. Beyond the above potential competition concerns, we have also heard that Private Relay could lead to a range of broader challenges for ISPs, caused by

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[177] Discussion paper: Ofcom's future approach to mobile markets
[178] For example: Response: Movement for an Open Web; Response: Mobile UK; Response: Virgin Media O2 UK Limited;
[179] We are aware that concerns have also been raised publicly, for example: Apple under fire over iPhone encryption tech (telegraph.co.uk).
[180] We are aware that concerns have also been raised publicly, for example: Apple under fire over iPhone encryption tech (telegraph.co.uk).

the fact that when turned on, it prevents ISPs from monitoring the type of traffic on their network. We understand this could have several implications for their ability to maintain a number of practices, including: providing access to specified services for free as part of their offering (eg EE's zero rating of Apple music);[181] applying network based parental controls; blocking illegal content as per commitments made to government in relation to terrorist and child sexual exploitation and abuse content; and managing traffic on their networks.

228. Apple's iCloud Private Relay appears to be a further example of a policy that, while seeking to provide its users with more privacy and greater control over their personal data, may have important implications for competition and other aspects of how the industry functions.

229. As highlighted above, we have not carried out an in-depth assessment of Private Relay in the context of this study, and as such have not reached any conclusions regarding the above concerns that have been raised with us by different parties. However, we note that if Private Relay were to be more widely used by Apple users in future, for example if the default setting were to be switched 'on' instead of 'off', then the potential scale of the above concerns could increase substantially for those affected.

230. The CMA will continue to work with Ofcom in monitoring developments in this space, while more broadly continuing to engage on this and other related privacy issues with the ICO.

[181] EE Is Latest Mobile Operator To Zero Rate Streaming With Free Apple Music (silicon.co.uk).

ANNEX: User journey for centrally disabling or enabling personalised advertising preferences

User journey for centrally disabling or enabling apps from showing the ATT prompt

231. Some users may have a strong preference on data privacy and wish to stop an ATT prompt being shown for every app they visit. Other users may want to revisit their previous choice and want to switch their preference subsequently.

232. Users of Apple devices have the option to stop third-party app developers from showing the ATT prompt by disabling 'Allow Apps to Request to Track' in Privacy Settings under Tracking. Or alternatively, users can enable this setting to allow apps to request permission for tracking.

233. 'Allow Apps to Request to Track' is enabled by default for new users and for existing users who had Limit Ad Tracking disabled before iOS 14.

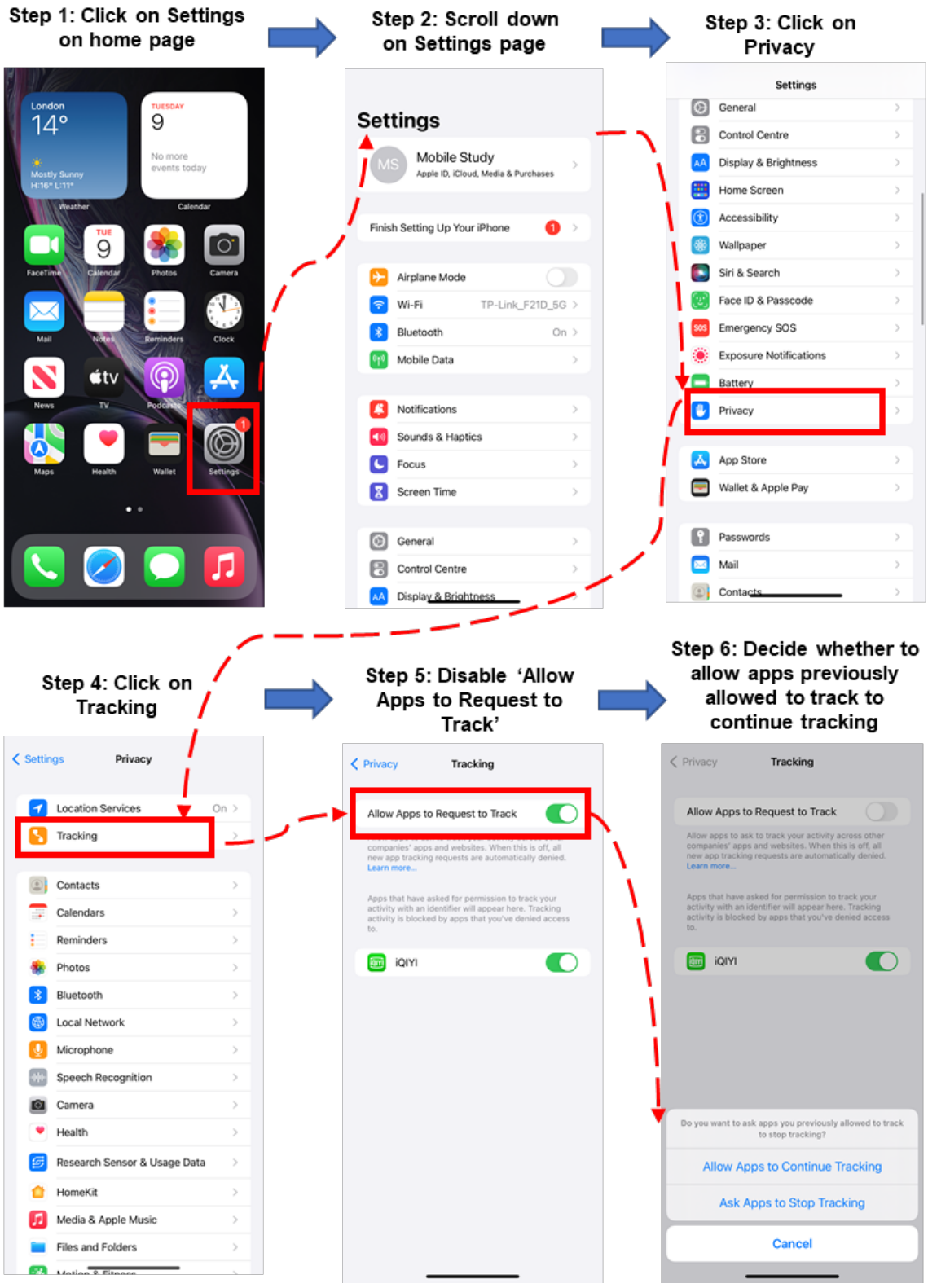
- If the user disables 'Allow Apps to Request to Track' then any app that attempts to surface the ATT prompt will be blocked from doing so and will be informed that the user has requested not to be tracked.

- Disabling 'Allow Apps to Request to Track' stops all apps, other than the ones the user has previously given permission to track, from accessing the device's IDFA.

- The user journey for disabling 'Allow Apps to Request to Track' is illustrated in Figure J.11. If the user has given permission to track to any app through the ATT prompt, and then afterwards disabled 'Allow Apps to Request to Track', the user will be able to select either 'Allow Apps to Continue Tracking' or 'Ask Apps to Stop Tracking' for those apps as shown in Figure J.11.

- The journey for users to centrally disable apps from asking permission to track involves a process with around six steps, including scrolling. We are concerned that the additional effort involved could discourage users from engaging with the centralised control. Apple told us that they did not commission any research on expected user engagement with the centralised control for disabling app developers from showing the ATT prompt.

Figure J.11: User journey on iPhones to centrally disable apps from asking permission to track users

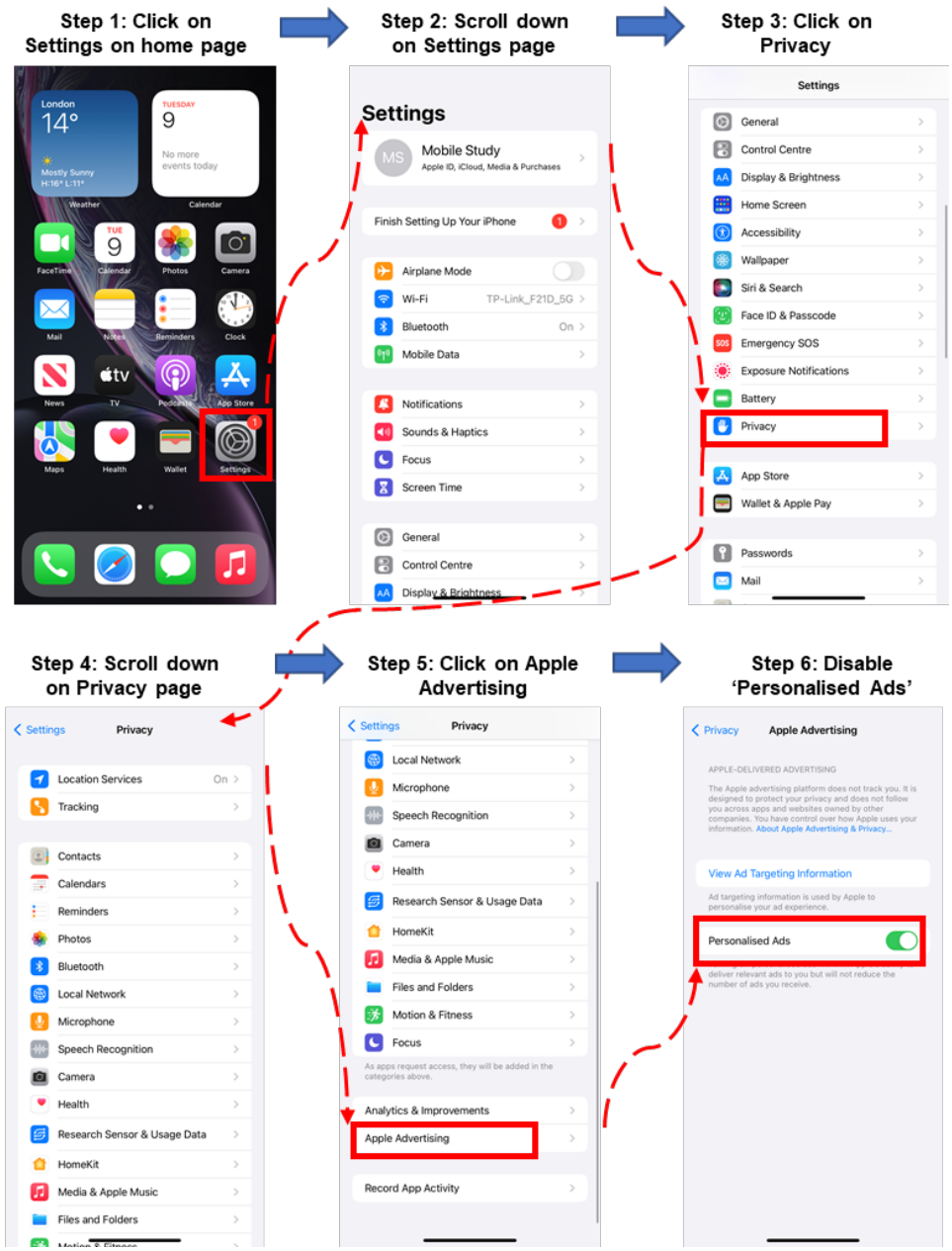


Source: CMA
Note: Screenshots taken on iPhone XR running iOS 15.1 in November 2021.

User journey for centrally changing Personalised Ads setting for Apple Apps

234. Users have the option to centrally disable or enable personalised ads by navigating to Apple Advertising under Privacy settings.[182] The user journey for this illustrated in Figure J.12. The process for centrally disabling or enabling personalised ads involves around 6 steps, including scrolling. The additional effort involved in the process could potentially discourage users from engaging with it.

Figure J.12: User journey for centrally disabling personalised ads for Apple apps on iPhone



Source: CMA
Note: Screenshots taken on iPhone XR running iOS 15.1 in November 2021.

[182] Control personalised ads on the App Store, Apple News and Stocks – Apple Support (UK).