

Unveiling Gatekeeping Practices in Mobile Environments: A Comparative Analysis of Operating Systems and App Gardens

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Mobile applications are shaping information sharing, cultural expression, and social engagement. Employing a walkthrough methodology, this study examines the handling of user requests to access Web content via hyperlinks within 27 mobile apps operating in the Apple iOS ecosystem. The research reveals notable distinctions: traditional news media apps like CNN and BBC facilitate users' direct access to Web content through their preferred mobile browsers with a single click, whereas many social media platforms confine users to in-app browsers. Tech giants like Alphabet and Microsoft trigger banner advertisements for their browsers when users click on a hyperlink within their e-mail apps. This approach allows them to capitalize on their dominant positions in one market to drive the visibility and adoption of products in adjacent markets. Moreover, emerging social media apps like TikTok adopt a policy of rendering hyperlinks unclickable, indicating a broader trend toward tightened control over information dissemination. These gatekeeping choices have far-reaching implications for user privacy, the equitable distribution of value between content creators and app administrators, and the future of the open Web.

Keywords: mobile operating system, iOS, app stores, mobile apps, competition, privacy, browser choice, gatekeeping

We're moving to a world where everything is digital, and everything's a URL. The fight to be the app that opens, controls and sees those URLs is going to be fierce. (Pierce, 2021, para. 15).

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Mobile apps are central to our information-driven life. Debates about their impact are part of a longer history of debates surrounding media technologies. For decades communication scholars have discussed how social interactions shape personal identity (Goffman, 1973) and how media affect our perception of the world (Katz, 2001). Today, the screen is mobile: In countries like the United States and the United Kingdom (but also Brazil and Mexico), mobile users are spending an average of four to five hours a day on apps (Perez, 2022). Furthermore, the procedure of datafication being advanced by the online platforms is argued to be triggering a shift in our worldview (Mejias & Couldry, 2019; Ortiz Freuler, 2023; Romele, 2020). If this were so, whose values would drive or govern such processes of change?

Mobile ecosystems are tightly controlled by two companies: Alphabet's Android, which controls 71% of the market for operating systems, and Apple's iOS, which controls around 28% of the market (Statista, 2023a). A growing number of scholars, activists, and policymakers are concerned that such market consolidation allows a small group of people to play an outsized role in shaping public life, including the pace and direction of technological development. This camp argues that monopolies undermine individual self-determination and water down our experience of democratic governance (Khan, 2017; Lynn, 2010). To underline this point, Lina Khan quotes Congressman John Sherman and states: "If we would not submit to an emperor, we should not submit to an autocrat of trade, with power to prevent competition and to fix the price of any commodity" (2017, p. 10). However, neither Khan nor Sherman was referring to programmers. Rather, they were observing how the structure of markets shapes consumer behavior. In "Amazon's Antitrust Paradox," Khan (2017) argued that "the potential anticompetitive nature of that power cannot be fully understood without looking at the structure of a business and the structural role it plays in markets" (p. 3). Since 2021, Lina Khan has been serving as the Chair of the Federal Trade Commission, the agency tasked with launching antitrust investigations in the United States. Therefore, Khan's phrase should now be interpreted as a call to map the ways in which dominant players can reshape markets to their benefit. This study contributes to that effort by showing how decisions by the managers of an operating system (iOS) and app-makers can shape the market of browsers and content production.

Governments have acknowledged the impact of design and have used their regulatory powers to ensure that users have an actionable choice between available browsers. This was a core element of the EU's settlement with Microsoft after the courts concluded it had abused its market dominance by establishing Microsoft Explorer as the default browser on the Windows operating system. As part of a settlement, Microsoft rolled out a browser choice screen in 2010. The screen displayed 12 browsers from which Microsoft users could choose. Vasquez Duque (2023) argues that although Microsoft's share of the market decreased after 2010, it is difficult to attribute the dip to this policy, since the use of Explorer was decreasing globally, including outside the EU, where the browser choice screen was not being deployed. Trusting in its effectiveness, however, in recent years, the EU deployed a similar policy to shore up competition to Google's search engine within the Android environment, which is owned by Google's parent company, Alphabet (Lomas, 2020). In China, regulators have started to demand that leading Chinese apps become more open and interoperable, including by enabling users to seamlessly share external links and content across platforms (Deng, 2021). This article contributes to these conversations by providing actionable evidence of the role of design in shaping user behavior in the mobile environment and a method to track it over time.

In the next section, I explain the scope of the study, provide key definitions, and review the disciplines and fields that intersect design and platform studies. Then, I explain the walkthrough method that guided the process of data collection and analysis. Subsequently, I explore and document the app environments: First, I compare how Alphabet's Android and Apple's iOS operating services enable switching default browsers and argue that Alphabet is using language that is likely to reduce the amount of people who manage to switch. Then, I contrast how 27 apps enable Web access and show that the type of app and business model explain how easily people can move out of the apps. I then discuss the general implications of the findings and their limitations. Finally, I conclude by synthesizing the emerging trends and point to fertile areas for further research.

Definitions and Scope

This article analyzes gatekeeping of access to information technologies. Information technologies are often classified as open or closed. In the case of the Internet, we have, on the one hand, the World Wide Web, which is developed on a set of open standards defined by consensus (W3C, n.d.) that originally emerged to facilitate the exchange of knowledge between academics (Berners-Lee, 1997). On the other hand, the app ecosystem that was developed by private companies aims to make mobile phones easy to use by the masses.² The behavior of mobile apps is typically regulated by mobile operating system controllers, like iOS (Apple) and Android (Alphabet), who balance the need to broaden the scope of software products available to their users with hardware capabilities and security concerns. According to Jonathan Zittrain (2008), "the concept [of mobile apps] was effective in paving the way for the further erosion of the open Web or 'generative Internet' toward an 'appliancized network' of proprietary social network sites" (p. 12). In short, the goals and characteristics of these systems are different.

Within the set of mobile apps, we have mobile *browser* apps. Today, around 60% of Web traffic worldwide takes place within mobile environments (Similar Web, 2022; Statista, 2023b). The mobile browser apps responsible for much of this traffic are developed using the proprietary code that characterizes the mobile apps—and in the case of iOS specifically developed using Apple's WebKit browser engine—while also operating as a gateway to the open ecosystem of websites that are built using the open standards of the Web. As such, browser apps, when built on open and global standards, are a suitable candidate to act as neutral mediators between different apps as well as in the long-term relationship between content creators and their followers, a relationship that will typically traverse the birth-death cycles of several platforms.

In "Multi-Situated App Studies: Methods and Propositions," Dieter et al. (2019) outline four entry points through which researchers can "actively invoke different app situations" to advance inquiry into platforms: app stores, app interfaces, app packages, and app connections (p. 2). Although this article focuses on app interfaces, I briefly examine the user interface of the two main Operating Systems (OS), iOS and Android, since this comparative assessment might help the reader better characterize Apple's own approach to gatekeeping before assessing the ways in which it enables gatekeeping by third parties within its app ecosystem. Thus, I observe the gatekeeping practices taking place at two distinct layers of the mobile

² In 2008, the World Wide Web Consortium had a program called One Web, which published series of recommendations aimed at keeping both worlds connected in a more coherent way than we have now.

Internet stack. As outlined in Figure 1, the OS Gate represents the power exercised by the OS, which typically includes controlling which apps are available to users through the app stores and dictating the general rules and behaviors apps should follow to remain available on devices. I also analyze the App Gate, which represents the power being exercised by app designers as they define the paths made available for users to navigate from one app to another.

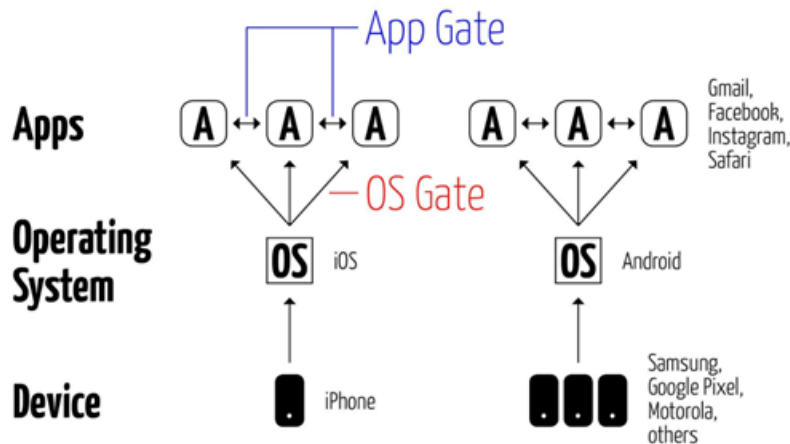


Figure 1. Sketch of the layers and gates analyzed in this article.

Conceptual Framework

A key characteristic of modern computing is the use of open and modular designs. This approach allows for different components of a system to be designed and deployed independently by different actors (Jacobides, Cennamo, & Gawer 2018), spurring decentralized innovation. These different modules have points of contact for information flow. These points of contact have been referred to as interfaces and are governed by protocols that will determine how adjacent modules can interact with each other (Baldwin & Clark, 2000). These spaces are often called control points (Clark, 2012). In more recent years, the term gatekeeping has become popular to analyze the way in which such control is exercised (Hutchinson & Treščáková, 2022; Woersdoerfer, 2023), even though the term was originally coined to describe the role played by the press in defining what news would reach the readership (Shoemaker & Vos, 2009, p. 7). Throughout this article, I will use the term gatekeeping in its broader conceptualization to discuss the power being exercised by apps and OS over control points.

The way in which platforms shape our decisions intersects several disciplines. In “Platformisation,” Poell, Nieborg, and Dijck (2019) describe platform studies as operating at the confluence of three disparate bodies of scholarly literature: business studies, critical political economy, and software studies. They provide a rich review of scholarly work that I complement by dissecting the issue in terms of the key actors involved (users, regulators, content creators, and app developers) and the ways in which the interests of these stakeholders are shaped and advanced.

Users and Consumers

Legal scholars are interested in how decisions made by software engineers not only influence but often prescribe the actions that can take place within a digital environment. Within this tradition, and as a direct critique of the libertarian narrative that was dominant throughout the early years of the Internet (Flew, 2021), Lawrence Lessig (1998) famously argued that code *is* law. Lessig underlined that the online environment was indeed subject to rules, and that code enforces these rules in ways that typically preclude the possibility of them being broken. Thus, the Internet was not the free space libertarians claimed it to be, but rather a collection of spaces under the tight control of a small (typically unelected and unaccountable) group of programmers.

At the intersection of psychology and economics, behavioral economists have placed attention on issues such as the *architecture of choice* (Thaler & Sunstein, 2009). Behavioral economists argue that individual decisions can be influenced by shaping how options are displayed. In this sense, they also critique libertarianism, but by targeting the core assumptions underlying human rationality. On the practical front, a community of practitioners is documenting how design techniques are used to nudge, or often deceive, people into buying a product or not unsubscribing from a service. The community documents and classifies these designs under different labels. For example, "Hard to cancel: The user finds it easy to sign up or subscribe, but when they want to cancel they find it very hard" (Dark Patterns, n.d., para. 8).

Regulators

Design and code are often deployed by corporations to influence or limit people's choices in ways that undermine competition. *Shark Patterns*, conceptually related to the *Dark* or *Deceptive Patterns*, places the focus on these cases. The term *shark* seeks to underline the predatory nature of these behaviors, while the term *patterns* underlines that, although anticompetitive intent is not disclosed, the repetition of a technique across multiple arenas suggests it is more than a coincidence. For example, "Enveloping: When service providers close the doors that lead beyond their own environments (e.g., Google pushing websites to deliver their content through Google's Accelerated Mobile Pages (AMP) system)," or "Anchoring: When corporate design choices limit your ability to switch between service providers (e.g., apps you cannot delete)" (Shark Patterns, 2021, paras. 1–3). These conceptualizations are grounded in regulatory action. For example, competition watchdogs in the EU and South Korea have separately fined Alphabet for preinstalling its apps on Android devices (Amadeo, 2022; Choudhury, 2021). In the United States, the Department of Justice is ramping up an investigation into whether Apple's app store and iOS rules are anticompetitive (Miller, 2023), while in November 2022, the UK's Competition and Markets Authority launched its own investigation into Apple and Google's dominance over the mobile browser market (Capoot, 2022).

Content Creators and Developers

As noted by Nieborg and Poell (2018), "for developers, being dependent on the GAFAM [Google, Apple, Facebook, Amazon, Microsoft] platforms is a double-edged sword. Network effects ultimately favor all but a handful of winners, thereby crowding out exceptions and alternatives (p. 16)." In this sense, content

creators, just like users, are subject to challenging dynamics when it comes to the platforms they depend upon for distribution. Meanwhile, the platform developers that exert massive control over both users and content creators are themselves subject to the draconian pressures and limits set up by the elites managing the major OSs and app stores (Apple, Alphabet, and Microsoft).

The breadth and depth of the power exercised at the app and the OS gates underlines the need to map how these actors have amassed such power and how they exercise it. Tech companies shape markets and the prospects of creators and developers through their gatekeeping of control points. For example, when in 2020 Epic Games sought to circumvent Apple's 30% fees on sales that take place within its mobile app environment, Apple removed the app from the iPhone's app store within hours, making Epic Games lose access to millions of customers (Morrison, 2020).

However, not all information systems are born equal. Some technologies, like the Web, are based on standards defined through consensus and delivered through open systems (W3C, n.d.). This means that every company can build on them freely, and intellectual property over such building blocks cannot be leveraged as a moat by any of the incumbents. Open standards also allow everyone to observe, learn, and scrutinize how the technology operates.³ Other technologies, like many of the mobile apps, are developed in closed environments, their inner workings protected from scrutiny by design and intellectual property laws (Pasquale, 2015). As more people engage through the closed app ecosystem initially promoted by Apple's iPhone (2007) and then adopted by Google through Android (2008), the gateways between the closed app environment and the more open Web ecosystem available through the Web apps become a site of tensions (Anderson & Wolf, 2010).

Furthermore, as people spend more time online (Statista, 2019), gatekeeping activities become more impactful. In a recent op-ed for *Protocol*, tech journalist David Pierce (2021) suggests we should acknowledge the growing tensions and their significance:

Think of browsers as the next generation of OSs, the infrastructure and connective tissue underlying all the apps you use. Both iOS and Android turned out to be pretty good businesses, right? Imagine being the same for the entire internet. [T]he metaverse may be the platform war everyone's talking about, but web browsers may be just as consequential. We're moving to a world where everything is digital, and everything's a URL. The fight to be the app that opens, controls and sees those URLs is going to be fierce. (para. 15)

The tension is not merely theoretical. In November 2022, Jack Dorsey, the founder of Twitter, tweeted, "We need a new mobile OS that's Web-only" (Dorsey, 2022), and since December 2022 is funding startups focused on developing such an open mobile operating system (Flynn, 2022).

³ Try, for example, making a right click on any website and selecting "View page source" from the drop-down menu.

Research Questions

To dissect the ways in which designers exercise control over users and information flows, I will address two research questions:

RQ1: Do iOS (Apple) and Android (Alphabet) differ in how they enable and communicate the possibility of modifying the default browser app?

RQ2: Does gatekeeping of Web access vary among different apps?

Methods

To answer the research questions and document how design choices create different navigation paths, I rely on a comparative walkthrough analysis methodology (Dieter et al., 2019; Light, Burgess, & Duguay, ., 2018).

Walkthrough Method

Tracing how design choices shape and prescribe user behavior is a fundamental step toward understanding market consolidation. As eloquently noted by Yelp's CEO, Jeremy Stoppelman (2011), "if competition really was just 'one click away' as Google suggests, why have they invested so heavily to be the default choice on web browsers and mobile phones?"

To reveal the paths made available to users, I rely on the walkthrough method. This method has the characteristic of replicating the average person's interactions with these platforms, which helps make the analysis accessible to the people it seeks to benefit. This is particularly important given the growing information asymmetry between the leading companies in this space and the users of their products (Zittrain, 2019).

Based on the walkthrough method (Dieter et al., 2019; Light et al., 2018), I document the operation of the OS Gate and the App Gate (see Figure 1). I first describe and contrast how actors manage the OS Gate (iOS [Apple] and Android [Alphabet]), and how they explain to users how to navigate the settings on their devices to change the default Web browser app. Then, I analyze interactions with 27 apps. The key interaction involves modifying the default browser on the OS, then clicking on a hyperlink within each of the 27 sampled apps, and recording whether it opens such a link on the preinstalled app, the user's choice of default app, or an in-app browser. Following the approach of Cotter, Medeiros, Pak, and Thorson (2021), I included screenshots within the body of the article to outline notable findings within each of these steps, while the screenshots for all the 27 apps are made available for consultation through the appendix.⁴

⁴ Screenshots of Apps: https://www.dropbox.com/sh/urib8g5vd6rcuht/AABa_f3ucDMV61SaI65-6fIBa?dl=0
Full Table: <https://www.dropbox.com/s/w9omfn8jss831op/Table%20-Submitted%20IIOC-%20Annex%20-%20Abusive%20Gatekeeping%20practices.xlsx?dl=0>

Sample

At the operating system layer (OS Gate), I focus on the Android and iOS mobile operating systems, which dominate the market. Whereas in 2012, each controlled around 25% of the market, today iOS continues to control around 25% of the market, while Android controls almost 70% (Statista, 2023a).

At the app layer, and for reasons of space and convenience, I narrow the analysis to Apple's iOS environment. Future research may involve comparing the observed outcomes within iOS with the corresponding behavioral patterns exhibited by the same applications on the Android platform. The selection of iOS as the starting point for this broader research agenda stems from the author's prolonged engagement with it as an iPhone user, which provides a better understanding of the operational nuances specific to iOS. Within this environment, I focus on three categories of apps where content typically includes hyperlinks: e-mail, news, and social media (see Table 1).

E-mail is an interesting category because it predates the Web by at least 20 years. E-mail is one of the original means through which content circulated over the Internet, and its basic functionalities and uses have remained unchanged. As a result, interfaces do not vary much across competing e-mail apps. Furthermore, e-mail apps are designed to operate as a skin for the e-mail protocols, which are built on open standards that enable users to message each other seamlessly, regardless of their e-mail clients.⁵ This contrasts with the closed messaging systems which are growing in popularity, such as WhatsApp or Telegram.

In the case of news, it consists of a service provided by newspaper companies long before the Internet itself came into existence. As Nieborg and Poell (2018) argue, what makes these apps special is that the newspaper companies have historically been platform independent and yet have come to depend on the tools and advertising revenue of big tech platforms over the past decades (p. 4). There is a consensus that the sector is struggling to adapt to the digital era, prompting calls for the development of new strategies toward protecting the public's right to be informed (Ananny, 2018; Pickard, 2023), which this article could help inform.

The third category is social media. Having evolved in tandem with smartphones, social media platforms enabled the massification of content production by a distributed and nonprofessional universe of creators (Gillespie, 2010; Nieborg & Poell, 2018). Furthermore, social media platforms successfully integrated technologies offered by mobile devices, such as the microphone and camera, into massive content production systems. Since the history of social media is deeply intertwined with that of the mobile app ecosystem, we might expect them to operate differently than the other two categories of apps.

Within each category of analysis, apps were selected according to a criterion of relevance. Since Apple does not publish the number of downloads for each app, I rely on Statista's rankings across the three categories: e-mail (4), news (11), and social media (14). E-mail apps were selected based on the popularity of the e-mail clients; news apps were selected according to the popularity of their websites; and the social media apps were picked in terms of the number of users.

⁵ In recent years, however, market leaders have leveraged control over the spam filters in ways that make it difficult for people to rely on independent or small e-mail clients.

Table 1. List of Apps Included in the Analysis.⁶

Category	Parent	App	Owens a browser
E-mail*	Verizon & Apollo	Yahoo mail	No
E-mail	Microsoft	Outlook	Yes
E-mail	Apple	Apple iPhone mail	Yes
E-mail	Alphabet	Gmail	Yes
News	Verizon & Apollo	yahoo.com	No
News	Alphabet	news.google.com	Yes
News	Naver	naver.com	Yes
News	Soft Bank & Naver	news.yahoo.co.jp	Yes
News	Microsoft	msn.com	Yes
News	Warner-AT&T	cnn.com	No
News	Grupo Folha	uol.com.br	No
News	UK Gov	bbc.co.uk	No
News	Marinho family (Brazil)	globo.com	No
Social Media	Pinterest	Pinterest	No
Social Media	Telegram	Telegram	No
Social Media	Quora	Quora	No
Social Media	Twitter	Twitter	No
Social Media	Facebook	FB Messenger	No
Social Media	Facebook	Instagram	No
Social Media	Snapchat	Snapchat	No
Social Media	Facebook	Facebook	No
Social Media	Advance Publications*	Reddit	No
Social Media	Weibo	Sina Weibo	Yes*
Social Media	Byte Dance	TikTok	No
Social Media	Tencent	Weixin/WeChat	Yes
Social Media	Alphabet	YouTube	Yes
Social Media	Facebook	WhatsApp	No

⁶ Details available through the annex. *Notes: Among the seven most popular e-mail clients were Samsung Mail, Google Android, and Apple Ipad, which were not available on the Apple App Store for mobile and were therefore excluded. Social media: the original list included Tencent's QQ and Kuaisho, for which it was not possible to create an account/authenticate my user. News: Data for BuzzFeed and Huffington Post were collected to nurture the discussions raised by Nieborg and Poell (2018) regarding their specific approaches to news but are excluded from all figures. In the case of Reddit, Advance Publications is the majority holder. In the case of Weibo, it does not own a browser directly, but Alibaba, which owns shares of Weibo, does (UC Browser).

Data Collection

Data on app behavior were collected by the author between March and May 2022 using a factory reset iPhone SE running iOS 15.3.1. The apps were downloaded through Apple’s U.S. App Store. Information about the app versions is available through the Annex.

Results and Analysis

RQ1: Do iOS (Apple) and Android (Alphabet) Differ in How they Enable and Communicate the Possibility of Modifying the Default Browser App?


Synthesis of Results

Yes, Apple and Alphabet present the pathways toward modifying the default browser app differently. Alphabet includes extra steps and describes the goal in a way that is likely to confuse some users.

Analysis

To assess RQ1, I set the focus on the OS Gate, which sits between the operating system and the app developers (see Figure 1). Gatekeeping over this area is exercised by the OS which defines how a browser app should operate to be allowed onto the App Store and how other apps will interact with it, such as by identifying it as the default browser app. Both Apple and Alphabet describe on their websites how to change the default browser. In both cases, this is presented as a numbered step-by-step procedure (see Table 2). In the case of Apple, it is a three-step process described in 52 words. In the case of Android, it is described as a five-step process described using 27 words. Though the difference in number is partially because of Android’s esthetic disaggregation of what are essentially the same steps, Android also has an extra screen users must click through: “Advanced.” The existence of this extra step and the choice of a term like “Advanced” are likely to discourage a proportion of individuals from successfully transitioning from Chrome to an alternative Web browser.

Table 2. Contents of Apple and Google’s Help Pages.⁷

Android	iOS
1. On your Android, open Settings 	1. Go to Settings and scroll down until you find the browser app or the e-mail app.
2. Tap Apps & notifications .	2. Tap the app, then tap Default Browser App or Default Mail App.
3. At the bottom, tap Advanced .	3. Select a Web browser or e-mail app to set it as the default. A checkmark appears to confirm it’s the default.
4. Tap Default apps .	
5. Tap Browser App > Chrome	

⁷ See archived Apple website (Apple, n.d.) and Google Website (Google, n.d.)

A second contrast is in how each company describes the user's presumed goal: Whereas Apple formulates it as "Change the default Web browser," Google frames it as "Make Chrome your default browser." This is not merely one of the many pages Google offers on the topic, but the one the company displays prominently when a person searches for "change default browser" in Google's support section (see Figure 2).

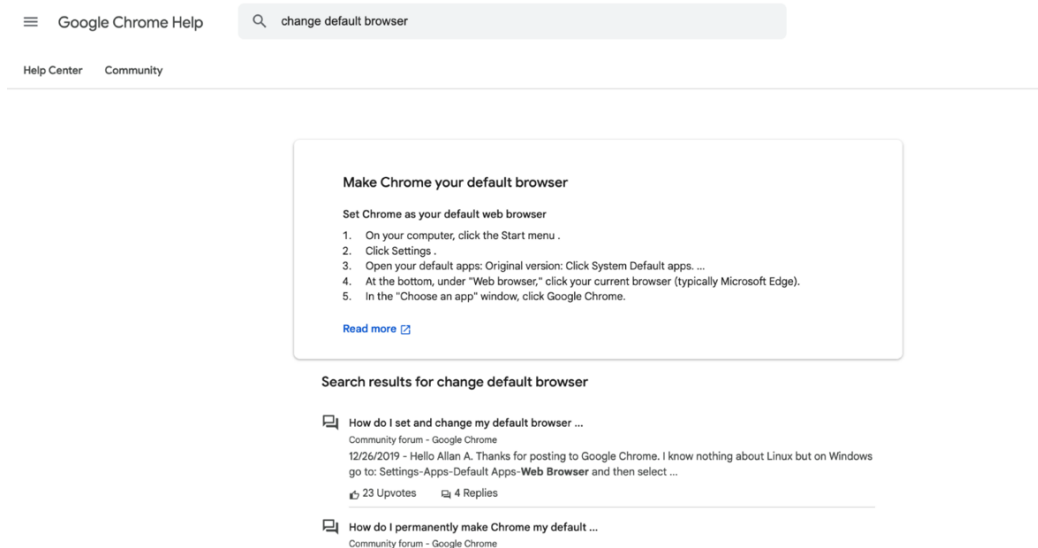


Figure 2. Screenshot of Google Chrome helpline website (Google, n.d.).

Key Implications

By presenting instructions that refer to establishing Chrome as the default, Google could be increasing the cognitive overhead for those users who seek to change the default *away* from Chrome, some of whom might wonder if it is possible to follow the same set of instructions to have an alternative browser replace Chrome. These behaviors nurture the position of Google critics, like Yelp's CEO, who in a 2011 Senate hearing stated that "if competition really were just 'one click away' as Google suggests, why have they invested so heavily to be the default choice on web browsers and mobile phones?" (Stoppelman, 2011, p. 4).

Defaults play a huge role in shaping human decisions; hence, they are heavily researched across multiple disciplines. A study published by *Science* magazine in 2003, for example, observed that the stark differences between rates of organ donation between Sweden and Denmark, two similar countries, could be explained by defaults. It underlines that "defaults impose physical, cognitive, and, in the case of donation, emotional costs on those who must change their status" (Johnson & Goldstein, 2003, p. 1). Underlying this effect is what Kahneman and others referred to as a *status quo bias* (Kahneman, Knetsch, & Thaler, 1991). It is likely that this behavior will come under regulatory scrutiny in jurisdictions like the EU, that in 2010 forced Microsoft to roll out a browser choice screen to its users, and more recently forced Google to use a similar screen to promote competition to its search engine within the Android environment owned by Google's parent company (Lomas, 2020).

RQ2: Does Gatekeeping of Web Access Vary Among Different Apps?

Synthesis of Results

Yes, they differ. The analyzed e-mail apps are not homogenous. In the case of news apps, those developed by traditional news media companies, such as CNN, BBC, and Brazilian Globo and UOL, allow users to access their preferred mobile browser app in one click, while news apps by tech companies like Google News or Yahoo News make it more difficult. Meanwhile most social media apps keep the user within an in-app browser, with the associated privacy implications. Furthermore, several new social media apps, like TikTok, make hyperlinks *unclickable*.

Analysis

To answer RQ2, I stand at the gates between apps and the Web browser app (App Gate: see Figure 1). The operating system managers controlling the OS Gate determine the types of behaviors that apps running within it can engage in. This includes the ways in which gatekeeping over people's decision to access Web content at the App Gate can be exercised. As a result, OSs offer app developers a degree of flexibility in determining and defining how an individual's expressed intent to access a Web resource (such as a click) is manifested as an action within the app's digital ecosystem. This flexibility translates into gatekeeping power.

Mapping the Pathways

The options and paths are synthesized in Figure 3, below, and can be described as follows:

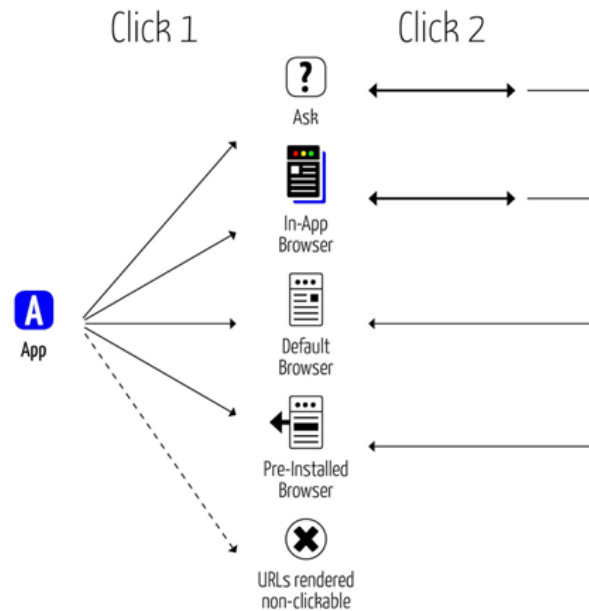


Figure 3. Options developers face when having to act on the user's intent to access a website, as defined by their decision to click on a URL.

- Ask: Users are asked how their click should be interpreted before the app opens Web content. This is typically done through a pop-up menu that displays a set of options, such as the preinstalled browser, the default browser, and a bespoke in-app browser.
- In-app browser: Web content is presented within the contours of the app in which the URL was originally displayed and clicked on. This allows app developers to define what buttons are visible, which can include an option for users to navigate away from the in-app browser and toward the browser app. As shown in Figure 3, this can include interpreting the click as a request to open another type of browser.
- Default browser: Content is displayed in the Web browser application that the user previously designated as the default, either within the mobile OS preferences or, in rare cases, at the application level.
- Preinstalled browser (that is not the default): The app developer disregards the user's expressed preference, which was indicated by the choice of an alternative default browser in the system preferences. Consequently, Web content is launched within the browser application that was preinstalled on the device by the OS manager.

- **Make URLs unclickable:** Developers disregard the established convention of making URLs clickable. This could be considered the equivalent of ignoring the user's intent. For example, apps like Instagram only allow URLs to be clickable when placed in specific areas of the app interface, like the user's own bio, while those placed on posts, comments, or stories are *not* clickable. This phenomenon, also known as "zero-click," is increasingly observed in social media applications (Natividad, 2022).

The five browser archetypes are synthesized in Figure 3. As noted by bidirectional arrows, the first two archetypes ("Ask" and "In-app browser") can lead to a second click, through which the user can restate their intent.

Analyzing Gatekeeping Behavior by Category of Apps

Most of the social media apps (12 of 14) keep users from leaving by presenting Web content through an in-app browser (see Figure 4). Meanwhile, YouTube asks users which browser to open and WhatsApp (owned by Meta, previously known as Facebook) sends users to the default. It is thus noteworthy that Meta properties are not homogenous in their approach, since Instagram, Facebook, and Messenger open hyperlinks within an in-app browser. Keeping users within the app might be an effective way of increasing data collection, which can then be used for ad-targeting, the standard business model for social media apps.

In contrast, news apps are split: The apps managed by traditional newsrooms, like CNN, BBC, and Brazilian newspapers UOL and Globo, open Web content on the default browser app. In contrast, apps managed by tech companies, such as Google News, Yahoo, Yahoo News Japan, and the Korean super app, Naver, keep their users within an in-app browser. Thus, news apps managed by tech companies behave like social media apps. This behavior is consistent with the analysis of Napoli, who argued that the latest news media platforms "have had their CEOs maintain (even if only temporarily) that they are technology companies rather than media companies" (2019, p. 7). Further research could focus on the types of data collected by these news companies during periods of in-app browsing and user awareness of such a situation.

E-mail apps show various behaviors: Apple Mail respects the user's browser choice; Google's Gmail triggers the Ask option; while Microsoft Outlook and Yahoo Mail keep users in an in-app browser.



Figure 4. A visual representation in the form of an alluvial diagram, showcasing how categories of apps behave when a user requests Web content.

Analyzing Gatekeeping Behavior and Conflicts of Interest

Disaggregating the data by app ($N = 27$, see Figure 5), we can see the full breadth of routes enabled by the OS: opening Web content within the app itself (in-app browser; $n = 19$), sending users to the browser they selected as default (Firefox, in my case; $n=6$), and even asking users what they want the app to do (Ask; $n = 2$). Notably, within the iOS environment, no app sent traffic to the preinstalled browser. This suggests that Apple is respecting the users' choice of default browser, even when this is against Apple's interests, given the preinstalled browser is Safari, which is owned by Apple.

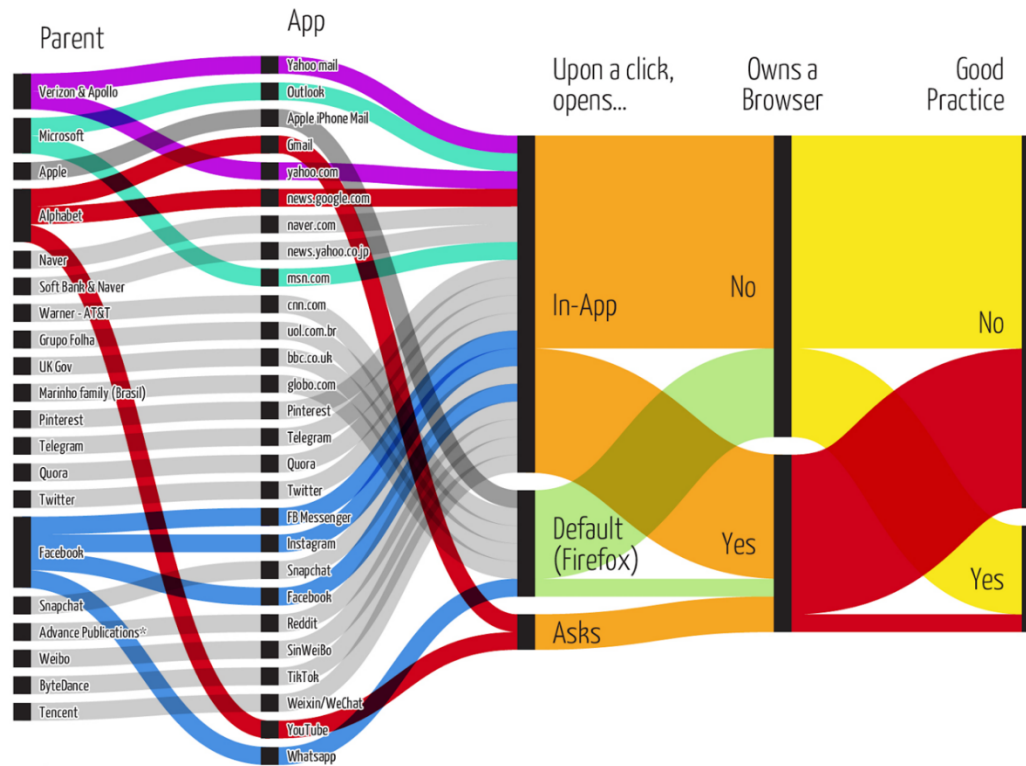


Figure 5. An alluvial diagram representing the associations between the categories of data collected.

Out of the six apps that respect the user’s choice of default, only one has a parent company that also owns a browser app: Apple’s iPhone Mail app, which respects the browser app set up as default instead of favoring the Apple Safari browser. When considering Apple’s stance on this matter, there are several possible interpretations. It might reflect their commitment to meeting the expectations they establish at the OS Gate. Alternatively, it could be attributed to the fact that Apple’s Safari is the default browser for the majority of iOS users, making it advantageous for them to interpret user intent as a request for the default browser. Further research might contrast these results with the behavior of Apple apps within the Android OS environment, where the preinstalled browser (which often remains as the default browser) is typically owned by Alphabet.

A subset of apps asks users where they want the Web content to be opened. In the case of YouTube and Gmail, the question is posed when the user clicks on a URL. In the case of Microsoft Outlook, this question is posed the moment the user tries to leave the in-app browser. All three of these apps have a parent company that owns a browser: Alphabet apps (YouTube and Gmail) have Chrome, while Microsoft owns Edge. The reason these apps behave in this way can be better understood by observing how they implement this choice screen (Figure 6).

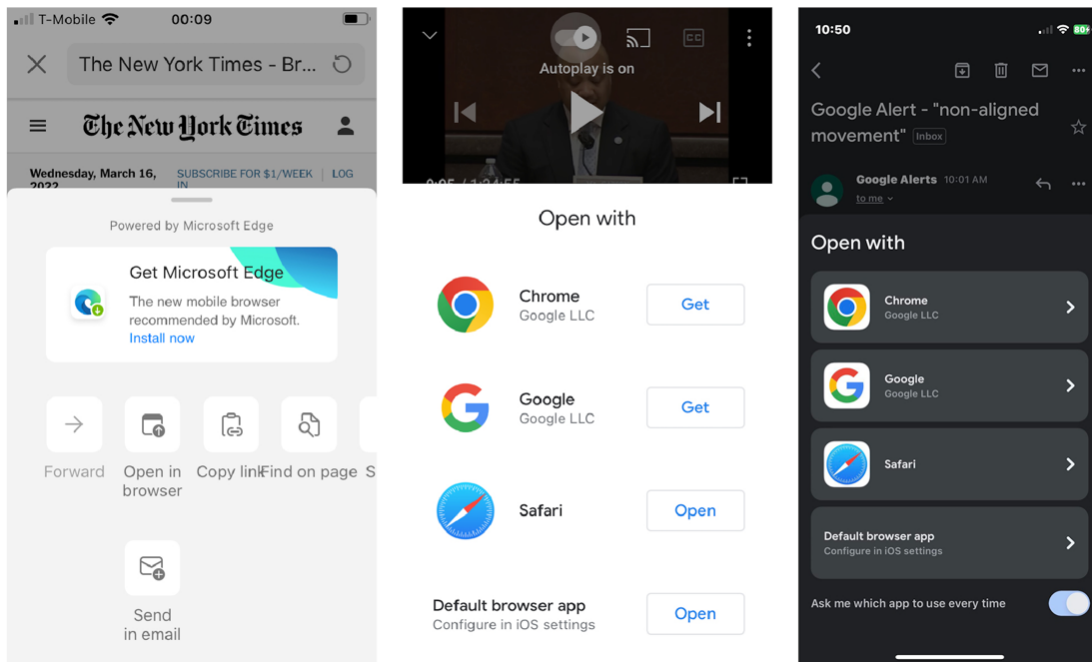


Figure 6. Screenshots of choice screens displayed by Outlook, YouTube, and Gmail.

As the screenshots show (Figure 6), both Microsoft and Alphabet are leveraging the choice screen to promote products in adjacent markets, thus paving the way for horizontal integration. In the case of Alphabet apps, they are promoting the Chrome Browser and Google App (a search-focused app that integrates a browser), neither of which were installed on my device at the time of research. In the case of Outlook, the banner promotes Microsoft's Edge browser.

Analyzing Gatekeeping Behavior by Apps that Rely on In-App Browsers

When we place the lens on the subset of apps that initially open Web content in an in-app browser and examine how many clicks it takes to get to a standalone browser app (default or preinstalled), the results are as follows (Figure 7):

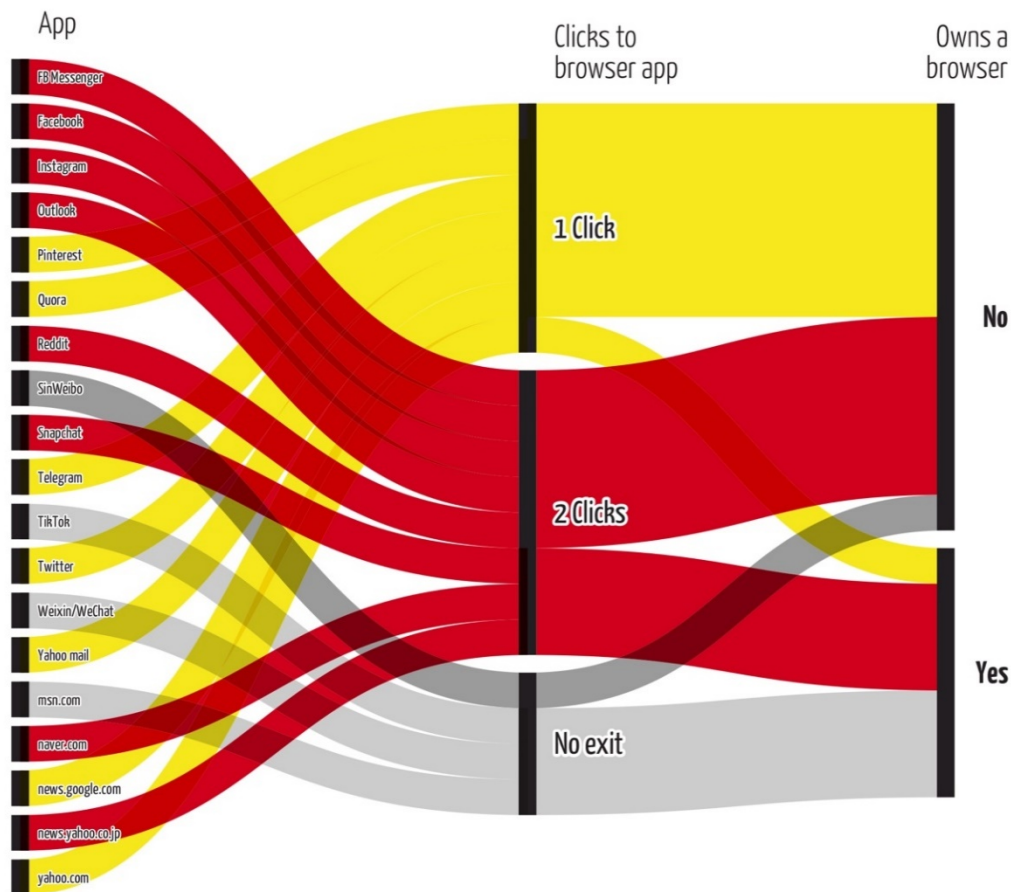


Figure 7. An alluvial diagram representing the associations between the categories of data collected.

It is worth highlighting that Meta’s suite of apps mostly relies on in-app browsers and makes it difficult for users to move onto the default browser app, for which it requires two clicks. Curiously, many of the apps making it most difficult for users to reach the default browser apps were also those that had a sister browser app. Of the seven apps with a sister browser app, three offered no exit from the app, three apps required two clicks to reach the default browser, and one (Google News) required a single click to go from the in-app browser to the default browser app.

Zero-click designs, that is, designs that render URLs not clickable, are the most aggressive form of gatekeeping: the doors leading out of the app’s environment are closed permanently. Of the four zero-click apps identified in the sample, three are of Chinese origin. This might be explained by observing that in China the widespread adoption of smartphones happened after the golden age of the Web. In China, the information ecosystem is characterized by super-apps that incorporate a wide range of features and services that in most other countries are scattered across websites and various apps.

General Implications

The findings highlight the breadth of discretion exercised at the OS Gate and the App Gate. Policymakers and regulators are interested in the many cases in which gatekeeping is exercised in ways that undermine competition.

Regulators could demand that actors managing the OS Gate more effectively limit behaviors at the app layer, an obvious example being the abuse of the “ask” function to promote sister browsers. These banners are being deployed by the largest players and seem designed to gain users in adjacent markets. The ads also suggest we might be observing a new iteration of the browser wars that took place in the 1990s, when competing browser providers would openly criticize the quality of the products of the competition and take part in practices aimed at undermining competitors.⁸ OS managers have in the past exercised their gatekeeping power to shape the behavior of apps, the clearest case being Apple and Google expelling Epic Games from their app stores when it implemented a technique to allow users to circumvent the payment of app store “taxes” for in-game purchases (Morrison, 2020). However, if regulators formally assign such a role to OS managers, they might legitimize the outsized power already being exercised by these companies. In line with this position, it was recently announced that, following regulatory scrutiny, iOS would limit its gatekeeping power at the OS Gate by enabling users to install apps outside of app stores (O’Flaherty, 2023), as they do on personal computers. The complexity and risks of this alternative path, however, might deter users from taking advantage of it.

Regarding in-app browsers, regulators should assess whether they offer the accessibility features of standalone browsers. Failure to do so could negatively impact on people with disabilities and users at large. Similarly, research is needed to determine whether users understand the distinction between a standalone browser and an in-app browser, and whether they have different privacy expectations in each case. This is particularly important since Instagram’s in-app browser (which I show is among the apps making it most difficult for the user to reach the browser app, with two clicks) was recently accused of injecting trackers onto the websites visited by users to monitor their behavior across the Web (Hern, 2022). Such a strategy is probably not unique to Instagram.

Content creators should be alarmed by the trend toward zero-click apps. Especially when performed by market leaders, zero-click designs should be assessed as an anticompetitive strategy referred to as *Enveloping* by the *Shark Patterns* community: “When service providers close the doors that lead beyond their own environments” (*Shark Patterns*, 2021, para. 2). The trend toward zero-clicks includes limitations to the use of active hyperlinks on Instagram (Natividad, 2022) and experiments by Google to take advantage of its control over Android to deploy a “search box” that accesses Web content while circumventing the browser (Claburn, 2021). This trend implies a tightening of the App Gate and greater control of app managers over content creators’ relationships with their followers. Furthermore, the fact that three of the

⁸ For instance, observe the reactions to a Google engineer’s request for Microsoft Edge to refrain from displaying pop-ups mocking Google Chrome as “so 2008!” when Microsoft Edge users visit the website where they can download Chrome (Yasskin, 2021).

four apps displaying this behavior are of Chinese origin shows that despite regulatory pushes for greater interoperability and openness (Deng, 2021), key apps are keeping their gates to the Web closed.

Finally, future research could examine how gatekeeping behavior, along with regulatory responses, influences governments' capacity to weaponize or neutralize control points in the context of geopolitical competitions (Ortiz Freuler, 2022). This would connect debates about these relatively overlooked design choices with discussions concerning how these control points impact on global governance (DeNardis, 2013).

Limitations

The study is limited in terms of breadth and depth. In terms of depth, there are key gates beyond this article's scope, such as those between device makers and OSs (Ortiz Freuler, 2021) that are fertile ground for further research. The article is also limited in the breadth of apps included in the sample. I made a deliberate choice of sampling the most popular apps for analysis given their outsized impact on the market and given that the reader is more likely to be familiar with them. Future work could focus on other apps and categories of apps. A broader and random sample might enable the use of statistical analyses to assess the robustness of the findings included in this study, which rather than providing definitive answers, seeks to present an urgently needed research agenda and display the methods to advance it. Finally, a fundamental challenge for researchers in this domain is the frequent updates to both apps and OSs, which constrain the ability to replicate results. This underscores the need for establishing an observatory capable of tracking trends and changes over time.

Conclusion

The article highlights how companies exercise gatekeeping powers at the OS and app layers of the mobile Internet stack, and how abusive gatekeeping can undermine competition. At the OS Gate, I show that iOS (Apple) and Android (Alphabet) differ in how they enable and communicate the possibility of modifying the default browser. I show that Google presents it as a procedure to "make Chrome your default browser" instead of generically changing the default browser. Such framing might reduce the proportion of people who successfully switch their browser away from Chrome. Further research could test this hypothesis in an experimental setting.

At the App Gate, I show that iOS provides app-makers with a diverse set of options from which to choose to how to manage user requests to access Web content. The results show that apps differ in how they exercise this power. I show that the type of app could be a useful predictor of gatekeeping behavior: Social media apps usually take steps to keep users within their walled gardens. The walls around their gardens are growing taller, with many apps requiring two clicks to access a browser app, and many of the popular apps of Chinese origin are not allowing the use of hyperlinks at all, despite reports that regulatory pressure was leading to greater openness (Deng, 2021). These gatekeeping decisions can shape popular cultural production and user engagement. For example, the extent to which professionalized content producers seek to develop their own personal website as a protected corridor through which they can herd their followers onto new platforms as platforms emerge and fade away. Researchers might want to prepare for a natural experiment scenario,

whereby a change in the way an app deals with hyperlinks can allow them to observe changes in the use of hyperlinks by content producers and their adoption of a personal website.

In contrast, apps developed by traditional news media companies are quick to send users out of their apps and onto the default browser when they click on a hyperlink. This might be explained by the fact that, even when they rely on advertising revenue, third parties provide the underlying targeting infrastructure, meaning these traditional news apps do not make as much use of behavioral data. This contrasts with Google News and Yahoo News, which keep users within in-app browsers. Future research could assess the relationship between app ecosystem maturity (Gawer, 2021) and the reciprocity of traffic flow from third-party platforms, investigating the factors leading to interface closure decisions.

In the case of e-mail apps, the results were split: E-mail apps that have a sister browser app herd user into their sister browser apps or keep users within an in-app browser, except for Apple iPhone Mail. Given the large user base of these e-mail apps, these herding behaviors can shape the market of browser apps and should be subjected to regulatory scrutiny.

Our information environments are critical to our social, political, and economic livelihoods. Understanding gatekeeping behaviors enacted by different actors managing the doors across different information ecosystems is becoming more important as people continue to spend more time in increasingly immersive virtual environments. Being able to have public conversations about how the doors that lead out of such environments are designed and how user intentions are being interpreted by the owners of said environments is becoming increasingly critical. This article seeks to advance a research agenda that can help us to collectively scrutinize technologies to ensure they are in line with the public interest.

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