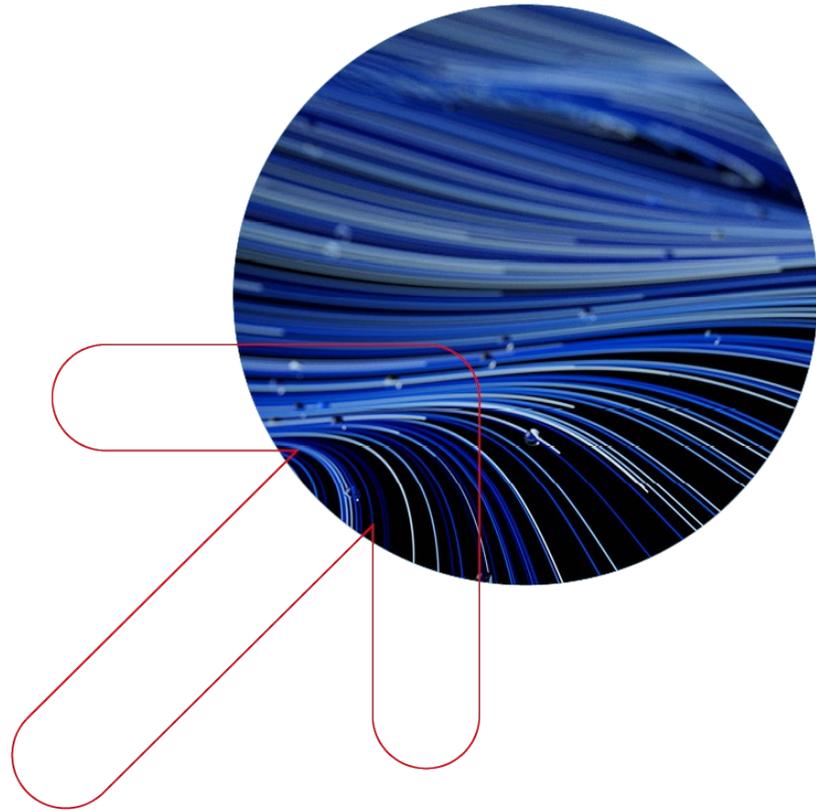# WIK • Discussion paper

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Access charges in software-based termination monopolies

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Table of contents

List of figures

List of tables

Summary

Digital platforms and data-driven business models have become integral to today's internet economy. Large technology companies like Apple, Google, Amazon and Microsoft exert control over access to online content, products, services and social interactions through their digital ecosystems and associated gatekeeping power. Within these ecosystems, mobile platforms centred around smartphones, operating systems and app stores play an increasingly pivotal role.

The recent introduction of the Digital Markets Act (DMA) by the European Union represents a significant development in the regulation of digital platforms and mobile ecosystems. By imposing rules aimed at promoting competition and fair access, the DMA directly motivates an examination of access considerations and pricing structures surrounding digital platforms and app stores. This research report provides an in-depth analysis of the various access modes and stages relevant to apps within dominant digital ecosystems, exploring appropriate remuneration approaches.

Modes of access in digital ecosystems

Several modes of access exist from an app provider perspective, including listing apps in dominant app stores like Apple's App Store and Google Play, sideloading apps directly via mobile operating systems, and listing apps in alternative third-party app stores.

Each access mode necessitates different levels of integration with the gatekeeper's services and products. For instance, listing in a major app store requires more extensive use of inputs and services provided by the gatekeeper than enabling sideloading of apps directly through the operating system. The specific access mode determines the breadth of "value components" provided to app providers by the gatekeeper, such as app review, hosting, distribution and promotion services for listings in primary stores. Comparatively, sideloading necessitates fewer supplemental gatekeeper components to facilitate access. However, irrespective of the mode, apps rely extensively on the underlying device and operating system capabilities enabled by the gatekeeper.

Access can span website usage, standard listing in main app stores, alternative stores, sideloading and sub-modes like public vs private APIs. Intersections arise since app stores reside within operating systems, and apps interoperate with hardware and software functionalities. The nuances across access modes give rise to complex considerations surrounding fair access terms and appropriate remuneration.

Reasons for mandated access

There are several potential justifications for mandating some form of access alongside associated payments:

- Patent law mandates access to ensure competition and innovation persist despite granting of exclusive intellectual property rights.

- The essential facilities doctrine requires access at fair terms when a facility or infrastructure is deemed indispensable but cannot feasibly be reproduced by competitors.

- Mandated access aims to proactively address abuse of dominance in digital markets by restoring competition. This approach has been seen in the regulation of telecommunications infrastructure.

- Interoperability mandates can specifically promote continued competition in digital ecosystems given the risks of excessive user and data lock-in effects that serve to entrench gatekeepers.

The DMA integrates elements of these various approaches and (partly) provides guidance on determining appropriate terms of access and remuneration.

Current access pricing in digital sectors

The standard 30% app store commission rate charged to developers by Apple and Google partly appears disconnected from underlying costs or value provided and has been publicly scrutinised. Commission rates in other industries vary starkly, ranging from considerably lower commission rates of around 10% observed in the gaming industry, which is likely more resource intensive, to other industries and regions with similarly high rates.

Access considerations also arise regarding the vast troves of user data accumulated by digital platforms. Access to such data for third-party usage or analysis has been argued to warrant compensation only for necessary data delivery costs, since the collection accrues at minimal marginal cost to platforms. New regulations like the Digital Services Act (DSA) increasingly consider data access a basic compliance cost that should be granted without charge as part of doing business. The cloud industry provides an example of highly differentiated pricing for different transactions related to access and processing of data.

For app store access, the DMA proposes adopting a "Fair, Reasonable and Non-Discriminatory" (FRAND) pricing framework, but the FRAND concept traditionally lacks concrete details and standardized methods, originating as a negotiation framework in relation to patents and standards.

Review of Regulatory Approaches

Reviewing existing regulatory approaches to mandated access in comparable industries like telecommunications, desktop computing, and mobile ecosystems illustrates the application of differing access fee and pricing philosophies:

- In regulated telecommunications domains, mandated wholesale access to certain network infrastructure has historically been subject to cost-based pricing schemes aiming to ensure appropriate terms.

- A similar approach was adopted in a landmark case mandating Microsoft provide interoperability access to Windows interfaces to enable third-party server applications.

- In mobile ecosystems, Apple and Google have promoted variable notions of "reasonable" access fees based on divergent perspectives. When compelled to provide alternatives (i.e. in the case of outside payment options), they have oriented rates toward the opportunity costs of those options. However, they argue existing commissions reflect the need to recoup ecosystem investments.

Recent regulatory interventions mandating access to aspects like search and payments have grappled with issues like design steering and default settings given the inherent dominance of incumbent options. While allowing access to alternative search engines on Android was lastly demanded to be free of charge, other cases left pricing unspecified.

New regulation – DMA

The DMA introduces provisions to enable developer choice in app distribution including app sideloading, alternative app stores, and payment methods. It mandates that dominant gatekeepers provide Fair, Reasonable and Non-Discriminatory access terms to their app stores. However, it does not specify access fee requirements for alternative stores or sideloading. Uncertainty also persists regarding whether mandated free access requirements for core operating system interfaces extend to third-party app developers seeking to interoperate with them.

Under the FRAND access mandate, gatekeepers must publish their standard terms and conditions of access. To evaluate the fairness of pricing terms, the DMA suggests possible benchmarks that regulators can assess such as rates charged by: competing platforms, for different developer services, across geographic regions, and for self-provided services.

A Proposed Decision Process

A consecutive decision process for regulators is proposed for determining appropriate software access fees:

1. Assess if compensation is appropriate:

The initial assessment should evaluate whether mandating a certain form of access necessitates compensation to the gatekeeper, considering relevant factors like the rationale for access, existing monetization channels, complementary access policies, and impacts on innovation incentives.

2. Determine relevant access modes

Potential access modes include app store listing, sideloading apps directly through the OS, and alternative or nested third-party app stores. Pricing principles should reflect the distinct levels of integration and gatekeeper components required for each mode.

3. Identify relevant cost and value components

Relevant cost and value components depend on the access mode, encompassing aspects like app review processes, development tools, distribution infrastructure, payment systems, marketing efforts, customer support, and more. The breadth of functions and value provided by the gatekeeper differ across access modes.

4. Decide on approach to determine access fees

Available valuation approaches include cost-based, value-based, or hybrid models. Cost-based schemes can prevent excessive pricing but may under-incentivize innovation. Value-based approaches better suit app store dynamics but make quantification complex, especially for intangible factors such as discoverability.

5. Benchmarking and/or data request

Where applicable, relevant benchmarks should be identified, for example by examining rates charged by competing platforms, in different regions, for different services, or for self-provided offerings. Data requests can also help quantify opaque cost and value factors.

6. Determine fee structure and range

This synthesizes the prior analyses into a pricing framework, set of tiers or fee caps aligning with FRAND principles.

7. Assess implementation obstacles and side-effects

The pricing approach must consider potential impacts on developer costs, consumer prices, market entry, gatekeeper responses, and other dimensions. Iterative analysis is required to strike the right balance between access, competition and innovation.

Implementational Considerations

Each step requires balancing current implementation realities, market data, gatekeeper incentives and access seeker considerations. FRAND provides a conceptual rather than prescriptive

framework that needs to be carefully translated into access remedies. Benchmarks are helpful, but risk distorting feedback effects on pricing. Changes to app stores should be phased in, with the impact on developers, consumers and gatekeepers assessed at each stage. Policymakers need to balance access, competition and continued innovation.

The impact of the DMA remains uncertain given gatekeeper resistance and incentives to circumvent rules. Regulators need to address the risk of large-scale circumvention and apply access policies consistently. Overall, this research highlights the multifaceted access considerations in digital ecosystems that are relevant to different stakeholders. It highlights the complexities of designing pricing frameworks that are appropriate for this interconnected domain that spans hardware, software and platforms. Further economic analysis and thoughtful, evidence-based policymaking are needed to achieve the desired outcomes. The concepts and proposals explored provide a foundation on which to build, using the DMA as an impetus.

1 Introduction and scope

Digital ecosystems have become essential components of the modern economy with dominant firms like Apple and Google serving as gatekeepers to their platforms, including app stores, devices, and software. These ecosystems play a pivotal role in enabling access to content, products, services, and social interactions. However, the mechanisms and compensation models for accessing these ecosystems vary across different stages, posing challenges for providers, developers, end-users, and regulators. While these ecosystems offer immense benefits to users, they also raise concerns related to competition and societal implications. As the level of regulation and legislation surrounding mobile ecosystems, such as the Digital Markets Act (DMA), is increasing, it becomes imperative to examine and understand the different access stages and associated remuneration structures.

Access to digital ecosystems can occur at various stages, each with its own nuances and considerations. For example, depth of access can range from a website being used to app listing in gatekeeper's stores to sideloading or provisioning and listing of third-party stores. Within each stage, sub-stages exist, such as kernel access versus chip access, public API (application programming interface) versus private API versus full interoperability, and app review versus app hosting versus app distribution. Moreover, these stages are interrelated, e.g. with the app store residing within the operating system (OS), and first and third-party apps leveraging hardware and software functionalities.

Providers of mobile ecosystems, including end devices, operating systems, app marketplaces, apps, and content, hold a critical position from a competitive standpoint. They manage hardware and software functionalities and control access to essential distribution channels. For instance, they exert significant influence over the conditions for downloading and listing apps on their closed software marketplaces, thereby possessing a considerable monopoly over their customer base.

Simultaneous control over crucial access stages across different levels provides leverage effects that yield competitive advantages throughout the ecosystem. Regulatory attention currently focuses on access to dominant application stores and the potential of alternative channels, which may also allow consumers to discover and use mobile applications. Other attention points concern fairness and reasonableness of terms, which can extend to other access issues, such as licensing entire operating systems or other components within digital ecosystems.

By exploring the trade-offs, challenges, and implications of different access stages and modes such as integrated app stores, alternative stores or sideloading, this research paper aims to provide insights into the complex landscape of digital ecosystems and shed light on the significance of remuneration structures. Moreover, given the increase in regulated access within mobile ecosystems through initiatives like the DMA and other international regulation, this research project assumes even greater relevance in understanding the dynamics between access and remuneration.

The study is structured as follows. Chapter 2 provides an analysis of the current status quo in digital ecosystems related to apps, including access modes and pricing. It also offers a regulatory overview, including past cases and the DMA. Chapter 3 explores potential approaches for evaluating fees for mandated access, discussing reasons for mandated access, compensation models,

and implementational questions. Chapter 4 concludes the study, summarizing key findings and providing an outlook on the future of access and renumeration related to apps and in general to digital ecosystems.

2   Classification & Status Quo

2.1   Digital Ecosystems

Digital platforms and data-driven business models have become core elements of today's Internet economy. At the same time, these ecosystems of infrastructure, hardware, software, sales platforms (incl. app marketplaces) and services are becoming more and more intertwined. However, with the development of large Internet corporations such as Google [Alphabet], Apple, Facebook [Meta], Amazon and Microsoft (formerly known as GAFAM), the Internet is also becoming increasingly centralized and residential as well as business customers are regularly subject to the applicable rules and regulations of these large internet corporations. For this reason, these market parties have been increasingly described as 'gatekeepers' (of the internet), a term that has now also found legal meaning with the development of the DMA.

The general trend is described in the literature as a shift from "multi-actor" to "multi-product" ecosystems (Jacobides et al., 2020). This implies, in particular, linkages across different product and service areas where these complement each other (for example, Apple devices and iCloud) or are directly linked (i.e. Apple's iOS and App Store - this also applies de facto to Android and the Google Play Store) (cf. Fletcher, 2020). This study focuses on these mobile ecosystems built around smartphones, with Apple and Google at the centre. Still, providers such as Amazon and Microsoft also orchestrate complex ecosystems covering a wide variety of market and product levels and might also become more relevant in mobile markets.

These linkages can be considered as vertical integration and provide gatekeepers with advantages in terms of resource control, operational efficiencies, access to data, self-preferencing, and barriers to entry. These advantages can make it challenging for non-integrated third-party providers to compete in both upstream and downstream markets. To promote fair competition and prevent anti-competitive behavior, many regulatory and competition authorities have started to monitor and address the potential abuses of gatekeepers' market power, resulting from vertical integration in particular.

In terms of business models, Apple and Google exemplify the distinction between device-funded and ad-funded platforms (cf. Etro, 2021). Currently, devices continue to account for approximately 75-80% of Apple's revenues (Apple, 2022), with Apple exercising tight control over both hardware and software levels. Recently, both Apple's subscription services and advertising revenues are taking on a steadily and rapidly growing role (Stokel-Walker, 2022). Advertising revenues include, in particular, those generated by so-called "search ads", i.e. sponsored search results, for search entries within the App Store. In the case of Google, this type of advertising within its general search engine represents the core, which has been extended to an entire advertising network that also offers, for example, display advertising in the form of banners on third-party sites (cf. Fourberg et al., 2021). Since Google profits from this via higher usage and more tailored advertising offers through the collection of data, its own services including the Android operating system are often offered free of charge and there are fewer direct restrictions on third-party use of software and hardware functionalities (CMA, 2022). Another substantial and growing source of revenue for both companies is the income from the app marketplaces based on commission payments for (in-)app purchases.

Various new and envisaged regulations, e.g. on access terms to application stores or on the use of Android, could necessitate changes in these business models.[1] In particular in the context of access to digital ecosystems, various gradations of access issues are sometimes raised under the heading of the term "device neutrality". In order to minimize overlap with other levels and terminology, this study continues to use and proposes the term "device neutrality" for the below marked core areas of mobile access (Steffen & Wiewiorra, 2022; also cf. RTR, 2019):

1. End device/hardware

2. Operating system (OS)

3. App Marketplace

4. Browser.

Beyond this high level, a wide variety of different possible access and entry points to digital ecosystems is encompassed. That is, both end users and in particular different third-party business complementors such as app developers or manufacturers might have different goals and interests in interacting e.g. with the device hardware, the operating systems, application stores or browser, or directly accessing apps or content. In the following, we want to further zoom in into accessing and using software or software components within such ecosystems.

2.2   Modes of access to digital ecosystems in relation to apps

As described before, access to digital ecosystems can occur through various modes at different stages, which will be discussed here in further detail. Figure 2-2 below shows at a more detailed level the different modes of access particularly in relation to apps, including app listing in gatekeeper's store, sideloading, provision and listing of third-party stores, and others. Each mode may have again different sub-modes, such as kernel access vs. chip access, public API vs. private API vs. full interoperability, and app review vs. app hosting vs. app distribution.

Furthermore, these stages often build upon each other, as the app store sits within the OS, and first and third-party apps may use both hardware and software functionalities. With a view on the DMA provisions (as further explained in section 2.3.2), the focus of this paper will be on access for end users and remuneration for app providers related to a) standard listing in main app marketplace, b) alternative app marketplaces and c) sideloading (see red marked areas in below figure). However, a similar debate may apply for all modes of access along the content access chain, for example for access at the browser level, i.e. in the form of (Progresssive) Web Apps, or access to certain data.

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[1]   http://www.fosspatents.com/2023/01/googles-warning-against-unintended.html.

Figure 2-1:   Access Chain

Device	OS	App Store	App	Content

- Kernel access
- Chip access
- Own drivers?
- ...

- Private APIs
- Public APIs
- Full OS (e.g. for OEMs)
- Alternative default OS functionality (e.g. Voice Assistant, Browser Engine)
- IOP
- ...

- Listing in Gatekeeper store
- Using store itself (e.g. for alt. OS providers)
- ...

alternative app store

- Alternative curation
  - alternative guidelines
  - pure resale of catalogue?
- Listing of store-in-store?
- ...

Sideloading

- Alternative default apps (e.g. Browser, Search)
- ...

Source: Based on Steffen & Wiewiorra (2022), p. 7.

Different access modes also require different levels of integration from third-party app providers into gatekeeper's services and products. For example, listing an app in the app store requires a higher level of integration than enabling the sideloading of an app. Additionally, each access mode has different underlying costs and value components to be provided by the gatekeeper. For instance, listing an app in the app store currently includes gatekeepers also providing app hosting, distribution, and promotion services. On the other hand, sideloading an app requires fewer additional value components (and hence costs), while application providers are still benefitting from the overall (eco)system. Irrespective of the access mode used, the functioning of apps on smartphones largely depend on the functionalities enabled through the devices and operating systems.

In general, many aspects cannot be viewed in isolation or be attributed to one specific part of the access chain only. The intersections of hardware, software and functionalities are often fluid as they sometimes function only in coordinated effort. However, the Android operating system can in principle be used and licensed on its own by "original equipment manufacturers" (OEMs), whereby they independently can access the entire operating system. In the case of Apple as a fully integrated manufacturer, even more software functionalities may depend on specific functionalities enabled by the device itself or hardware components. While the focus of this paper mainly concerns access to software, it also provides an insight where access to hardware (e.g. certain chip sets) cannot be separated from the granted software functionality.

2.2.1   App distribution via application stores of Apple and Google

The current main mode of access to applications for end users is via the application stores of Apple (App Store) and Google (Play Store), where third-party developers can list their apps. Whether apps are listed in the gatekeepers' stores or accessed via (future) alternative routes, app

developers rely on the functionalities and APIs provided by the relevant OS. APIs enable an app to perform its functions by establishing communication between the app and the underlying operating system's hardware and other software programs. For example, APIs enable app developers to access the smartphone's hardware features (such as the camera or location services), specific services (like Google Maps), and other apps installed on the device.

Operating system providers, like Apple and Google, define and control APIs. They dictate how the software and hardware interact and control the access to information based on privacy controls implemented at the operating system level. It is worth noting that there are public and private APIs. Public APIs are accessible to app developers for regular use. In contrast, private APIs are e.g. reserved for Apple's internal testing and security purposes or selectively provided to authorized developers. As gatekeepers, Apple and Google can restrict or deny access to APIs that are crucial for the proper functioning of third-party apps. These restrictions can have implications for interoperability with other apps and the overall app functionality.

To list their apps in Apple's application store, app developers must participate in the Apple Developer Program and pay an annual fee of $99 (or $299 for an enterprise license). Similarly, developers who want their apps to be available in the Google Play Store need to enter into the Google Play Developer Distribution agreement and pay a one-time registration fee of $25. In return, certain tools and resources are provided, in particular in the form of developer kits. Developer kits, such as Apple's Developer Kit and Google's Android SDK (software development kit), are comprehensive sets of tools, resources, and documentation provided to app developers. They can help developers in creating, testing, and distributing applications on the respective platforms. Furthermore, they offer integrated development environments (IDEs) like Xcode (Apple) and Android Studio (Google), which enable writing code, designing user interfaces, and debugging applications. IDEs provide developers with a centralized workspace to efficiently develop their apps including a wide range of software frameworks, libraries, and APIs and documentation, guidelines and best practices.

Before an app can then be listed or updated on the Apple App Store or Google Play Store, it undergoes a review and approval process conducted by Apple or Google respectively. Both have specific guidelines in place that developers must follow to ensure their apps meet the necessary criteria to avoid rejection.

The resulting listing in gatekeepers' app stores provides an important value for developers due to the "discoverability". The aspect of "discoverability" pertains to how easily users can find and access an app. When an app is listed in the main app stores like Apple's App Store or Google's Play Store, it enjoys significant advantages in terms of discoverability compared to an app that is only available e.g. via sideloading. By being listed in the main app stores, an app benefits from increased visibility and exposure to potential users.

App stores offer features such as categories, charts, and rankings that showcase popular and new apps. These sections provide greater visibility to listed apps, increasing the chances of being discovered by users who are actively browsing or searching for new apps. Search functionality within app stores allows users to find apps based on specific keywords or categories. Even beyond the sole visibility, gatekeepers' app stores are trusted platforms where users go to find reliable and vetted applications. This inherent trust helps build credibility and influences users to explore and download listed apps.

Discoverability and trust can be essential for suppliers without own established brands (cf. CMA, 2022), while it is arguably less relevant for large, well-known providers such as Microsoft, Epic, Disney, Netflix or Spotify. In that way, the value provided to a developer being listed in the main stores may greatly differ depending on the characteristics and status of the developer itself.

2.2.2 App distribution via sideloading and alternative app stores

In addition to the current standard access mode of apps being listed in Apple and Google's stores, apps may be sideloaded or downloaded via alternative independent app stores. Sideloading refers to the process of installing apps on a device from sources other than app stores, such as it used to be common practice on desktop computers. Here,it involves manually downloading the app's installation file (APK for Android or IPA for iOS) and installing it on the device.

Sideloading is already available on Android devices and will need to become available for iOS devices under the new DMA rules. However, as apparent on Android, sideloading can be additionally challenging due to technical complexities, potentially excessive security warnings and required steps. Apple so far maintained a restrictive policy by disallowing and imposing restrictions on users to prevent sideloading of apps. In contrast, Google employed a more indirect approach of discouraging sideloading. Users were required to navigate through multiple steps, disable Android's security settings, and encounter several security warnings, which acted as deterrents to the sideloading process.

One further limitation of sideloading is that app developers themselves are responsible for creating their own update mechanisms. Apps listed in the main app stores benefit from automatic update mechanisms. When developers release new versions or updates, existing users are notified and prompted to update their installed app. Unlike apps from official app stores, sideloaded apps do not benefit from automatic updates. The developer must establish their own update regime, ensuring that users are aware of and able to install the latest versions of the app. Additionally, developers need to develop their own download platforms and host the app, adding to the technical requirements and responsibilities. However, the facilitation of a similar update functionality could in principle be demanded from gatekeepers and implemented for apps downloaded through other channels, like sideloading or alternative app stores.

Since applications and application stores operate in conjunction with operating systems and hardware, the underlying cost and value components from the overall hardware and software platforms may also be considered more generally for downstream access and not only in the scenario of direct access to the operating system. Hence, there is an ongoing debate in how far gatekeepers should be compensated for a) the previous costs to develop and operate the operating system as a whole and respective APIs and development environments, and b) the new implementation costs for enabling alternative mode of access to apps. For example, CMA (2022) acknowledges that adjustments to operating systems to allow alternative app distribution models could result in additional costs for Apple's and Google's platforms.

Overall, it is worth noting that while these alternative paths have already existed in the Google/Android ecosystem, they have not significantly impacted the dominance of the Google Play Store. While the DMA obliges sideloading also for the iOS ecosystem and in addition also prescribes an

easing of the process to go through when using alternative channels for installing apps, the effectiveness of alternatives to dominant app stores remains somewhat questionable.

2.2.3   Licensing of apps and OS

Independent device manufacturers and providers of operating systems may also wish to directly incorporate gatekeepers' own apps and services, in particular the main application store itself. Many users of devices from independent manufacturers still expect the availability of certain must-have apps from Google or that are available through the Google Play Store. On the other hand, Google has also entered into a number of agreements with Android device manufacturers that involve substantial payments to the manufacturers to further ensure that Chrome and the Play Store are preinstalled on most Android phones and that Google is the default search engine in many other browsers (see CMA, 2022). As a consequence, manufacturers must pre-install and prominently display the Play Store in order to use Google's version of the Android operating system, and large portions of the operating system can only be updated through the Play Store. Manufacturers selling devices with preinstalled Google apps were even prohibited by Google from selling other devices with unlicensed versions of Android. This was very difficult for other competitors to replicate (see CMA, 2022; CCI, 2022). These agreements ultimately led to the current situation in which Google's products are being used by the vast majority of Android customers. New market entrants using their own independent version of Android have a hard time attracting users and app developers, because they would not be able to provide access to Google's core applications and APIs, which are also important for the functioning of native Android applications.

In the European Commission's Android case (EC, 2018), Google was prohibited from a number of such direct bundling obligations in licensing. However, bundling is often still indirectly achieved through monetary and other incentives. Agreements between Google and manufacturers of Android devices include Google sharing a significant portion of its revenue from search ads from the Play Store with these manufacturers in exchange for placing and promoting Google apps. In net terms, Google paradoxically ends up paying licensees of Android and Google Services more than the licensees actually pay for their usage in the first place (cf. CMA, 2021, Appendix E). As more users and traffic are thereby steered towards (or kept within) Google's larger ecosystem, this still appears to be profitable on balance due to Google's overall (advertising) business model.

If practices such as revenue sharing agreements or other non-monetary incentives would not be possible anymore, like foreseen by the CCI (2022) and partly the DMA, Google might even change its approach concerning Android and Google Play Services, resulting in a more direct recoupment of Android and Google Play costs. In any case, a thought experiment about a potential "fair and reasonable" price or license fee for individual apps or the Android OS in isolation seems worthwhile and could also help to further inform the discussion across different access stages.

2.3   Regulatory overview in respect to access charges

2.3.1   Past cases/legislation related to access charges

Reviewing regulation of access charges and the responses of involved parties, we have distinguished three categories: 1) as applied in regulated telecom networks, 2) as mandated in relation

to interoperability for the Windows ecosystem and 3) as reviewed/mandated for certain aspects of Apple's and Google's mobile ecosystem.

1) Access charges in traditional telecommunication networks

There has been a longstanding experience in regulated access in respect to telecommunication networks where a certain network operator has a significant market position as reviewed in the market analysis. Access to long established (copper) networks is regulated mostly to be cost based against long run incremental cost (BEREC 2023). For so called next generation networks like fibre networks, where investment stimulation is key, access fees are either set at a reasonable level including a mark-up to compensate for the investment risks or there are safeguards in place which avoid that the access fees are set too high so that the access seeker cannot economically replicate the relevant retail service of the network provider (comparable here with the provider of the software based ecosystems).

2) Access charges in relation to interoperability information in the 'Windows' ecosystem

Another example outside the mobile ecosystems, is the access to interoperability information in respect to Microsoft Windows PCs for market parties offering services on an adjacent market (file and print sharing). The 2004 Microsoft case addressed Microsoft's effective refusal to supply Windows interoperability information to other market players together with the tying of Windows Media Player. Microsoft, as dominant player in the market of the Operating System Windows, leveraged this position to the downstream market of the workgroup server operating system. The EU Commission ordered Microsoft to "disclose complete and accurate specifications for the protocols used by Windows work group servers in order to provide file, print and group and user administration services to Windows work group networks". This disclosure must be made on a reasonable and non-discriminatory basis to any undertaking that has an interest in offering work group server OS products. Microsoft was allowed to require reasonable and non-discriminatory remuneration for the production of the documentation and for specific IP rights that the decision might prevent it from fully enforcing. Microsoft did not fully implement the interoperability remedies until October 2007. Therefore, it received two additional fines, €280.5m and €899m (reduced to €860m on appeal), for non-compliance.[2]

3) Access charges in the context of Apple's and Google's mobile ecosystems.

There have been several recent competition cases and legislation providing insights into the setting of access fees in respect to alternative payment options, alternative search engines and browsers, and the concept of essential facilities. Understanding these cases can shed light on the regulatory landscape and potential implications for access charges in the mobile ecosystem.

- *Reduction levels of app commission by Apple and Google for 'outside' payment*. Cases regarding alternative payment options for in-app purchases have been extensively pursued in South Korea and by the ACM in the Netherlands (KCC, 2021; ACM, 2022b). These reviews resulted in a reduction of 3, respectively 4, percentage points on Apple's and Google's base commission (30% in most cases). The reduction of the commission in

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2 European Commission decision of 24 March 2004 in Case 37.792 *Microsoft* (refusal to supply Windows interoperability information and tying Windows Media Player).

response to the regulations in the Netherlands and South Korea shows an approach by Apple and Google that resembles an "efficient component pricing rule" (cf. Baumol & Sidak, 1994; Gilbert, 2021). This means that the pricing attached to the payment processing component is strongly oriented towards the efficient costs of the "outside payment option". This approach is normally applied to price-regulated utilities, but does not seem appropriate for mobile ecosystems due to completely different fixed and marginal cost structures. These cases show that this approach hardly allows developers to cover their costs of the 'outside' payment option and therefore does not meaningfully facilitate switching to other access channels. It is not attractive for app developers to handle the payment processing component with external providers outside the app marketplaces at similar costs if the remainder of the commission must continue to be paid to the gatekeepers, especially given the additional organisational and possibly financial effort involved in implementation.

- *Arguments from Google on the level of its in-app payment service.*   The CCI in India has also been reviewing the level of the applied fees for the payment option, but from a different perspective. Instead of regulating a reduction for the app developer, the CCI asked Google to provide information on the provisions associated with its in-app payment system before and after the introduction of the User Choice Billing (UCB) system[3], which enabled app developers to use 'outside' payment options, as well as the policies governing the sharing of user and app developer data. Google argued that their in-app payment service fee was set at such a level that it supports investments in the Google Play app store and the Android mobile operating system, allowing them to be distributed for free while also covering expenses related to developer tools and analytics services.[4]

- *Access to alternative browsers in Android.*
Regarding Google's Android ecosystem, there have been efforts to increase competition, e.g. by integrating alternative search engines in the Chrome Browser and promoting alternative browsers. The development of Choice Screens aimed to provide users with options and reduce the dominance of Google's search engine. This access for providers of alternative browsers was initially based on auction based pricing but later was required to become free of charge. Additionally, steering issues related to "dark patterns" and other design considerations have been reviewed to ensure fair access and choice for users within the Google ecosystem (cf. Decarolis & Li, 2023).

- *Unfair and inequitable terms of access equal constructive refusal*   Another relevant case is the 2021 General Court Decision in in Case T-612/17, Google and Alphabet v Commission, the Google shopping case. Google was sued in 2017 for violating EU competition law, Article 102 TFEU, by abusing its dominant position on the market for online general search services, by favouring its own comparison shopping service (Google Shopping) over competing comparison shopping services on its general search page. The Google search engine was labelled as a "quasi-essential facility" (cf. Moreno Belloso, 2021). Although not a direct refusal, the case focused on the unfair and inequitable terms of access that could be seen as a constructive refusal, potentially foreclosing the

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downstream market. This case already highlighted the importance of fair and non-discrim-
inatory access terms for third parties within Google's ecosystem.

- *Access to functions of the operating system.*   With re-
  spect to Apple's restricted NFC functionality, this has for example been addressed in Ger-
  man legislation. According to the Payment Services Supervision Act § 58a, providers of
  mobile payment services have the right to access the functionalities of the operating sys-
  tems and the respective technical infrastructure of the NFC interface integrated in cell
  phones and other devices (cf. Franck & Linardatos, 2020). However, this mandated ac-
  cess has not yet led to providers offering their own NFC payment functions in practice.
  Despite a tightening of the law in June 2021, Apple Pay remains the only NFC-based
  payment wallet on iOS devices. The development of the wording of the law in terms of
  remuneration is nevertheless noteworthy. While the initial version prescribed access for
  an "appropriate fee" ("angemessenes Entgelt")[5], the wording in the current version has
  been changed to a fee not surpassing actually incurred costs of each access instance
  ("tatsächliche Kosten des jeweiligen Zugriffs").

Reviewing the different cases on access to certain functions in mobile ecosystems, it is observed
that mandated access to alternative functions like search engines (Google Android case) and pay-
ment systems was quickly followed by (design) steering issues as existing functionality in these
ecosystems are de facto having a monopoly position.

Access to alternative search engines was set to be free, however, all other access cases reviewed
consider a fee without setting an explicit value. Considering the low success of mandated access
in these cases, regulatory thinking tends to move in the direction of cost-based access (Apple NFC
case 2021) combined with review of possible steering issues of end users and other design con-
siderations.

2.3.2 DMA

The Digital Markets Act (DMA) further introduces provisions aimed at promoting competition and
ensuring fair access within mobile ecosystems (see below table for relevant articles). This chapter
explores the DMA's foreseen provisions for gatekeepers, focusing on alternative access and pay-
ment methods, as well as the aspect of access pricing. In particular, the DMA prescribes the pos-
sibilities of sideloading, alternative app stores, alternative payment options and allowing external
links from within apps to help promote such alternative channels. In addition, gatekeepers are
obligated to provide effective interoperability with competing services or devices, allowing alterna-
tive providers access to the same features as the gatekeeper's own services or devices.

The following table shows that in some parts and articles, access is deemed to be free, but in the
case of access to app marketplaces (as well as online search engines and online social networks)
access fees are supposed to be FRAND. Furthermore, Article 6(4) does not seem to explicitly
provide for compensating the gatekeeper for enabling alternative app marketplaces, external

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[5] https://www.bundesbank.de/resource/blob/836488/4b807b6a0a7eb3188cd8f4329fc04473/mL/pay-
ment-services-oversight-act-data.pdf.

payment options or sideloading. However, if not explicitly forbidden, it is likely that gatekeepers might attempt to charge a price in enabling these options.

Table 2-1:   DMA articles and access remuneration

Remuneration	Article
Explicitly free of charge	Art. 6(7): Interoperability requirement for dual role Art. 6(8)-6(10): Data portability & interoperability Art. 7(1): Messenger interoperability
FRAND	Art. 6(11): Access to data for search engine providers Art. 6(12): Access to app marketplaces, online search engines and online social networks
Not specified	Art. 6(3), Choice Screens (search engine, virtual assistant & web browser) Art. 6(4), alternative app marketplaces and sideloading

Source: Own collection.

The interoperability requirement of Art. 6(7) demands equality of access for alternative services and hardware providers to operating system, hardware or software functions of gatekeepers - if these are used by gatekeeper's own competing services or devices on their platform.

However, the intended scope of Art. 6(7) is somewhat unclear. From recitals (55)-(57), it seems that the main focus is on complementary and supporting services and hardware, such as wearables, Apple Pay or other ancillary services such as the in-app-purchase system. However, a broader interpretation is also possible due to the broad term of "providers of services" that must be granted effective interoperability, which could e.g. include app developers in general, even game developers whose games are only available as web apps. Such developers might potentially try to claim a right to any operating system features that had previously been unavailable to them due to, in particular, Apple's restriction of web apps and obligated use of Apple's own browser engine.

One of the potentially greatest points of contention will be the FRAND provision for access to app marketplaces, which puts the disputed 30% commission rate of Apple and Google into question. Art. 6(12) reads:

"The gatekeeper shall apply **fair, reasonable and non-discriminatory general terms and conditions to** commercial users' access to [...] shops for software applications, online search engines and online social networking services."

It is further elaborated, that gatekeepers shall publish general terms and conditions of access and are to provide an effective dispute resolution mechanism. FRAND access is also prescribed by Art. 6(11) for access to ranking, query, click and view data for competing search engine providers, as well as in the Data Act for certain data access provisions (cf. Habich, 2022).

In recital (62), the DMA suggests possible benchmarks to assess the fairness aspect of access pricing:

- "the prices or conditions charged or imposed by other operators of software application shops <u>for the same or similar services</u>";

- the prices or conditions charged or imposed by the operator of a business for software appli-cations for different related or similar services or charged or imposed on <u>different types of end users</u>;

- the prices or conditions charged or imposed by the operator of a business for software appli-cations for the same service in <u>different regions</u>;

- the prices or conditions charged or imposed by the operator of a software application business for the <u>same service that the gatekeeper provides to itself</u>."

These and other potential benchmarks will be further discussed in chapter 3.5.3.

2.4 Current access and usage pricing in the software and digital sector

This paragraph describes the existing access pricing methods in various areas of the digital sector with the aim of providing context for the current discussion on access fees for app stores.

2.4.1 App store commissions

The commission structures implemented by Apple and Google in their app marketplaces have been a topic of extensive discussion and criticism. One of the main points of contention is the 30% commission charged by both companies. Developers and consumers have voiced their opposition, citing the 30% rate as excessive and potentially discriminatory. These commission structures have further faced scrutiny from regulatory bodies, such as the UK Competition and Markets Authority (CMA), which has highlighted concerns about the fairness and competitiveness of these pricing models.

At least in some cases, the commission imposed by Apple or Google is passed on to consumers, resulting in higher prices for app subscriptions or in-app purchases. An example that illustrates the impact of these commissions is Spotify. Prior to adopting Apple's in-app purchase (IAP) system, Spotify offered its premium subscription for €9.99 per month when purchased directly on their website. However, when the subscription was purchased through Apple's App Store, the price increased to €12.99, as Spotify was offsetting Apple's 30% commission. This additional cost was ultimately borne by consumers.

Another criticism raised is the inconsistent application of the commission, which does not reflect a cost-based compensation. Apple requires apps categorized as "digital goods and services," which constitute only 16% of all apps in the App Store, to use Apple's proprietary payment processing solution (IAP). Until recently, the 30% commission was implicitly tied to the use of IAP (similarly for Google's proprietary payment processing solution, GPB). However, apps offering physical goods or services (which make up 84% of all apps, including major players like Amazon, Face-book, and Uber), as well as digital goods consumed outside of the app, are exempt from using IAP and hence from the commission. Recent investigations and their subsequent ramifications have started a process of disentangling the collection of commission fees and use of the gate-keepers' own payment systems (see chapter 2.3.1).

Table 2-2:   Distribution of commission collection in the App Store

No commission: More than 90%	
	Commission: Less than 10%

Apple does not collect a commission on:
 	
▪ **Digital goods and services** that are purchased outside of the App Store, for example:
  * Subscriptions to multiplatform video streaming apps like Hulu
  * Subscriptions to audiobook apps like Audible
  * Subscriptions to music streaming apps like Spotify
  * Subscriptions to news and magazine apps like the NY Times
▪ **Physical goods and services** ordered within-app, for example:
  * Ordering a ride through the Uber app
  * Placing an order on the Amazon app
  * Ordering grocery delivery through Instacart
  * Transaction fees on digital payments occurring through apps
▪ **In-app advertising** for apps that make money through in-app advertising, for example:
  * Non-gaming apps like Pinterest and YouTube
  * Gaming apps like Rolly Vertex and Helix Jump
	Apple collects a commission on:
	
	▪ **Digital goods and** services that are purchased *in or through* the App Store, for example:
	  * In-app subscriptions to multiplatform video streaming apps like Hulu
	  * In-app subscriptions to education apps like Duolingo
	  * In-app purchases of a game's bonus features
	  * In-app subscriptions to news and magazine apps like the NY Times

Source: Caminade & Borck, 2023.

Another current exception are reader apps that offer content such as e-books, videos, and music and such providers have been allowed (already pre-DMA) to include external links for subscription, effectively circumventing the commission. This allowed services like Spotify and Netflix to operate without offering in-app subscriptions. With the introduction of the DMA, such practices could be extended to all apps, providing more flexibility for developers. While there are further exceptions to the standard commission rate, such as a 15% commission for automatic subscription renewals after a one-year term or for small businesses generating less than $1 million in total developer revenue, the average commission paid by developers currently remains around 25-30%.

2.4.2 Commissions in the gaming sector

Gaming is one of the most popular categories in every large app store worldwide. As per Statista in Q3-2022, games had a 12.68% of share in Apple app store, respectively 13.8% in Google's play store (of all popular apps categories).

The gaming industry is also heavily contributing to the revenue generation worldwide. As per Statista, the gaming industry is leading clearly in revenue generation above all other apps, and this trend continues in revenue forecasting for 2027. According the Statista model, the gaming industry will be generating 352.1 million U.S dollars in revenue from total of 732 million U.S dollar total revenue.

Figure 2-2:   Revenue of mobile apps worldwide 2019-2027
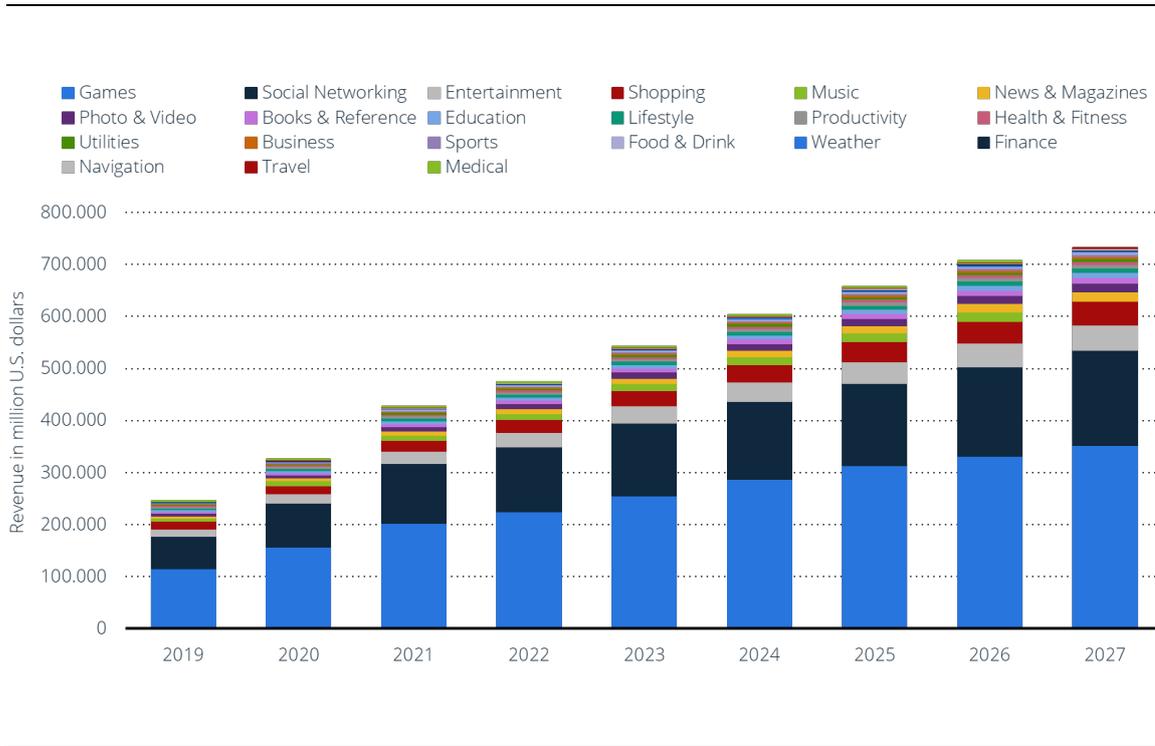
Source: by segment, in million U.S. dollars: Statista 2023.[6]

For the non-mobile gaming industry, comparable platform fees are also hovering around 30% for most popular platforms like Playstation, Steam and Nintendo. However, Epic games, one of the most popular games developers, is offering to take only 12% commission from developers and another gaming platform, itch.io is offering developers to set their own commission with a default of only 10%. Another example of reduced commissions is by Microsoft, which recently changed the commission payable by developers to 12% for PC games while maintaining 30% commission for its console Xbox digital store.

When we consider the gaming industry it should be noted that games are the most resource-demanding applications. They not only require heavy processing power, but also great network accessibility speeds and huge data storage. Hence, the platforms providing access to these apps have to support these requirements and will most likely have higher costs compared to other categories of apps.

Another consideration is the applied business model in the gaming industry. Sony and Microsoft argue that their consoles are sold at a subsidized price and their business model is to generate the main revenue from game revenues and its digital store. If this business model is compared to, in particular, Apple's business model, it is noted that these parties make significant profits from the sales of their mobile devices while still applying 30% commission from developers.

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6 https://www.statista.com/statistics/270291/popular-categories-in-the-app-store/, https://www.statista.com/statistics/279286/google-play-android-app-categories/ and https://www.statista.com/forecasts/1262892/mobile-app-revenue-worldwide-by-segment.

2.4.3 Access pricing in respect to data

Questions regarding fair pricing have also surfaced in the context of data access. To establish an equitable pricing framework for data access, it proves valuable to draw insights from pricing models employed in other sectors. Notably, cloud service providers furnish an array of storage products accompanied by pricing structures for data writes, storage, and reads. These rates exhibit variation contingent on specific use cases, distinguishing between read-intensive and write-intensive scenarios. The pricing strategies embraced by cloud service providers can be regarded as pertinent market-based benchmarks for data access, thereby illuminating how costs may be delineated to align with precise usage scenarios.

The pricing scheme for cloud access and the execution of operations are multifaceted, predicated upon a myriad of factors associated with data interaction. Variations manifest in pricing models based on data center locations, levels of availability, storage volume, data access, data operations, data migration, and customer support. Moreover, cloud providers extend supplementary features at an added cost, encompassing data backup, recovery mechanisms, and advanced security features.

Frequency of data access and the nature of data operations have the potential to substantially impact cloud pricing. Certain providers introduce distinct charges for inbound and outbound data transfers and may impose bandwidth limits, incurring additional fees for higher bandwidth utilization. The dynamics of data operations and access can witness exponential escalation contingent upon the specific attributes of the application. Consequently, cloud storage emerges as a cost-effective solution for backup and archival purposes, particularly in comparison to frequently accessed data. To consider Google Cloud Storage as an example, the chart below delineates cloud storage pricing across different regions:

Table 2-3:   Cloud storage pricing across different regions

Location	Standard storage (per GB per Month)	Nearline storage (per GB per Month)	Coldline storage (per GB per Month)	Archive storage (per GB per Month)
Warsaw (europe-central2)	$0.023	$0.013	$0.006	$0.0025
Finland (europe-north1)	$0.020	$0.010	$0.004	$0.0012
Belgium (europe-west1)	$0.020	$0.010	$0.004	$0.0012
London (europe-west2)	$0.023	$0.013	$0.007	$0.0025
Frankfurt (europe-west3)	$0.023	$0.013	$0.006	$0.0025
Netherlands (europe-west4)	$0.020	$0.010	$0.004	$0.0012
Zürich (europe-west6)	$0.025	$0.014	$0.007	$0.0025
Milan (europe-west8)	$0.023	$0.013	$0.006	$0.0025
Paris (europe-west9)	$0.023	$0.013	$0.006	$0.0025
Berlin (europe-west10)	$0.025	$0.014	$0.007	$0.0024
Turin (europe-west12)	$0.023	$0.013	$0.006	$0.0025
Madrid (europe-southwest1)	$0.023	$0.013	$0.006	$0.0025

Source: https://cloud.google.com/storage/pricing#regions.

These are only storage charges but multiple other charges are associated with Google Cloud Storage. Google charges extra for data processing, which consists of the following:

- Operations Charges (for all requests made to cloud)

- Retrieval Fees (Data read from certain storage locations)

- Inter-region replication (Data written to dual or multiple regions)

- Autoclass Management fees (Autoclass enabled bucket).

It is important to note that the cloud pricing model is very complicated and considers multiple factors For example, above mentioned operation charges are further divided into three different classes of operations and different storage classes. Retrieval fees apply when one performs any read, copy, move or rewrite operations and these costs are additional to network charges associated with reading the data. Inter-region replication is billed on a per-GB basis and Autoclass management fees is charged on buckets that have Autoclass enabled and have a monthly fee of $0.0025 for every 1000 objects stored within them. See the following tables as illustration of these charges.

Table 2-4:   Storage Classes Operations & Retrieval Rates

Storage Class[1]	Class A operations (per 1,000 operations)	Class B operations (per 1,000 operations)	Free operations	Data Retrieval (Rates per GB)
Standard storage	$0.005	$0.0004	Free	$0
Nearline storage and Durable Reduced Availability (DRA) storage	$0.01	$0.001	Free	$0.01
Coldline storage	$0.02	$0.01	Free	$0.02
Archive storage	$0.05	$0.05	Free	$0.05

Table 2-5:   Inter-region replication costs for associated locations

Location	Default replication (per GB)	Turbo replication (per GB)
European dual-regions, including eur4	$0.02	$0.04
EU (multi-region)	$0.02	Not available

Questions about fair pricing have also been raised in terms of access to data collected by gatekeepers (also cf. section 2.3). Among others, this could be search query data from search engines, aggregated transaction data from online platforms and/or anonymised data from public entities.

One important consideration is the nature of search query data collected by gatekeeping search engines. As search engines gather this data as a byproduct of their operations, the marginal cost of obtaining user information is minimal. Therefore, it is generally deemed undesirable to allow gatekeeping search engines to charge fees for access to search query data that they have already collected (Edelson, Graef & Lancieri, 2023). However, it is deemed reasonable to allow gatekeepers to impose costs for delivering the data in a usable format.

A similar notion is reflected in the Directive on Open Data and Re-Use of Public Sector Infor-mation.[7] Article 6(1) of this Directive stipulates that the re-use of documents should be free of charge. However, it also allows for the recovery of marginal costs incurred for activities such as reproduction, provision, and dissemination of documents, as well as anonymization of personal data and measures to protect commercially confidential information. This provision strikes a bal-ance between free access to data and allowing for the recovery of justifiable costs associated with its provision.

On the other hand, as apparent in the context of the Digital Services Act (DSA)[8], the costs asso-ciated with granting access to data can be seen as a form of "compliance costs" necessary to meet certain requirements imposed on dominant incumbents (here: VLOPs and VLOSEs[9]). In that sense, granting free access to databases would resemble standard legal compliance costs for – by definition – large companies that are deemed to have sufficient resources (cf. Edelson et al., 2023).

2.4.4   Access pricing based on FRAND

Another compensation mechanism in the industry is "fair, reasonable and non-discriminatory" (FRAND). The roots of the FRAND mechanism can be traced back to patent law and antitrust regulations. Over the years, courts and regulatory bodies have recognized the importance of en-suring access to essential technologies and preventing anti-competitive behavior. This recognition led to the development of legal doctrines and guidelines that govern the licensing and pricing of so called standard-essential patents (SEPs).

SEPs are patents that cover technologies essential to implementing a specific industry standard. These patents are typically held by companies that participate in standard-setting organizations, aiming to ensure interoperability and compatibility across devices and systems. However, the own-ership of SEPs can give rise to concerns about monopolistic behavior and potential abuse of mar-ket and hold-up power. To address these concerns, the concept of FRAND licensing emerged, in which patent holders are required to offer their SEPs to interested parties on fair, reasonable, and non-discriminatory terms. The FRAND framework aims to strike a balance between protecting the intellectual property rights of patent holders and ensuring that essential technologies are accessi-ble to all market participants on reasonable terms.

The terms of these licenses should be fair and reasonable, taking into account factors such as the value of the patented technology, the economic benefits derived from its use, and the potential for broader adoption of the standard. The FRAND mechanism has been widely adopted in various industries, including telecommunications, where SEPs, e.g. for LTE or Wi-Fi, play a significant role. The FRAND mechanism does not represent a simple formula or guideline to calculate such

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7 Directive (EU) 2019/1024 of the European Parliament and of the Council of 20 June 2019 on open data and the re-use of public sector information (recast).
See https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019L1024.
8 Regulation (EU) 2022/2065 of the European Parliament and of the Council of 19 October 2022 on a Single Market For Digital Services and amending Directive 2000/31/EC (Digital Services Act). See https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32022R2065&qid=1689949834293.
9 Very Large Online Platforms and Search Engines.

a rate, but rather provides a *framework* for negotiation and dispute resolution, aiming to prevent licensing disputes and promote the widespread adoption of standard technologies.

Open banking, a key initiative driven by the European Payment Services Directive 2 (PSD2) regulations[10], has implemented the concept of terms within its framework. In accordance with the requirements established by the European Banking Authority Regulatory Technical Standards on Strong Customer Authentication and Common and Secure Communication, the European Telecommunications Standards Institute and Open Banking Europe collaborated to create the PSD2 x509 Certificate Format Standard. This standard, a crucial component of open banking, is made available to Qualified Trust Service Providers and Payment Service Providers operating in the European market on FRAND terms. This approach is supposed to ensure that access to standardized certificate formats and associated services is fair, reasonable, and non-discriminatory for all participating entities.[11]

2.4.5 Overview

In summary, the current app commission of around 30% charged to developers by Apple and Google does not seem to be cost based and is applied inconsistently. Looking at the more resource intensive and hence more costly gaming industry, it is noted that commissions can be much lower (up to 10%), which is also an indication that the commonly used 30% commission is high.

Compensation mechanisms in relation to access to data collected by gatekeeper's platforms (which is part of the service provided when using an app store) tend to point in the direction of compensating for the delivery costs in a usable format. This is based on the argumentation that the collection of data has a marginal cost for the gatekeeper (search engine, platform, app store). In the latest regulation like the DSA, this compensation for access to data by gatekeepers even tends to be considered as compliance costs and hence should be free. The cloud industry provides an example of highly differentiated pricing for different transactions related to access and processing of data.

The alternative price mechanism for app store access fees as proposed by the DMA, FRAND is previously applied in relation to patents and certain other standards, and is more of a negotiation framework. The considerations of using FRAND for setting access fees related to digital ecosystems will be discussed in chapter 3.

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[10] EU Directive 2015/2366 of the European Parliament and of the Council of 25 November 2015. See https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32015L2366.

[11] oasis-obe-api-identification-and-security-standards-for-apis-and-communications.pdf (openbankingeurope.eu).

3   Evaluating fees for mandated access to digital ecosystems

3.1   Overview & proposed decision process

This chapter will explore the different approaches for setting fees for access to app stores and in general to digital ecosystems. The debate over access to software and digital ecosystems, whether compulsory or voluntary, often first revolves around the question of whether such access should be free or remunerated. The first viewpoint gains particular traction when dealing with dominant providers under asymmetric obligations, where free access has recently been demanded or considered (Heim and Nikolic, 2019; also cf. DMA). On the other side of the spectrum, proponents argue that companies that invest in data collection and platform development should be fairly compensated to encourage continued growth in digital business models, data analysis, and technological innovation (e.g. Podszun, 2021, also see traditional telecommuncations regulation).

Yet, determining the appropriate compensation model introduces its own set of complexities. The remuneration scheme for obligatory access to digital ecosystems can adopt diverse approaches, be it cost-based or value-based, and can manifest through various structures like one-time payments or recurring fees. It can also be argued that each access scenario may necessitate a customized solution instead of a one-size-fits-all rule.

Resulting from the considerations we present in the following chapters, we have developed a possible decision process for regulators. Figure 3-1 provides a graphical overview.

Figure 3-1:   Decision process
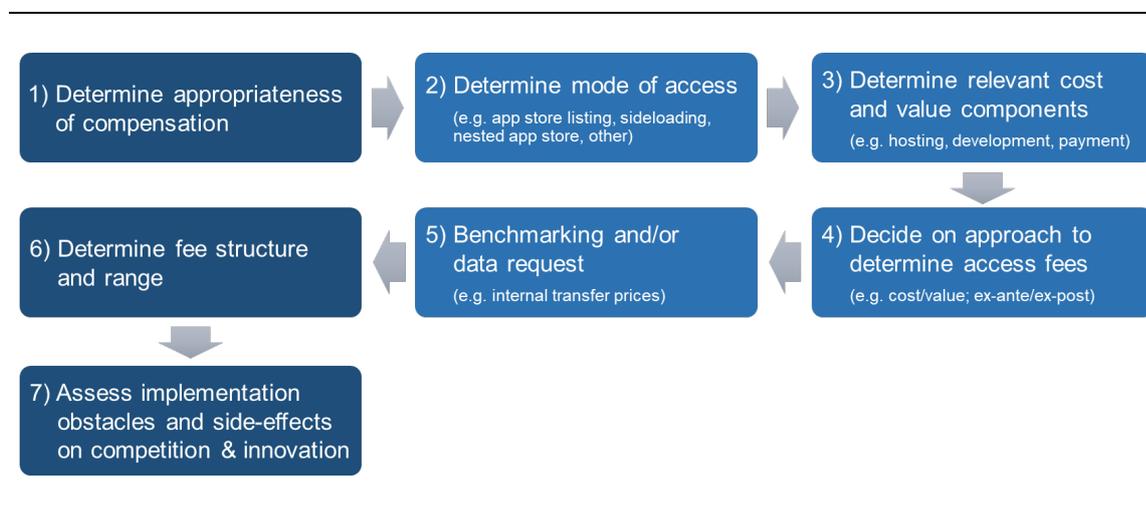
Source: Own development & illustration.

3.2   Considerations for potential approaches

Considering the appropriate payment of mandatory access, it is essential to assess whether an app store can cover its costs and has sufficient incentives for further developing its operating system and functionalities if a majority of app developers were to migrate to alternative channels. This is crucial for the financial sustainability of the gatekeeper's infrastructure and the provision of services. While it is theoretically possible that developers predominantly opt for free or less costly alternatives, other factors play a significant role in keeping developers at least partially engaged in the existing model. One such factor is discoverability. App stores offer valuable visibility and exposure to a wide user base, which can significantly impact the success and profitability of developers' apps. This undeniable value could justify the need for a remuneration based on the opportunities and benefits provided by the gatekeeper's ecosystem.

Another aspect is that platforms' current approach of sharing in revenue via commission has the advantage of indirectly subsidizing new apps, thereby encouraging app development (cf. Lambert, 2022). Popular apps contribute most to the cost of maintaining them, while developers of free apps pay nothing, and developers of unpopular (or yet-to-be-developed) paid apps pay little. This means that app developers pay less in the early stages of their apps, when revenue tends to be low, and more in return when their apps have proven successful. To the benefit of consumers, this structure can encourage the development of new apps and could increase overall market performance despite possible losses for popular providers. A more cost-oriented approach for all app developer could therefore potentially hurt the market of free apps.

In addition to financial considerations, other aspects must be taken into account when regulating fees for mandatory access. These include ensuring fair competition, promoting innovation, hence balancing the interests of all stakeholders involved. Striking a balance between incentivizing gatekeepers to invest in their infrastructure and services, while also fostering a competitive and vibrant ecosystem for developers, requires careful examination of various factors and continuous assessment of market dynamics.

Therefore, we have explored below logical thought steps with respect to mandated access pricing in the analysis:.

1. **Decide on the appropriateness of compensation.**
   While the main goal of this paper lies in providing a more conceptual foundation for assessing or calculating software access fees, the first question to explore is whether gatekeepers should be entitled in the first place to receive remuneration for providing access to their platforms and which factors determine the appropriateness of such compensation. Different justifications and considerations surrounding mandated access need to be considered, examining the circumstances under which it becomes necessary and the factors that contribute to its legitimacy. Depending on the justification of mandated access in each case, different levels of compensation may be appropriate and will be important for evaluating its impact on the software and digital ecosystem.

2. **Decide on the access modes and related different access fees.**
   A regulator needs to identify the possible varying degrees of access which should be mandated in order to promote competition. Depending on the specific access stage or

point, prices need reflect the varying degrees of access and the differently associated costs and values.

3. **Decide on the relevant cost and/or value components.**
Assuming a remuneration is to be granted to the access-giver and given the choice for certain access modes, the question then becomes, which cost and/or value components should be included in assessing a fee. Determining the elements to be considered in the pricing of mandated access is crucial. We will analyse the different cost and value components that may come into play while considering both tangible and intangible costs and values.

4. **Decide on the suitable approach for assessing the access fee.**
In the history of regulation, prices e.g. for access to regulated network monopolies have sometimes been set ex ante by regulators. The alternative approach, that seems to be currently foreseen by the DMA for access to app stores, rather involves an ex post evaluation to review if rates negotiated or set by the gatekeepers are appropriate, or in this case FRAND.

Either ex-ante or ex-post, there will be an assessment of the appropriate access fees. One main distinction lies between cost- or value-based approaches. This analysis aims to compare between cost-based approaches, which focus on recouping specific expenses incurred by the gatekeeper, and value-based approaches, which account for the intrinsic worth and benefits derived from accessing the platform. Understanding the merits and limitations of each approach will inform our assessment of the most appropriate model.

Furthermore, in this process, there is the interplay between transparency, disclosure, and potentially required estimation. We will explore the challenges posed by private (i.e. business secrets) or intangible components. We will also examine the role of estimation and determination in cases where specific components may be difficult to quantify.

3.3 Decision on the appropriateness of mandated access & payment

This section describes first the possible grounds for mandated access to software or digital ecosystems and thereafter the current status quo of the debate on mandated access to app stores. Justifications can be based on various legal, competition, and regulatory grounds.

3.3.1 Possible reasons for mandated access & payment

- One such ground is the application of patent law or agreements. While patents grant exclusive rights to inventors or technology owners, there are cases where granting mandated access or enforcing contractual commitments becomes necessary to ensure fair competition and foster innovation. By allowing other market participants to utilize patented technology under specific conditions, such as reasonable compensation or licensing agreements, mandated access strikes a balance between protecting intellectual property rights and promoting competition. This approach recognizes the importance of ensuring that patent rights do not become barriers to entry or hinder the development of new and innovative products and services.

- The essential facilities doctrine provides another justification for mandated access. This doctrine applies when a particular asset or facility is deemed indispensable for competitors, and

its reproduction is not feasible. The purpose of the doctrine is to protect competitors who, even when operating on the same scale as the dominant undertaking, lack the ability to reproduce the facility. To invoke the essential facilities doctrine, it must be demonstrated that the refusal to grant access by the dominant undertaking would lead to the elimination of competition in the downstream market. In the context of digital platforms, the essential facilities doctrine may be relevant when gatekeepers possess a position of dominance that allows them to impose unfair terms and conditions on their competitors. Thus, even in the absence of a formal refusal to provide access, the gatekeeper's position can create an environment that stifles competition, necessitating mandated access to promote a level playing field.

- Mandated access can also serve as a remedy to address market abuse or anticompetitive practices more generally. When a dominant player engages in behavior that hinders competition, regulatory authorities may intervene and require mandated access as a means to restore competition, foster innovation, and protect consumer interests. This approach aims to rectify situations where a dominant player's actions create barriers to entry or limit the ability of other players to compete effectively. By mandating access, regulatory authorities can promote fair competition and prevent the abuse of market power, ultimately benefiting consumers by ensuring a diverse range of choices and competitive pricing.

  In the regulation of telecommunication monopolies, mandated access has been historically employed. Telecommunication infrastructure and services are considered essential for economic development and societal connectivity. Regulatory frameworks often require dominant telecommunication companies to provide access to their network infrastructure, ensuring fair competition, universal service, and affordable pricing. This regulation is aimed at preventing monopolistic control, promoting market competition, and enabling access for new entrants. Mandated access in the telecommunication sector facilitates innovation and ensures that consumers have access to reliable and affordable communication services.

- Interoperability mandates provide another justification for mandated access, particularly in the context of digital ecosystems. Interoperability refers to the ability of different systems or platforms to communicate and work together seamlessly. In digital markets where dominant platforms can create barriers to entry by locking in users and data, mandating access and requiring interoperability can foster competition, consumer choice, and innovation. By enabling access to dominant platforms and promoting interoperability, regulatory authorities encourage a more open and competitive digital environment. This approach supports the development of new services, encourages innovation by smaller players, and can enhance consumer welfare by providing a wider range of options.

3.3.2 Current status quo of the debate on mandated access to app stores

The DMA consolidates some of these previous approaches and will now form a legal foundation for mandated access in various areas itself. In the wake of the final agreement of the DMA and its implementation, there is also an ongoing discussion about where and when access provisions should be free of charge to potential access-takers.

While the DMA provides that interoperability access in the case of a dual role of the gatekeeper must be provided "free of charge", some commentators have noted that the scope of this is not totally clear and argued that the costs of providing access for the gatekeepers should be at least

partly covered by access seekers. For example, De Streel et al. (2023) argue that while a low or zero price for access has the potential to foster entry, competition and innovation by complement-ors, it may also lead to entry of inefficient entrants, to discrimination in non-price aspects or to hampering strategies by gatekeepers and may lower innovation incentives by the gatekeepers themselves. In the case of free access, monitoring would thus be needed on both sides to avoid entry of inefficient entrants on one hand and to avert non-price discrimination.

The reduction in investment incentives for access-givers and the potential threat of ceased oper-ations without the ability to recover costs incurred by operating the platform/ecosystem is an im-portant aspect to critically examine. For example, with respect to the App Store, Apple has strongly defended its existing terms of access, arguing that the charges imposed on developers compen-sate Apple for providing essential tools, technology, distribution channels, and other services that enable developers to leverage the iOS ecosystem (see section 3.4 for further discussion). Apple and Google contend that these costs add to the direct costs associated with running their app stores that also need to be covered by the commissions for app developers (CMA, 2022).

It is essential to consider Apple's and Google's overall business models in this context. For Apple and Google, the costs associated with developing and operating their operating systems and app stores are presumably already more than covered through other revenue sources (e.g. CMA, 2022). In Apple's case, these costs may be offset by the margin earned over hardware costs, considering the profitability of their devices business. Similarly, Google's costs may be covered through revenue generated from search traffic and data, considering their dominant position in the search advertising market. This assumption is supported by the profitability of Apple and Google, which consistently exceeded what is required to provide a fair return to investors, according to the CMA (2022) market study. They estimate that Apple's and Google's return on capital employed (ROCE) while using a benchmark for their weighted average costs of capital (WACC), indicate that both companies earn substantial profits. Apple's high profit margins and returns on capital, particularly from the devices business and services segment (which includes App Store commis-sions and the search default position on Safari), demonstrate their significant profitability. Similar profitability is observed in Google's search advertising business, where they enjoy a market share of around 99% in mobile search (CMA, 2022).

Based on CMA's analysis, Google's profits significantly exceed the benchmark level required to cover investment costs. In fact, Google's profits exceeded standard investor returns by at least £4 billion in the UK in 2021. CMA concluded that the current app commission levels are set signifi-cantly above any relevant cost measure. This highlights the potential for competition to drive inno-vation which eventually will benefit consumers. These profits could potentially decrease if these platforms faced greater competition or if alternative options with lower prices and improved quality were available.

While remaining agnostic about the extent to which gatekeepers would indeed overall have cost recovery problems or lower investment incentives, we posit a fully cost-compensating and a fully value-compensating level as first orientation points for a systematic conceptual framework. In practice, different parts of this analysis may then be called upon to review if offered access fees are in a fair and reasonable range.

3.4   Decision on the access levels and related components of the app store

As described in chapter 2, access to app stores can occur through various modes at different stages: through app listing in gatekeeper's stores (Apple/Google), sideloading directly via the OS of mobile phones (akin to PC) and lastly through listing in alternative app stores.

The interaction between different access levels and access components plays a particular role in the implementation of the foreseen access remedies as it impacts which components need to be mandated and the related appropriate access fees. For example, the operation of an alternative app store might encompass a range of different implementations. That is, will all alternative stores need to provide their own hosting and distribution services and their own payment systems? Will all alternative stores need to engage in their own separate content and security checks and reviews or could there, for example, be alternative stores that only offer their own marketing and curation efforts based on the existing (gatekeeper-reviewed) app catalogues? The latter would resemble a standard form of resale as known from the regulated telecommunications industry and could also involve (lower) alternative prices. In other cases, alternative providers would need to bring more and more of their own infrastructure into the digital ecosystem. Still, even a completely own operation of an app store needs to be embedded in the running OS and/or devices of the gatekeeper. Thus, the analogue of an alternative telecommunications company using "only own infrastructure" is not possible here, strictly speaking.

In the final text of the DMA, it remains partially unclear how to interpret the respective articles with regard to access provision of partial aspects only, e.g. only app review or only app distribution. It is possible that gatekeepers will initially pursue an all-or-nothing approach, forcing operators of alternative stores or sideloading developers to use as much of the gatekeeper's services as they can. Potentially, gatekeepers could be obliged more specifically in the future to also offer more granular components, e.g. of an app store ecosystem, such as testing or hosting, or be obliged to allow for a form of "app resale". Thinking about such finely grained access levels , involved components and appropriate pricing, can be even more complex, but can be crucial for developing competition and innovative business models by app developers.

In this chapter, we will try to identify and disentangle such different components in different access stages as far as possible, while still acknowledging points of diffusion and intersection and discuss different approaches when and how such common or overhead costs can be considered. As one of the areas of most contention, the largest focus will lie upon the current app store model with apps being listed in the two main gatekeeper stores and on the proposed alternative access channels of sideloading and alternative app stores.

3.4.1   Components related to gatekeeper's app stores

Related to the mode of access, certain functions or components from gatekeeper's app stores are provided (and hence their costs should potentially be covered). On the one hand of the spectrum there is the regular listing in gatekeeper's app store, which contains all components. Thereafter, the alternative app store, where app developers use less functions of the gatekeeper's store and on the other end there is sideloading, which does not use functions from the gatekeeper's store but does use the integration with gatekeeper's operating system.

The main cost components for listing an app in an app store include:

- Development, maintenance & support for developer kits/programs

- Development & marketing of the app store

- App review & approval process:
    - Quality check
    - Security check
    - Compliance check, e.g. Intellectual Property

- Hosting & distribution of apps, including update mechanism

- Customer support

The relevant consideration in this thought process will be discussed in the following text per component.

Development tools

Development tools offered by gatekeepers include software development kits (SDKs), APIs, and documentation that also assist developers in creating, testing, and optimizing their apps. However, they largely build upon development and functionalities that are firstly used for first-party app and OS features. These tools nevertheless provide valuable resources and may include technical support, streamlining the development process and enhancing all apps' functionality. According to James Malackowski, an expert witness in Apple's trial against Epic, Apple's research and development (R&D) expenditure significantly increased from $500 million in 2015 to $18 billion in 2020. Apple CEO Tim Cook asserted that the company's research efforts indeed benefit the App Store in particular.

However, developers with advanced technical expertise may choose to rely on their own development tools or utilize alternative third-party frameworks to tailor their app development workflow according to their specific needs. Some expenses might arguably be claimed as being specific to external developers in the area of development tools. For example, Apple's WWDC event costs $50 million per year (but is at least partly offset by ticket prices at $1,500 per ticket) and a new facility for developers to receive support from Apple engineers is currently under construction.

Platform/Storefront

The storefront is a fundamental component that gatekeepers provide as it serves as the digital marketplace where apps are listed and made available to users. It ensures visibility and discoverability for external developers' apps, allowing them to reach a wide audience. This basic functionality is essential for developers to connect with potential consumers effectively.

Marketing and promotion efforts play a significant role in establishing both an operating system and a tied app store. Gatekeepers allocate substantial resources to advertising campaigns, developer outreach programs, events, conferences, and incentives to attract app developers and foster a vibrant ecosystem of third-party applications. Effective marketing strategies are essential for generating user adoption, increasing market share, and positioning the operating system as an appealing platform for users and developers.

Only few developers with already established brands and related services may be able to provide a similar experience to end users. There are also significant marketing expenses from gatekeepers that go towards the app store ecosystems as a whole and sometimes even towards specific third-party apps. Indeed, Apple claims to have spent $1 million themselves for the marketing of Epic's game Fortnite before its removal from the App Store. However, such voluntary expenses may also hint at the value that is generated vice versa from the presence of certain apps and games, and similar marketing expenses may pay themselves through generated revenue cuts when purchases are made consequently through Apple's IAP system.

Distribution services

These include hosting, content delivery, and app updates, which are crucial for developers to ensure their apps are accessible, reliable, and up-to-date for users. These services enable the seamless delivery of app content and facilitate the distribution process across different devices and platforms.

While the distribution services provided by gatekeepers can simplify app deployment, some developers may have the capacity and resources to manage these aspects themselves, particularly if they have specific requirements or prefer a more tailored approach.

It should also be noted that both Apple and Google have implemented a maximum size limit for hosting of applications in compressed format, For 'high demand' applications, which requires additional storage, different extension pack could be utilized. Apps on Google Play for example have a size limit of 150 MB which is based on the maximum compressed size of APKs[12] at the time of download across all supported devices. Google allows to expand this limit with APK extension packs for up to 4GB. In case of Apple, they allow a maximum executable file size of 500 MB for iOS 9.0 or later, and an uncompressed file size of under 4GB.[13]

Payment services

Payment services currently also play a central role in facilitating transactions between developers and users, allowing for the monetization of apps and in-app purchases. While the integration of secure and reliable payment systems within the app store ecosystem simplifies the purchasing process and builds trust with users, some developers may opt to handle payment processing independently or explore alternative payment methods, especially if they have established their own payment infrastructure or prefer more flexibility in pricing models.

Review and safety measures

App review processes, content moderation, and security checks, are relevant for maintaining quality standards, safeguarding user experiences, and protecting against malicious activities. Each year, a significant number of apps, estimated to be around 4.8 to 5 million, are submitted for

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[12] APK is the file format used by the Android operating system, and a number of other Android-based operating systems for distribution and installation of mobile apps, mobile games and middleware (Wikipedia).

[13] Sources: https://developer.apple.com/help/app-store-connect/reference/maximum-build-file-sizes and https://support.google.com/googleplay/android-developer/answer/9859152?hl=en#zippy=%2Cmaximum-size-limit.

review. The processing time for app update submissions varies, with some taking hours while others may require only up to a minute for review. In recent years, the app rejection rate has increased, reaching approximately 40% in 2020. Among the common reasons for app rejections, about 14% of cases required additional information from developers, while 10% were due to the presence of bugs within the applications. Notably, around 60% of submissions consist of updates to existing apps, highlighting the ongoing maintenance and evolution of app offerings within the ecosystem.[14]

However, there have been debates regarding the effectiveness of the app review process in enhancing security. Some experts argue that the built-in defences within the underlying operating system, such as iOS, provide significant security measures, making the additional benefits provided by the app review process negligible. Mechanisms like sandboxing, which restrict the capabilities of individual apps, contribute to the overall security of the system. One expert, Mickens, suggested that iOS is not "meaningfully more secure" than macOS (which allows for sideloading) when questioned about the comparative security levels between the two platforms.[15] Gatekeepers typically provide these services themselves to ensure a secure and trustworthy app environment. Nevertheless, some developers and potential store providers may prefer to implement their own review and safety measures or work with third-party providers, especially if they have unique content requirements or specific security protocols.

Customer support

These encompass user assistance, troubleshooting, and feedback channels, which are important for maintaining a positive user experience and addressing user queries or concerns.

While gatekeepers typically offer customer support options for developers, some developers may prefer to handle customer support directly to maintain closer interaction with their user base, gather valuable insights, and ensure a more personalized and tailored support experience.

Basic and commercial add-on functionalities in app stores

Based on the above information, it is clear that within an app store ecosystem, various components and services are provided to developers to support their app distribution and reach consumers. These components typically include the platform itself i.e. the storefront, distribution services, payment services, review and safety measures, development tools, and customer support.

While these services can be valuable and beneficial to developers, it is important to consider the distinction between the basic functionality that a developer truly needs to reach consumers and the commercial or business add-on services that may be optional or preferred by developers..

Separation of app store components based on technical versus commercial bundling

Overall, app developers may have different strategies and priorities when it comes to utilizing the components and services offered within the app store ecosystem. Gatekeepers should consider

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14   https://de.scribd.com/document/506939826/Kosmynka-Demonstratives-Epic-vs-Apple.
15   https://de.scribd.com/document/499643765/376-13-James-Mickens-Opening-Opinion-Summaries#.

providing flexibility and options for developers to choose the app store components that align with their individual needs and business models.

Determining which functionalities within the app store ecosystem can be separated or detached from the core service is essential for understanding the extent of flexibility and choice available to developers. It involves examining the underlying architecture, integration points, and dependencies between different services. We can assess the detachability of specific functionalities by examining:

- The technical feasibility of providing the functions separately. For example, while the integration of external payment services within the app store ecosystem is technically feasible and may be provided by third-party payment providers, gatekeepers may impose requirements that in-app purchases must be routed exclusively through their own payment systems.

- The bundling requirements imposed by gatekeepers. Gatekeepers may have specific policies or requirements that encourage or mandate the combined use of certain services or functionalities. By distinguishing between technical necessities and bundling requirements, we can identify which functionalities are intrinsically linked to the core platform service and which are commercially add-on and hence potentially detachable.

- Examine whether they are provided in-house by gatekeepers like Apple or Google or outsourced to third-party providers. For example, Apple and Google are not payment providers themselves, they integrate payment services within their app store ecosystems. Distribution services, such as hosting and content delivery, are often outsourced to providers like Akamai. By identifying which functions are outsourced, we can assess the potential for separating them from the core service.

3.4.2 Components related to gatekeeper's OS

Despite the fact that in the case of alternative app stores and sideloading, more functions may be performed by the app developers themselves, gatekeeper's have argued that the integration between their operating software and the app functionality is nevertheless required to a large extent. Gatekeepers argued that the underlying cost and value components from the overall hardware and software platforms therefore should be considered more generally for all forms of downstream access.

The determination of cost and value components across the digital value chain is complex as it is encompassing various access levels and different access instances. As the digital landscape evolves, spanning from hardware to operating systems, software functionalities, app stores, and individual apps, different actors engage with distinct components, each interacting and contributing to the overall value chain. Effectively addressing cost and value components is crucial for establishing fair and transparent access pricing mechanisms. However, because many of the costs for the mobile ecosystem as a whole are incurred simultaneously for a number of different services, it is generally difficult to allocate costs or determine an appropriate benchmark (cf. ACCC, 2021).

While the large ecosystems by Apple and Google have been able to generate arguably supra-competitive levels of revenue, there have been significant investments in the overall infrastructure.

This includes not only the development of the operating system and its functionalities, but also the server capacities and data centres for distribution and hosting of apps and updates, as well as the development and documentation of APIs, the offering of the developer kit, and ongoing quality and security controls (cf. Voelcker & Baker, 2020). This is particularly true for fixed costs such as the (further) development of the operating system or the establishment of a data centre, through which other partly unrelated services are also offered, e.g. iCloud services in the case of Apple.[16]

The cost components for the operating system as a whole can be categorized into several areas:

- One significant aspect is **Research and Development (R&D) costs**. Creating an operating system involves extensive R&D efforts, with teams of software engineers, developers, designers, and testers working on various aspects such as core functionalities, user interface design, security features, and compatibility with hardware devices.

- **Maintenance costs** include updates and bug fixes, and ongoing improvements are necessary to keep the operating system secure and aligned with evolving technology standards.

- **Infrastructure costs** represent another essential consideration. Operating systems rely on robust infrastructure to support their functionalities. This entails investments in servers, data centres, cloud computing resources, and network infrastructure, enabling the processing, storage, and transmission of data. A reliable and scalable infrastructure is crucial to ensure smooth operations, data synchronization, and integration across devices and services.

- **Testing and quality assurance** are critical to ensure a stable, high-performing, and secure operating system. Investments are made in testing infrastructure, compatibility testing devices, and quality assurance professionals. Thorough testing, debugging, and performance optimization help identify and rectify bugs, vulnerabilities, or compatibility issues that may arise.

- **Intellectual property (IP) protection** is an important consideration as well. Developing an operating system involves creating and safeguarding IP rights. Companies invest in obtaining patents, copyrights, and trademarks to protect their innovations, user interface designs, algorithms, and other proprietary elements of the operating system. IP protection ensures exclusivity and prevents unauthorized copying or infringement by competitors.

- **Compliance and regulatory costs** are another important aspect to consider. Gatekeepers must adhere to various regulations, standards, and industry requirements throughout the development and deployment of their operating systems. This includes complying with privacy regulations, ensuring accessibility features, addressing security vulnerabilities, and meeting compatibility standards. Dedicated teams, audits, certifications, and ongoing monitoring are necessary to ensure compliance with evolving legal and regulatory frameworks.

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[16] https://baxtel.com/data-centers/apple.

3.4.3 Available information on cost components related to gatekeeper's app stores and OS

In the debate between gatekeepers, regulators and app developers, certain information is being shared which can shed a light on the level of current commissions. The table in this paragraph summarises these facts. For example, Apple contends that its current App Store commission rates reflect **"the tools, technology, distribution, and other services** which allow developers to leverage **iOS,** in addition to the **cost associated with running the App Store**". (CMA, 2022, p. 304 ff.)[17]

In some instances, specific figures underlying these arguments are available. According to a recent study (Caminade & Borck, 2023) on behalf of Apple, Apple provides to developers a) a platform with an average of more than 650 million weekly visitors, b) developer tools in the form of 250,000 public APIs, more than 40 Software Development Kits (SDK) and additional education programs such as developer academies and camps and certified trainings. Furthermore, according to the study, the number of average weekly automatic app updates amounts to more than 40 billion, representing c) the distribution services that are offered through an app store ecosystem. Also the app review and safety aspect is an offered feature; 1.7 million app submissions have been rejected by Apple in 2022 and they claim to have prevented fraudulent transactions at a value of more than 5 billion $ since 2020.

Table 3-1: Overview of app store components and available cost information

Stage	Relevant components & possible indicators	Examples Apple vs. Google
Platform/Storefront	# of users & visitors Marketing expenses Consumer spending	650 million weekly App Store visitors, 2.5 billion active Playstore users Consumer spending Q3-2022: 21.2 billion USD Apple, 10.4 billion USD Google
Distribution services	# of available apps # of downloads	1.96 vs. 2.59 million available apps 8.1 billion vs. 26.9 billion downloads Q1-2023
Payment services	Additional payment methods & providers	Apple: carrier billing Google: alternative billing systems by region
Review & Safety (incl. privacy, security, quality standards, IP rights)	# of submitted & rejected apps Delisted/removed apps & accounts Fraud prevention # of reviewers & moderators Automated review	540k vs. 215k removed Apps 428k vs. 173k banned developers Apple: 5 billion $ fraud prevention Value of M&A (e.g. „SourceDNA" for malware detection)
Development tools	# of APIs # of (users of) development & performance tools Courses, seminars & events	Apple: „250.000 APIs", 40 SDKs Google: 700k monthly Flutter-SDK users

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[17] Also see:
https://assets.publishing.service.gov.uk/media/62277271d3bf7f158779fe39/Apple_11.3.22.pdf.

Stage	Relevant components & possible indicators	Examples Apple vs. Google
Customer support	Billing Refunds & claims Assisted users Assistance & feedback channels	Apple: 5.000 employees for refunds

Source: Own illustration. Data collection from Statista (2023), Caminade & Borck (2023) & more.[18]

3.5 Decision on compensation & calculation approaches

This chapter provides an overview of potential compensation and calculation approaches that can guide the assessment of access fees in mandated access scenarios, e.g. based on FRAND. The focus is on the possible cost- and value-based approaches, the use of benchmarks to evaluate what is reasonable, and the utilization of calculation methods. Understanding these different approaches, can pave the way to fair and transparent access fee structures that foster competition, innovation, and consumer welfare.

In particular with respect to access conditions to app stores, fees have been criticized of "bearing no relation to the cost or value of the services the mobile app store operators provide to developers" (U.S. Department of Commerce, 2023, p. 36). However, previous attempts of reaching appropriate access fees based on the FRAND concept known from the field of "standard-essential patents" (SEP) have also faced criticism. Not only for its diffuse nature and lack of a uniform standard, but also because determinations are typically subject to individual ex post judicial review or court intervention. Ambiguities also remain for applying FRAND terms to access to app marketplaces under the DMA (cf. de Streel et al., 2021). Consequently, discussions and negotiations around FRAND may predominantly end up within court systems again. Nonetheless, further research is warranted from a fundamental economic perspective to compare calculation methods and systematically identify and analyse relevant cost components.

3.5.1 Cost-based vs. value-based approaches

General pros and cons of both approaches

Cost- and value-based approaches play a crucial role in the determination and assessment of access fees within various contexts. While cost-based approaches primarily focus on the direct costs incurred by the access provider, value-based approaches consider the value derived from the access and its impact on stakeholders. Direct costs are generally lower than the perceived value of access and consequently cost-based approaches are mostly proposed by access seekers and value-based approached by access providers.

In many sectors, cost-based approaches are commonly used to determine access fees. These approaches consider the actual costs incurred by the access provider, such as investments in infrastructure, maintenance, and operational expenses. Cost-based approaches are often favoured for their more objective nature, as they provide a more clear and quantifiable basis for fee

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18 Full list in Bibliography.

calculation. Additionally, they are perceived as ensuring that access fees reflect the costs associated with providing access. This approach is frequently utilized in regulated industries, such as telecommunications, where access to certain network infrastructure is subject to cost-based pricing.

On the other hand, value-based approaches focus on the value derived from access and the benefits it provides to stakeholders. These approaches consider factors such as market demand, competitive dynamics, and the economic value generated through access. Value-based approaches further take into account the potential for innovation, increased consumer welfare, and the status quo of competition within digital ecosystems. By assessing the value created by access, these approaches aim to capture the economic impact and overall significance of the services provided. Value-based approaches are often associated with more dynamic and market-oriented industries, where the value of access can vary significantly.

Both cost- and value-based approaches offer distinct advantages and drawbacks:

- Cost-based approaches provide a more straightforward and objective method for fee calculation based on actual incurred costs. They ensure that access providers are adequately compensated for their investments and operational expenses. However, cost-based approaches do not consider the risk taken and/or the value created by access and fail to capture the broader economic benefits or the potential for innovation within digital ecosystems.

- Value-based approaches, on the other hand, capture the economic value it generates. By considering market dynamics and consumer welfare, they can incentivize competition and drive innovation through allowing for mark-ups and profits beyond cost-recoupment. However, value-based approaches may introduce subjectivity and require a more complex assessment of the value derived from access.

- The legitimacy of one approach over the other depends on the specific context and objectives of access regulation. In certain cases, cost-based approaches may be more appropriate, promoting access and preventing excessive pricing while ensuring that access providers are still compensated for their investments and operational costs. Conversely, value-based approaches may be favoured in dynamic and innovative digital ecosystems, where the value created by access extends beyond direct costs. Value-based approaches can in these instances reward risky innovation and thus the broader economic value and the consequent overall welfare of consumers.

Practical application of approaches

In disputes about the app store commissions, Apple itself argued in negotiations in the Epic case that the 30% is not a processing fee, but reflects the value of the App Store to the developer. This includes access to the large user and developer network, Apple's technology and development tools, marketing efforts, and customer service (Subcommittee on Antitrust, 2020). Further, the marketplace also offers privacy, security, and a seamless transaction.

While some opponents like Match Inc. agree that app store operators should be compensated for the value they bring to app developers, they argue for a finer distinction about what services are actually provided and what really constitutes a value to the individual developer, as opposed to

aggregated und bundled prices (or price tiers) that have so far been used in app store pricing[19] (also cf. section 2.4.10). Epic, another counterparty in court, further argued that Apple's sales margins are too high and more than enough to cover any relevant costs. However, Apple responded that Epic's calculations were insufficient and specifically highlighted additional "software costs" that Apple pays for the larger iOS ecosystem to enable the App Store to function in the first place.

Even when applying a strict cost-based approach for access to app stores, many additional considerations need to be made. For example, with respect to the personnel costs for reviewing and testing the large number of apps each week, it can be argued that popular apps generate more costs, which could justify higher access fees in relation to them. Indeed, popular apps with many daily downloads and regular updates tend to cause additional costs for app stores in terms of server utilisation and review effort. However, the more finely disaggregated such cost attribution becomes, the more complex it would also be to determine and allocate this to individual apps.

For value-based approaches, quantification is even more challenging as it often needs to be partly subjective by definition, since many components are rather intangible, such as discoverability, trust or the overall user experience. In the following, it is discussed what components might be identified and what the practical issues could be.

- **Trust.** An essential intangible value component of app stores is trust. App stores arguably provide a "safe place to find great apps and games," offering users confidence in the reliability and security of the apps they download. Trust encompasses several elements, including payment processing and safety protections against payment fraud and subscription abuse. These features contribute to the overall user experience and enhance user confidence in the platform. The centralized review and distribution model can also help to build trust by promising less malicious apps and lower rates of malware infections. Still, even Apple's current system has been shown to be far from perfect in this regard (cf. Lin et al., 2021).

- **Distribution & discoverability.** App stores provide developers with a global distribution platform that grants access to a vast user base. This broad reach and exposure increase the potential visibility and success of apps, further contributing to their value within the ecosystem. Discoverability can play a major role in terms of value generated to (at least part of) developers, especially for small and medium-sized developers, although it is difficult to measure (cf. ACM, 2019; Geradin & Katsifis, 2021). Many developers rely on the app marketplaces as an advertising space towards users to even become aware of lesser-known apps via search, rankings, or proposed showcases. For example, some developers state that the further development of a web app is not worthwhile compared to a native app, since their apps are largely only found via the main app stores. Also (a sufficiently large amount of) consumer ratings and reviews can play an important role for this process, which is not fulfilled under alternatives such as sideloading and web apps (ACCC, 2022).

  Alternative app store operators would at least face a standard chicken-and-egg type problem in terms of initially generating enough users to make a system of ratings and/or reviews relevant. However, an app developer with a strong brand established outside the

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App Store (Facebook, Spotify, Epic Games, etc.) could likely move to other formats with a lower impact on discoverability. This is not true for the vast majority of app developers because they do not have a strong brand that is recognised by consumers.

In addition, app developers with an already existing strong brand (for example Fortnight from Epic) can also add value to the visibility of the app store they are sold within, which would justify an outpayment to them instead, hence a negative commission.

Furthermore, there are other aspects where the value of access to an app store for third-party developers can be negative, particularly due to the fact that they are not the direct intermediaries with end customers and due to limitations imposed by app store policies. For example, app developers utilizing in-app purchases (IAPs) may encounter challenges in obtaining necessary data for troubleshooting user payments due to the lack of a robust reporting infrastructure. Furthermore, app developers are often restricted in offering their own customer support services, resulting in a potentially worse overall customer experience. The payment, subscription, or refund process may also be hindered, as developers must rely on app store platforms, opening tickets and waiting for resolution. These limitations not only limit third party app providers, but can also create switching costs for end users and may lock them into a specific platform, thereby potentially impeding competition.

Overview

Overall from a theoretical point of view, cost-based approaches can be used to set a 'lower end' for an access fee, whereby excessive pricing is avoided. Meanwhile, the value-based approach may be more appropriate for the dynamic environment of app stores as it rewards innovation and its broader economic value. This will result in a 'higher end' fee and hence together with the cost-based fee indicate a reasonable range. From a practical point of view, cost-based pricing is more straight forward. Especially the intangible value components like trust and discoverability of app stores can be challenging as will be further be discussed in following sections.

3.5.2   What is "fair, reasonable and non-discriminatory"?

The reactive approach of Art. 6(12) DMA and Art. 6 DMA in general (cf. section 2.3.2), for whose regulations further specifications and dialogue are foreseen, initially leaves the gatekeeper free to set its own FRAND conditions with the regulator in a review position[20]. The DMA also provides for a procedure for justifying these conditions in dialogue with the Commission, taking into account the specificities of the market. In the context of SEP licensing (the original application of FRAND), it is generally accepted that there may be more than one choice of possible FRAND conditions in each specific context, reflecting remaining ambiguities and also a complex interplay of price and non-price components (Picht, 2017; Habich, 2022).

The non-discriminatory part of FRAND seems the most straight forward as this can be described as being the same terms and conditions for everyone. However, fair and reasonable is more difficult to define. Overall, the question arises as to how far the FRAND system from the area of intellectual property rights (cf. section 2.4.4) can be transferred to digital ecosystems. This is similarly

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20 "The Commission shall assess whether the published general conditions of access comply with this paragraph."

argued with respect to FRAND access for data of search engines, which is provided for in the DMA in Art. 6(11) and in the Data Act (cf. Habich, 2022).

Ambiguities regarding FRAND

Recital (62) of the DMA more broadly defines the unfairness aspect as "general conditions, including pricing conditions" for app store access "would be unfair or lead to unjustified differentiation". This would be the case where prices or other conditions lead to an "imbalance of rights and obligations imposed on business users or confer an advantage on the gatekeeper which is disproportionate to the service provided by the gatekeeper to business users or lead to a disadvantage for business users in providing the same or similar services as the gatekeeper".

However, this again leaves much room for interpretation, while the FRAND concept in the patent space has already been described as notoriously contentious and often diffuse. As Podszun (2021) summarises from a law perspective, "FRAND solutions have […] repeatedly led to considerable difficulties in intellectual property law practice" and that it ultimately remains "unclear today how the "fair price" should be determined."

In particular, a proclamation of FRAND conditions does not in itself provide a uniform or otherwise specified standard and is usually rather subject to ex post judicial review or, in rare cases, is determined by the court itself. Martens (2023) also warns of a lack of "meaningful economic definitions of FRAND pricing" beyond some basic common understanding of a price falling somewhere *between* marginal costs and a full profit-maximising monopolistic price. Its application towards access to app marketplaces and data has also been criticised as remaining too ambiguous (e.g. de Streel et al., 2021).

FRAND serves as the start of a negotiation process

In the patent area, a commitment or responsibility to offer FRAND terms for licensing a patent does not mark the conclusion of negotiations but rather serves as their starting point. In complex situations, such as the licensing of standard-essential patents, determining the specific contractual terms that strike an appropriate balance of interests while complying with antitrust laws' non-discrimination requirements is also often not immediately evident. Moreover, satisfying FRAND conditions typically encompasses a range of reasonable solutions, rather than a single license agreement.

This view is supported by decisions such as the High Court of England and Wales [J. Birss], Judgment of 23 October 2018 and the OLG Karlsruhe, which acknowledge the existence of multiple possible FRAND-compliant licensing arrangements. The inherent flexibility and subjectivity within the FRAND framework can present challenges when attempting to establish a systematic guideline for calculating fees in the context of mandated access to digital ecosystems, including app stores. While FRAND principles set the foundation for negotiations, they do not provide a prescriptive methodology for determining access fees. This lack of a standardized calculation approach necessitates the involvement of parties in negotiating and determining fair and reasonable

compensation. The absence of a rigid formula or precise guidance for FRAND calculations can lead to varying interpretations and potential disputes. [21]

Application of FRAND to other markets including app stores

The application of FRAND to another market context either way requires significant efforts to determine compensation and establish a framework. Mapping out how FRAND would operate within this market, especially in terms of compensation, presents challenges. With SEPs, the concept of "comparable licenses" is commonly used to determine fair compensation, but there are limited benchmarks available for app store access and data categories, leading to uncertainty in the assessment process. SEPs, app ecosystems and data have different market dynamics, further complicating the application of FRAND principles to digital ecosystems. In SEP disputes, a patent owner usually accuses an implementer of holding out on paying a FRAND royalty, creating a very different market and legislative dynamics. In the context of access to app marketplaces and to data, holdout is less likely to occur given that access can be technically prevented by the respective gatekeeper. The market dynamics of data are also characterized by greater uncertainty on both sides compared to SEPs, where the technology is standardized and publicly disclosed.

To comprehend the FRAND concept further, **it is crucial to understand that it represents a bid that can be asserted and examined ex post, rather than a specific calculation method in itself**. In the realm of patents, various calculation methods have historically been employed, considering court decisions and accepted valuation theories.

- One commonly adopted approach is the "top-down" method, which involves assessing the overall value of the patented technology within a particular industry or market. Top-down starts with the analysis of the entire market and industry relevant to the standard in question. It considers the total market value associated with the standard, often taking a broad perspective. It typically calculates a percentage or portion of this market value as the FRAND royalty rate. This percentage is often seen as the contribution of the patented technology to the overall market. The top-down approach provides a holistic view of the industry's value and tries to distribute the value of the technology across all products that use it.

- On the other hand, the "bottom-up" method focuses on analysing the incremental value that the patented technology contributes to a specific product or service. It focuses on the specific patented technology in question and its direct relevance to the standard. It analyzes the value of the technology within the specific product or component that uses it. This method is more granular and technology-specific. The bottom-up approach calculates the royalty rate by considering the value added by the patented technology to the specific product where it is incorporated.

- The top-down approach is often used when it's challenging to isolate the value of the specific patented technology, especially in cases where the technology contributes to many different products within a standard. The bottom-up approach is applied when the

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21 https://betriebs-berater.ruw.de/wirtschaftsrecht/urteile/Patentverletzungsklage---FRAND-Einwand-II-42277.

patented technology's contribution can be directly assessed within a specific product or component.

Further economic concepts have been incorporated into FRAND calculations, including hypothetical negotiations, comparable transactions, next best alternatives, and aggregate royalty loads. These methods help provide a framework for determining fair and reasonable compensation in line with industry standards and legal precedents. While these existing FRAND calculation methods have been refined within the patent domain, their applicability to mandated access to digital ecosystems, such as app stores, requires careful consideration. The unique characteristics of app stores, including their complex ecosystem dynamics, diverse revenue streams, and intangible value components, necessitate tailored adaptations and potentially new calculation methods, if any.

Following arguments have been brought forward by scholars regarding the application of FRAND principles to data access, which also hold relevance in the context of app stores and other stages within digital ecosystems:

- Globocnik & Scheuerer (2020) summarise several key considerations. Firstly, they note that estimating measures such as the value of data and the necessary infrastructure investment is already a complex task. The challenges associated with valuing data and determining appropriate compensation extend to app stores, where factors such as discoverability, user experience, and trust are intangible but contribute significantly to the ecosystem's value.

- Furthermore, the question of maintaining innovation incentives through appropriate remuneration possibilities always arises. **The application of FRAND principles to app stores and other digital ecosystem stages necessitates a case-by-case evaluation that considers the specific dynamics of each segment and sector**. A specific approach is crucial to strike the right balance between incentivizing innovation and ensuring fair compensation for access.

- As instances of data trading, access negotiations and the number of (data) licensing agreements are likely to increase not least because of the new regulation measures, a better standard of comparison for evaluating fair access can be developed over time. The growing prevalence of data and access transactions provides an evolving benchmark that can inform the assessment of FRAND terms in the future.

- Schweitzer (2021) also notes more generally that the fairness objective and the FRAND idea should not get lost on the distributional question of overall profits between firms at different levels of the value chain, but should focus on competition and on positive end results, e.g. consumer prices, for final users. Larouche & de Streel (2022) also highlight that the profit distribution resulting from individual negotiations reflect the relative power of these firms, which is however difficult to assess based on objective criteria.

- Another similar question lies in whether access-givers should be compensated only for adaptation costs of the newly created access infrastructure or if they should be compensated for parts of the total and/or even sunk development costs.

<u>Final offer arbitration to determine 'fair and reasonable'</u>

In situations where determining a "fair price" or reasonable compensation becomes challenging, the mechanism of final offer arbitration has been proposed by both scholars and regulation bodies (Podszun, 2021; CMA, 2022[22]). This approach allows the parties involved to propose their own offers, and an independent judge selects one offer without the ability to modify it. By imposing this constraint, both parties are compelled to consider a reasonableness limit and make offers that reflect their understanding of fair compensation.

The use of final offer arbitration as a method to determine fairness and reasonableness has the advantage of being relatively efficient and providing a resolution in a timely manner. It encourages parties to engage in meaningful negotiations and take into account the perspectives and interests of the other side. Moreover, this approach recognizes the parties' expertise and knowledge of their respective industries, as they are best positioned to assess which remuneration models and levels are appropriate for their specific case (e.g. Podszun, 2021).

However, final offer arbitration also has some limitations that should be considered. By forcing parties to make potentially extreme offers with no middle ground, it can lead to outcomes that are still unbalanced and do not adequately reflect a fair price. The arbitrating judge is constrained to simply picking one side's offer, even if an intermediate solution may be more reasonable. This binary choice could encourage gaming behavior, where parties make unrealistic demands hoping the arbitrator will still select their offer over the other side's. Moreover, the bilateral nature of final offer arbitration and the confidentiality of the process means that the resulting prices are not transparent to third parties or the wider industry. This could lead to incoherent pricing across different pairings of businesses, when each arbitration case is decided in isolation. Stronger bargaining power or willingness-to-pay may still be overrepresented in the final offers instead of a more systematic approach, e.g. a cost-oriented system if feasible and favored (cf. sections 3.5.1 & 3.3.1).

The opacity and potential variability in outcomes could conflict with the goal of non-discrimination in access pricing. However, differing prices may in principle be justified by the specific circumstances and characteristics of each case. Still, it poses challenges for regulators seeking to apply consistent evaluation criteria across multiple disputes. Overall, while final offer arbitration can facilitate timely dispute resolution, it has limitations in transparency, consistency across cases, and accounting for pricing complexities. Regulators would still need to develop assessment frameworks to ensure some coherence in evaluating final offers, even when only deciding between (paris of) two proposals. Thus, this approach could be combined with thorough justification by parties and flexibility for arbitrators to request additional information and changes.

3.5.3 Benchmarks

The DMA's FRAND framework currently only explicitly proposes various benchmarks to be used as a yardstick to determine fairness of access pricing. Such benchmarks can shed light on the level and structure of prices within the digital ecosystem. In recital (62), the DMA suggests the following benchmark examples:

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[22] A new pro-competition regime for digital markets - government response to consultation - GOV.UK (www.gov.uk).

- prices charged or conditions imposed for the <u>same or similar services</u> by other providers of software application stores

- prices charged or conditions imposed by the provider of the software application store for different related or similar services or to <u>different types of end users</u>

- prices charged or conditions imposed by the provider of the software application store for the same service in <u>different geographic regions</u>

- prices charged or conditions imposed by the provider of the software application store for the <u>same service the gatekeeper provides</u> to himself.

One approach involves examining existing alternative app stores, such as Samsung Galaxy Store, Amazon App Store, Aptoide, and FDroid. Analyzing the prices and costs associated with review processes, distribution, and other operational aspects of these alternative stores can provide a basis for comparison. Furthermore, it is essential to explore benchmarks from other sectors, including consoles and PC platforms.

<u>Observations made from existing benchmarks</u>

Various concepts have been suggested by Google and Apple, among others, as potential benchmarks for commission payments. These include the respective other dominant app marketplace, previous alternative marketplaces under Android, the console as well as the PC games market (Cellan-Jones et al., 2022). Apple and Google have pointed out that the Xbox console store also charges a 30% commission fee to developers (although this has recently been reduced to 12% for PC releases). Apple also frequently pointed to the fees charged by console manufacturers such as Sony and Nintendo to claim that its 30% commission is industry standard. However, the console manufacturers sell their hardware to consumers at a loss, which they then recoup ex post through the commissions. In contrast, Apple already sells the device itself at substantial profit margins. In addition, Apple has numerous other ways to monetize the iOS operating system ($99 developer fees, app store commissions, advertising) than would be the case in the console space (Geradin & Katsifis, 2021).

The following table provides an overview of the applied commissions.

Table 3-2:   Commission Rates for Select Video Game Digital Marketplaces

Xbox	30% (15% for non-video game subscriptions)
PlayStation	30%
Nintendo	30%
Steam	30% for sales below $10 million 25% for sales between $10 million and $50 million 20% above $50 million
Epic Games	12%
* Commission rate from third-party sources, not disclosed by the marketplace.	

Source: analysisgroup.com.

While the PC market also shows commission rates of exactly 30% (Steam), it at least has a wider range of marketplaces that charge lower rates, e.g., the Epic Games Store or the Microsoft Store

on Windows at 12% each. In addition, apart from the direct download option on PC devices, the market entry of other players seems to have led to a reduction in rates for some marketplaces here (CMA, 2022). In contrast to Apple, which provides for a reduction of the base rate only for small developers, an opposite discount structure can be found at Steam since 2018, where the rate is generally lowered from 30% to up to 20%, the more revenue a game generates in each case.

The respective discounts given by Apple and other large mobile app stores are shown in the following table. Apart from reductions for small developers/businesses in terms of revenues, a discount on (ongoing) subscriptions is often observed, potentially speaking for the idea that the initial discovery of an app reflects a large part of the value provided by app stores (cf. section 3.5.3).

Table 3-3:   Commission rates of large app stores in the US & EU

Store	Commission rate
Apple App Store (standard)	30%
Apple App Store (subscriptions)[1]	30%
Apple App Store (subscriptions - after subscriber first year)[1]	15%
Apple App Store (Small Business Program)[2]	15%
Apple App Store (Small Business Program - subscriptions)[1]	15%
Apple App Store (News Partner Program - in-app subscriptions)[3]	15%
Apple App Store Netherlands (dating apps)[4]	27%
Google Play (standard)[5]	30%
Google Play (subscriptions)[5]	15%
Google Play (enrolled in the 15% service fee tier group, applied to the first one million U.S. dollars in earnings)[5]	15%
Google Play (enrolled in the 15% service fee tier group, applied to earnings exceeding one million U.S. dollars)[5]	30%
Amazon Appstore (standard)[6]	30%
Amazon Appstore (Small Business Accelerator Program developers with less than one million U.S. dollars in revenues)[7]	10%
Amazon Appstore (Small Business Accelerator Program standard and exceeding one million U.S. dollars in revenues)[7]	20%
Amazon Appstore (subscriptions)[6]	20%
Samsung Galaxy Store (standard, unless otherwise agreed upon)[8]	30%
Microsoft Store (standard)[9]	15%
Microsoft Store (mobile gaming apps after August 1, 2021)[9]	12%
Microsoft Store (for Windows 8 devices)[9]	30%

Source: Statista, 2023.

However, an international comparison (Table 3-4) shows that a rate of 30% is not necessarily always on the high end of commissions. In addition, the Chinese app stores show a stronger distinction between games and other apps.

Table 3-4:   Commission rates of other app stores

Aptoide (open sources app store for Android devices)	▪ 25% for certified publishers (or otherwise agreed upon rate)
LG SmartWorld (app store for LG devices)	▪ 30% (or otherwise agreed upon rate)
MyApp (Tencent's app store for Android devices)	▪ 55% for games ▪ 30% for new Tencent games starting 2019*
Huawei AppGallery (app store for Huawei devices)	▪ 50% for game in-app purchases ▪ 30% for paid downloads and non-game in-app purchases ▪ 20% for education apps ▪ 30% for new Tencent games starting 2019*
OPPO Software Store (app store for OPPO devices)	▪ 52.5% for games
Qihoo 360 (app store for Android devices)	A tiered structure for games, calculated monthly: ▪ 20% below ¥100,000 ▪ 40% from ¥100,000 to ¥1,000,000 ▪ 60% from ¥1,000,000 to ¥5,000,000 ▪ 64% over ¥5,000,000* ▪ 30% for new Tencent games starting 2019
Vivo App Store (app store for Vivo devices)	▪ 52.5% for games
MIUI App Store (app store for Xiaomi devices)	▪ 50% for games ▪ 30% for new Tencent games starting 2019*
MM Store (China Mobile's app store for Android devices)	▪ 52.5% ▪ +23.75% commission for promotion options

Source: analysisgroup.com.

During their experience with running Fortnite, Epic Games revealed insights into the costs of operating a digital store for the PC environment. Payment processing fees for major payment methods ranged from 2.5% to 3.5%, CDN costs accounted for less than 1.5%, and variable operating and customer support costs fell between 1% and 2%. Their analysis concluded that stores charging a 30% commission significantly mark up their costs by 300% to 400%.[23] It is also worth noting that Epic collaborated with Nvidia to include the game on Nvidia's GeForce Now streaming service. As part of this collaboration, it was revealed during a deposition that Nvidia agreed to redirect all revenue earned from Fortnite on their platform to Epic.

In contrast to Apple and Google, platforms like Discord and the updated revenue share agreement of the Microsoft Store require lower commission rates of 10% and 5-15% respectively. In the case of Microsoft, developers can keep 95% of their revenue for apps downloaded through a direct URL, while an additional 10% of revenue is commissioned for apps download via Microsoft Store search or the Store Collection.[24] This difference potentially reflects the value of discoverability (see Section 2.2.1) that is implicitly separated here by Microsoft's offered payment structure. In the main mobile app marketplaces, such a distinction is currently not made.

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23 Seth Barton, "New Epic Games Store takes on Steam with just 12% revenue share – Tim Sweeney answers our questions", MCV, 4 December 2018, available at https://www.mcvuk.com/development-news/newepic-games-store-takes-on-steam-with-just-12-revenue-share-tim-sweeney-answers-our-questions/.

24 https://blogs.windows.com/windowsdeveloper/2019/03/06/updated-microsoft-store-app-developer-agreement-new-revenue-share/.

Similarly, other e-commerce marketplaces in the retail and travel industries, such as eBay and Booking.com, charge commissions between 10-12% and 15% respectively. Benchmarks from alternative app stores, PC platforms, and various e-commerce marketplaces offer valuable points of reference when assessing the fairness and reasonableness of app store commission fees. They provide insights into alternative pricing levels and structures that have proven successful and profitable for the platform operators while still allowing commercial users to receive a significant portion of the revenue generated.

In particular, the eCommerce sector holds particular value as a comparison point because it is one of the few related industries exhibiting a somewhat more competitive market environment. Fee structures from digital marketplaces like Amazon, eBay, Etsy or Walmart show several important insights[25]. These players have been able to uphold relatively high fees and commission rates, even in the presence of relevant competitors. While commission rates alone range from roughly 6-15% here, the overall payment systems are more complex and may involve flat per-item or per-listing fees, optional add-on subscriptions and rates that starkly differ by category. Services like shipping, fulfilment or storage are offered as optional and separable parts of the overall platforms. This shows, that there does not necessarily need to be a one and only "right" commission fee for everyone. For example, separate (and potentially free) tiers for open-source developers may be justified, especially from a value-based perspective.

Table 3-5:   Commission Rates for Selected Digital Content Platforms

Anchor by Spotify	30% on sponsorships (advertising) 9.5% on listener donations (including 5% payment processing fee)
Twitch	50% on net subscription revenue 25% (minimum) on advertising revenue
Roku	20% on pay-to-install or in-channel purchases 30% of advertising inventory
YouTube	45% on advertising revenue*
Amazon Prime Video	50% on purchase and rental revenue
Kindle Direct Publishing	30% for eBooks between $2.99 and $9.99 65% otherwise
Nook	35% for eBooks between $2.99 and $199.99 60% otherwise
Kobo	30% for eBooks $2.99 and above 55% for eBooks below $2.99 55–68% for audiobooks
Audible	60% for exclusive content 75% otherwise
Patreon	7.9%, 10.9%, or 14.9% depending on features
* Commission rate from third-party sources, not disclosed by the marketplace.	

Source: analysisgroup.com.

The value of discoverability of Google Search

An additional benchmark to consider when evaluating the value of discoverability and the status quo bias is the placement and revenue sharing agreements (PAs and RSAs) established by Google. These agreements provide insights into the financial arrangements between Google and

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25   https://www.webgility.com/blog/marketplace-fees-amazon-ebay-etsy-walmart.

Android manufacturers, shedding light on the significance of discoverability and the revenue generated through such arrangements. Google's payments to Android manufacturers under the Placement Agreements (PAs) are indicative of the value placed on search and search/Chrome activation on each handset.

In 2021, a market study in the UK by CMA (2021) found that Google paid approximately £100-200 million to Android manufacturers, with the majority going to Samsung. Interestingly, the payments made under PAs surpassed the licence fees manufacturers incurred when entering the European Mobile Application Distribution Agreement (EMADA). This implies that, effectively, Google did not charge manufacturers for licensing its proprietary apps. Notably, data from Google reveals that payments made under the PAs exceeded licence fee revenues both in the UK and the wider European Economic Area (EEA) in 2020 and 2021. Google's revenue sharing agreements (RSAs) resulted in further substantial payments to manufacturers. In 2021, Google paid manufacturers around £1.5-2 billion in ad and Play Store transactions revenue worldwide.

Additionally, Google's estimated payments to Apple for having Google as their default search engine in the Safari browser in the UK amounted to £1-1.5 billion in 2021. The majority of this significant sum, ranging from £0.5-1 billion, pertained to mobile-related arrangements. In the US, recent estimates even amount to up to $20 billion per year[26]. These financial figures from Google's placement and revenue sharing agreements provide a benchmark for evaluating the value of discoverability and the revenue generated through exploiting the status quo bias.

Value of access to hardware components

Access to hardware components can also provide reference points to some extent. Although there is by definition not always a direct software access, the accessibility of hardware components is often closely linked to software functionalities. One example of hardware component access is Near Field Communication (NFC) and Bluetooth technology. These components are integral to various software functionalities, such as contactless payment systems like Apple Pay. The legal development surrounding Apple Pay provides insight into access and monetization considerations.

In the case of Apple, access to the NFC interface, a hardware component, appears to be granted free of charge unless Apple specifically monetizes it themselves. Apple has been restrictive in allowing access to the NFC interface for payment-related purposes but has released or established cooperations for other areas, such as automotive applications. The approach taken by companies like Apple, where access is granted selectively based on monetization strategies, raises questions about fair competition and the potential impact on innovation and consumer choice. It is worth noting that access to hardware components can vary across different sectors and industries. Therefore, examining access benchmarks beyond the software and digital sector, such as in the automotive industry, can provide additional insights.

Overview

From a dynamic perspective, using FRAND benchmarks to determine access fees in digital ecosystems raises the possibility of introducing feedback effects between competitors. This means

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26   https://www.theregister.com/2023/10/10/google_pays_apple_18_20_claims_bernstein/;
     https://www.cnbc.com/2023/10/27/google-paid-26-billion-in-2021-to-become-a-default-search-engine.html.

that the actions of one competitor, such as Microsoft entering the app store market with a lower commission rate, could indirectly influence the commission rates of other major players like Apple and Google. This may occur on one hand through the desired standard competitive effects, but could also directly influence the assessment of what commission fees are considered fair and reasonable.

However, the introduction of FRAND benchmarks and such resulting feedback effects may further complicate the already complex landscape of digital ecosystems. Determining what constitutes a "fair and reasonable" access fee becomes intertwined with market dynamics and competitive strategies, making it challenging to establish a standardized and objective framework for calculating such fees.

3.6 Other implementation issues & problems

3.6.1 Alternative app stores: nested in gatekeeper's store or sideloaded?

One of the key implementation questions surrounding digital ecosystems and app stores is the concept of nested app stores. Should alternative app stores be allowed within the gatekeeper app stores, or would they need to be sideloaded onto devices? This question carries significant implications, particularly in terms of compensation.

Prior to the DMA, companies like Epic Games already had the goal of having a competing app store, i.e. an Epic Games Store, being available through the iOS App Store itself, with equal access to underlying operating system features for software installation and updates. The aim was to create a seamless experience similar to that of the iOS App Store.[27]

Allowing alternative app stores within gatekeeper app stores means that users would have the option to access and download apps from multiple sources within the primary app store environment. This approach would offer convenience and ease of use for users, as they can find and access a variety of apps from different stores without leaving the familiar app store interface.

From a compensation perspective, this model may require establishing revenue-sharing agreements between the gatekeeper app store and the alternative app stores for any purchases made within the alternative stores. The gatekeeper app store would need to determine the appropriate level of compensation for hosting and facilitating the distribution of apps from these alternative stores.

On the other hand, if alternative app stores were required to be sideloaded onto devices, it means that users would have to manually install these stores outside of the official app store ecosystem. This approach raises different considerations for compensation. Since the gatekeeper app store would not be involved in the distribution of apps from alternative stores, the question of compensation becomes more nuanced. In this scenario, compensation models could vary, ranging from agreements between the alternative app store and developers for revenue sharing, subscription fees, or other compensation arrangements.

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27 Apple vs. Epic emails https://casetext.com/case/epic-games-v-apple-inc-1.

While the concept of alternative app distribution channels may seem appealing in theory, there are practical considerations that may limit their effectiveness. It is important to recognize that only part of the millions of app developers on the App Store would have the resources to create and effectively operate alternative distribution channels. Building brand credibility and marketing budgets to compete with established app stores can be challenging for many developers. Moreover, consumer purchasing habits play a significant role. It may be difficult to change consumer behaviours and convince them to adopt alternative app distribution channels. The success of existing game marketplaces like Steam in the PC market, where sideloading has traditionally been established and multiple alternative marketplaces exist, suggests that factors such as discoverability, centralized management, and unified user interfaces can provide significant value to both game providers and consumers.

3.6.2   Circumvention of current app store rules

The introduction of alternative app distribution channels may also give rise to circumvention and threat scenarios. As gatekeepers like Apple explore alternate ways of collecting commissions (as evident from the implementation of the ACM ruling), such as tracking and invoicing developers directly, challenges may arise in terms of monitoring and enforcing fair compensation. Managing and tracking transactions outside the established app store framework can be resource-intensive for both the gatekeepers and app developers, creating a disincentive on using this model.

Previous examples of side-deals between large players in the industry also highlight the potential for circumvention scenarios within the app store ecosystem. In these cases, specific arrangements or concessions were made between companies to gain certain advantages or privileges, often outside the standard terms and conditions of app store platforms.

- One example is the agreement between Google and Apple, where Google reportedly pays Apple a significant amount to be the default search engine on Apple devices. This arrangement allowed Google to maintain a prominent position and ensure its search engine was the default choice for users, potentially influencing search market dominance.

- Similarly, Apple granted Amazon usage privileges on Apple TV, such as integrating their streaming services, in exchange for listing Apple devices on the Amazon marketplace. This agreement allowed Apple to expand its reach and presence on Amazon's platform while providing Amazon with valuable content access.

- Another notable example involves Apple's reduced 15% commission rate for Amazon Prime subscriptions, despite not fitting within the general exemptions outlined by Apple. This arrangement provided preferential treatment to Amazon and showcased the potential for customized commission rates for specific partners.

- The deal between Sony and Epic Games introduced various concessions and cross-platform usage agreements for Fortnite players. Sony agreed to allow users to purchase virtual currency on one platform and use it on another, promoting interoperability between different gaming platforms. In return, Epic Games paid a higher commission for in-game purchases made via Sony PlayStation, acknowledging the benefit it derived from cross-play functionality.

- Furthermore, there is Sony's request to Microsoft for cross-play and compatibility with Sony's VR system and Microsoft PC environment in exchange for not obstructing Microsoft's acquisition of Activision Blizzard. This example highlights the potential for strategic negotiations and concessions to achieve desired outcomes.

3.6.3 Overview

These examples demonstrate how larger players in the industry can negotiate side-deals to bypass certain app store rules or gain advantages that may not be available to other developers. Such circumvention scenarios raise questions about the fairness and level playing field within the app store ecosystem (i.e. with respect to the non-discriminatory aspect). They underscore the need for transparent and consistent policies that apply to all developers and prevent the formation of preferential arrangements that may impede competition and innovation. To ensure a more equitable app store environment, it is crucial to address these circumvention scenarios and establish clear guidelines that promote fair competition, prevent anti-competitive behavior, and provide equal opportunities for all developers, regardless of their size or bargaining power.

It is in any case crucial to consider potential unintended consequences of mandated alternative app distribution channels and their respective remuneration models. While the intention may be to support developers in general, there is a possibility that these changes primarily benefit the already dominant players who have their own gatekeeping power, such as Microsoft or Epic. Smaller developers may struggle to compete and may not experience the same level of benefit.

4   Conclusions and outlook

This analysis has conducted an in-depth examination of access considerations and remuneration approaches within digital ecosystems, with a focus on app stores. Key findings demonstrate the multifaceted technical and economic factors surrounding app distribution. Alternative access modes like sideloading and third-party stores face inherent challenges around discoverability, security, and seamless integration compared to dominant app stores. At the same time, the standard 30% commission rate often appears disconnected from costs or value provided by app stores. Access to collected user data by platforms seems to warrant compensation for delivery but not collection costs. The FRAND pricing concept proposed under the DMA currently lacks concrete details or standardized calculation methods.

A systematic decision process is proposed encompassing: assessing the appropriateness of compensation; determining relevant access modes and fees; identifying associated cost and value components; selecting suitable valuation approaches; benchmarking and requesting data to inform estimates; determining fee structures aligned with FRAND principles; and evaluating implementation impacts on competition and innovation.

From a theoretical perspective, cost-based approaches provide a pricing floor while value-based models indicate a ceiling. However, quantifying intangible factors like app store discoverability proves challenging in practice. The FRAND framework offers a starting point for negotiations rather than a clear methodology. Suggested pricing benchmarks risk distortive feedback effects across platforms. App store changes could be phased, assessing stakeholder impacts iteratively. Policies must strike a balance between access, competition and continued innovation.

Open Questions and Challenges

Several open questions and challenges remain regarding app store access remedies. The FRAND approach promises no quick resolution, only a procedural starting point given inherent ambiguities. Uncertainty persists around adequate pricing benchmarks, as dominant platforms are often compared against one another. However, eCommerce illustrates tiered fees and unbundled offerings like separate payment services that could provide meaningful comparisons.

The larger DMA policy mix could spur competition and market entry over time, providing new potential benchmarks. However, gatekeepers are already preparing responses to undermine policies. DMA interpretation remains unclear regarding specifics of mandated access components for app stores. For example, do granular elements such as rating or hosting need to be offered separately? Can existing catalogues of applications simply be resold to provide alternative curation? Do access seekers need to build all new infrastructure, even if they use existing gatekeeper components?

The notion of "stores within stores" also raises concerns around denial of access and double marginalization, if reasonable terms cannot be negotiated between nested platform providers. A shift to more cost-based access risks harming currently subsidized developers of free and open-source apps through higher fees or pushing them onto less safe channels. Allowing competing gatekeepers like Microsoft risks entrenching their dominance over smaller developers lacking scale. Collaboration between gatekeepers could also reinforce positions through side-deals and preferential arrangements.

Indirect sideloading impediments should be monitored as well, like increased SDK costs, certification refusals, excessive warnings, and restrictive defaults. Such responses could inhibit adoption of alternative distribution channels despite a mandate for their availability. App review processes constitute another potential barrier, as gatekeepers may retain sole discretion over security and policy enforcement. Altogether, the technical complexity across integrated hardware, software and services gives gatekeepers considerable leeway to resist change.

<u>Current Preparations by Gatekeepers</u>

Gatekeepers are already mobilizing to dilute or circumvent looming DMA regulations. Apple and other large platforms have legally contested imminent DMA measures, including objections to mandated alternative app stores. Microsoft intends to launch a proprietary app store in Europe after the approval of its Activision acquisition, but its overall impact may be limited given Europe's relatively small share of global app revenue.

Apple may try to enable restricted iOS sideloading through developer certificates and revocation rights rather than open installation. Sideloading risks regarding security and convenience are being emphasized in public positioning. Apple's operation of its managed distribution program for institutional customers suggests how it may constrain alternative stores - by limiting exposure, steering usage of its payment system, requiring App Store usage, and thereby closely tracking commissions.

Overall, the DMA's impact remains uncertain given the considerable resistance and resource asymmetry between regulators and tech giants. Consistent monitoring and stringent enforcement will be critical to avoiding bypassing of regulations in practice. This study illuminates multifaceted considerations that policymakers must weigh carefully to craft balanced policies ensuring app access, platform competition and continuous innovation. The concepts explored provide a foundation for reasoned debate as reform pressures intensify globally. There are no perfect solutions, as interventions risk unintended consequences including reduced investment incentives. However, the status quo also clearly suffers from distortions. Navigating these trade-offs calls for an evidence-based approach that continuously evaluates the impacts of phased policies and refinements. The DMA offers an opportunity to enhance fairness and competitiveness if implemented judiciously, but it is only the starting point on the complex road ahead.

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