Caught in the Network: The Impact of WhatsApp's 2021 Privacy Policy Update on Users' Messaging App Ecosystems

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ABSTRACT

In January 2021, WhatsApp announced an update to their privacy policy, sparking an outcry that saw millions of users install other messaging apps such as Telegram and Signal. This presented a rare opportunity to study users' experiences when trying to leave the world's most popular communication app. We conducted surveys in February and May with 1525 WhatsApp users from Mexico, Spain, South Africa, and the United Kingdom. Over a quarter wanted to switch at least part of their communication to other apps, but 74% of them failed to do so. By May, 27% had increased their use of other apps, and only 16% used WhatsApp less. Beyond network effects, users struggled with making informed choices of alternative apps and with differences in their design and functionality. We suggest messaging interoperability as an approach to alleviate switching costs and discuss implications for HCI research and competition regulation of digital services.

CCS CONCEPTS

• **Human-centered computing → Empirical studies in collaborative and social computing**.

KEYWORDS

Ecosystems of Communication Apps, Messaging Apps, WhatsApp, Computer-Mediated Communication (CMC), Interoperability, Privacy, Competition Regulation, Policy

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1 INTRODUCTION

On January 4, 2021, WhatsApp announced an update to its privacy policy. All users were notified that they should accept the new terms by February 8 to continue using WhatsApp. This announcement triggered major privacy concerns among WhatsApp users and lured millions towards other messaging apps such as Telegram and Signal, which registered over 20 million new installations each in just one month [73]. The main changes to the privacy policy related to communicating with WhatsApp Business accounts: while communication was end-to-end encrypted as with any WhatsApp account, WhatsApp Businesses were now provided means to store conversations on any third-party service, including other Facebook servers and Facebook-owned analytic and marketing tools. However, what motivated a global backlash was the new privacy policy exposing that some user data collected by WhatsApp was shared with Facebook[1]. WhatsApp extended the deadline to May 15th, after which users that had not accepted the new terms would be deprived from essential functionality: *"If you haven't accepted by then, WhatsApp will not delete your account. However, you won't have full functionality of WhatsApp until you accept. For a short time, you'll be able to receive calls and notifications, but won't be able to read or send messages from the app"* [87]. Ultimately, after global protests such as the `#SaveWhatsApp` campaign[2] and legal confrontations from Brazil, India and Germany, WhatsApp decided to simply keep reminding users to accept the new terms without limiting any functionality.

We see this set of events as unprecedented evidence of millions of users attempting to break loose from network effects and adopting alternative apps that better match their preferences. This presents a rare opportunity to learn about what users perceive as enablers and barriers to switching communication apps–a central matter in ongoing policy-making efforts to regulate competition in the digital age between social media platforms and communication apps [16]. We approach this question with an ecological lens and study the role of *ecosystems* of communication apps in the adoption or rejection of significant (unwanted) changes to an app such as the case of WhatsApp's new terms and privacy policy. Previous research showed that people use many messaging apps side by side—often referred to as *multi-homing* [20]—and treat them as unique "communication places", each with different emotional connotations, purposes and rules about which contacts belong in or out [58]. Users may also face *expression breakdowns* when the personal forms of expression they acquired through the use of one app are missing in their communication via other apps [39]. Thus, leaving WhatsApp may imply sacrificing an important communication place or access to personal forms of expression (e.g., custom stickers acquired from a friend). This motivates us to study what other factors besides the reachable network in an app may have helped or discouraged users

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[1] When mentioning Facebook, we refer to The Facebook Company (now, Meta) and not the social network site.
[2] https://savewhatsapp.org/

from leaving WhatsApp to inform discussions on how to regulate competition between communication apps.

We ran a two-part longitudinal survey with 1525 WhatsApp users from Spain, Mexico, South Africa, and the UK in February and May 2021 with the goal of characterizing their ecosystems of communication apps and how these changed in response to WhatsApp's new terms and privacy policy. We identify how the size of app ecosystem and number of frequently used apps relate to trying and succeeding to move away from WhatsApp and adopt other apps. We also identify the main factors that made people keep using WhatsApp despite wanting to move to other apps and common barriers to adopting alternatives. We discuss how our results support the negative impact of network effects that current efforts in competition regulation aim to counter, how they motivate increased interoperability between communication apps, and how future HCI research could inform both policy on interoperability and technical solutions that go beyond establishing standard protocols.

2 CONTEXT

2.1 WhatsApp and the messaging app market

WhatsApp Messenger is currently the most used messaging app world-wide: it is available in 60 different languages across 180 countries, and is used by at least two billion users [81] to send approximately 100 billion messages a day [28].

WhatsApp was first released in 2009 and quickly gained popularity, going from one million users at the end of its launch year, to 200 million in April 2013, to 500 million in April 2014 [41]. This quick growth did not go unnoticed: both Google and Facebook tried to acquire WhatsApp in 2013 and 2014 respectively, the latter successfully for an (at the time) unprecedented USD 19 billion [27].

After the acquisition, Facebook explored two monetization strategies for WhatsApp: 1) gathering data about its users for targeted advertisements and 2) branching out to business-to-customer relations [36]. The data harvesting approach proved difficult because WhatsApp messages were end-to-end encrypted and the original founders had cultivated a privacy-focused, "no ads" image. When Facebook made efforts to connect WhatsApp accounts to Facebook profiles, they received a EUR 110 million fine from the European Competition Commission, since they had argued this was very difficult to do during their merger review in 2014 [36]. In January 2018, WhatsApp introduced "WhatsApp Business": a separate app where organizations can create business profiles and access dedicated features such as auto-replies, messaging statistics, and business verification labels [77]. It was later complemented with more business tools, such as "Catalogs" of items or services for sale (2019) [78] and in-app purchases (2020) [79].

In December 2020, the US' Federal Trade Commission (FTC) sued Facebook for illegal monopolization in the market for personal social networking services [70], characterizing the acquisitions of WhatsApp in 2014 (and Instagram in 2012) as "a deeply rooted view within Facebook that, as Mr. Zuckerberg put it in a June 2008 internal email, 'it is better to buy than compete'" and concluded that this has resulted in "the unlawful maintenance of [Facebook's] monopoly by means other than competition on the merits"[70].

2.2 The January 4, 2021 Privacy Policy update

On January 4th, WhatsApp updated its privacy policy (see [89] for the "European Region" version, and [88] for the rest of the world), and notified users about this change through a full-screen in-app pop-up (Figure 1, a). This update replaced the existing policy from July 2020 (and April 2018 for the "European Region"). There were two main aspects that changed compared to the previous version.

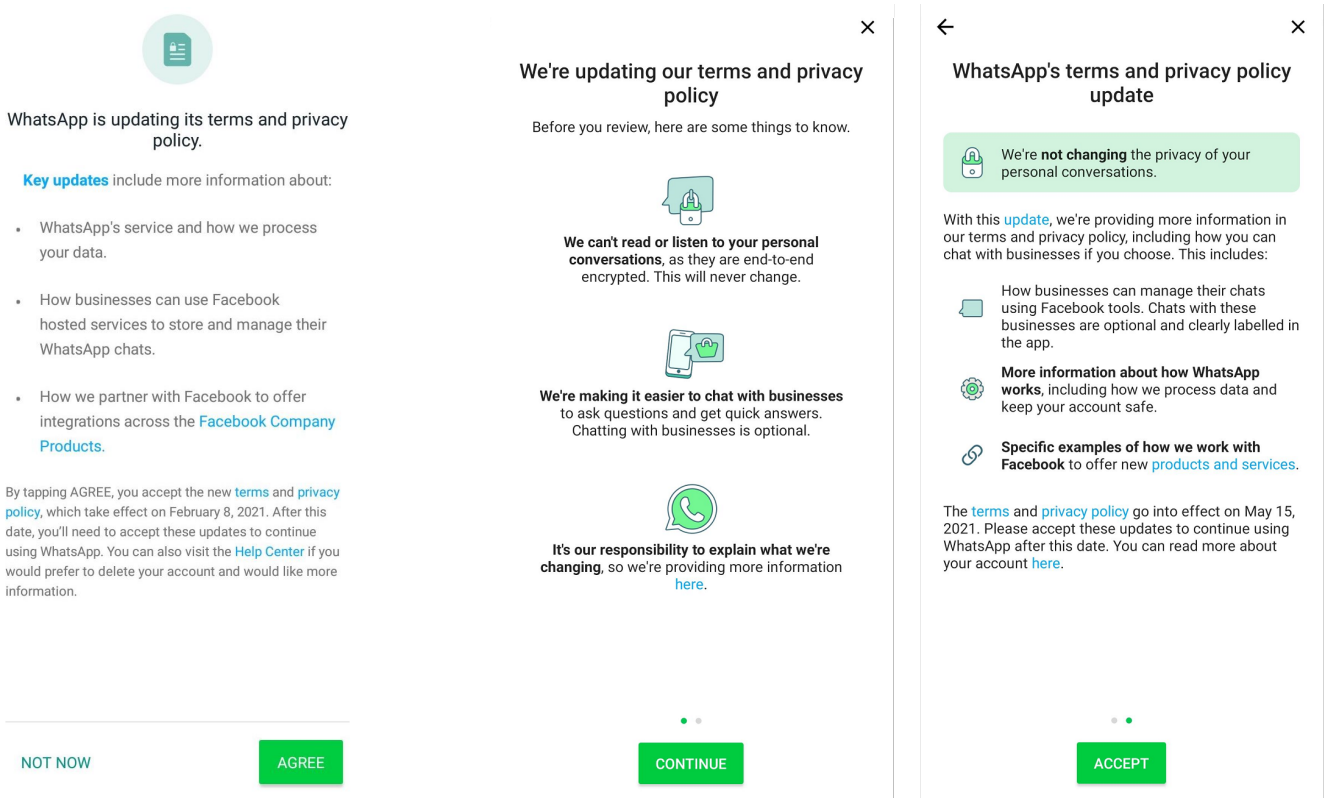
The first change was mostly informational: the new policy described in more detail what data was processed for which purposes. This was likely in response to increased transparency requirements in data protection regulations across the globe and pending lawsuits (e.g., by the Irish Data Protection Commission, which resulted in a record EUR 225 million fine later that year [21]). For example, the previous policy stated that they collected location data only when using location-based services, but the new one adds that they also use IP addresses and phone number area codes to estimate users' location, even when location-based services are not used. The new policy also clarifies what information is shared with other Facebook Companies, which may include the user's phone number, transaction data (e.g., from Facebook Pay), interaction data (e.g., how often they use features or communicate with businesses), device information, and IP address. While the "European Region" version [89] states that the shared data can only be used on WhatsApp's behalf (e.g., for infrastructural services), the non-EU [88] version adds that it can also be used for the benefit of other Facebook Company Products (e.g., showing relevant ads). This difference is likely a result of the conditions placed on the 2014 merger of WhatsApp and Facebook by the European Competition Commission.

The second change pertained to how commercial companies can use the WhatsApp platform, what data they might collect, and who they might share it with. Whereas the previous policy only mentions businesses once—to explain they can contact users—the new version mentions businesses twenty-seven times. It adds that multiple people within the business, but also external services used by the business ("which may include Facebook"), will be able to "send, store, read, manage, or otherwise process [your messages] for the business" (e.g., perform data analytics, train machine learning models, or use it for advertising profiling).

2.3 Reactions to the update

When the policy changes were first released on January 4th, users were told they needed to accept them by February 8th if they wanted to continue to use the app. By January 6th, global media started reporting on the new policy and its unusual ultimatum (e.g., [8]). On January 7th, Signal—a free, open source, and end-to-end encrypted communication app partially funded by former WhatsApp co-founder Acton—gained two million new users (10% of its existing users) in 24 hours [73]. Five days later, Telegram, another communication app that emphasizes privacy as a core value (although it does not have end-to-end encryption by default), reported 25 million new users within 72 hours [73].

On January 12th, WhatsApp started to officially respond to the controversy in diverse ways. First, they updated their website with a page titled "*Answering your questions about WhatsApp's privacy policy*" [82] to emphasize that message content was still encrypted. Three days later, they pushed back the deadline for accepting the



(a) January 4 update notification

(b) February 18 update notification

Figure 1: Two versions of WhatsApp's in-app pop-up notification about its privacy policy update

new privacy policy to May 15th [83]. Between January 17th and 30th, they rolled out their own *status* updates (Figure 2) in different countries to communicate directly to their users and clarify the update (e.g., India [34], South Africa [5], US [75]). On February 18th[3], WhatsApp launched a redesigned version of their in-app pop-up about the update (Figure 1b), this time featuring two pages and emphasising that users' messages cannot be read by the company [74]. On an archived sub-page of their website's FAQ from February 19– titled "*What happens when our terms and privacy policy takes effect*"—they inform users that "[...] you won't have full functionality of WhatsApp until you accept. For a short time, you'll be able to receive calls and notifications, but won't be able to read or send messages from the app." [85].

Various countries' regulators also responded to the update. The South African Information Regulator, on March 4th, notified Facebook that it was not allowed to "process any contact information of its users for a purpose other than the one for which the number was specifically intended at collection" without first receiving authorization [66]. The Indian Competition Commission ordered an anti-trust investigation into Facebook because it considered the change in data protection and loss of control over personal data as a reduction in quality of the service [43]. The most severe reaction came from the Hamburg Commissioner for Data Protection and Freedom of Information, which ordered Facebook to stop processing all personal data from WhatsApp, saying there was no valid legal basis for such activities, and asked the European Data Protection Board (EDPB) to enact an EU-wide ban [71]. Although the EDPB eventually decided against this measure, it did request that the Irish DPA (because WhatsApp is headquartered in Ireland) to launch an investigation into what kind of data processing has occurred and under which legal basis [13].

Despite these controversies, WhatsApp maintained its May 15 deadline for the privacy policies to go into effect, with contradictory messaging about the consequences if users did not accept it. On the 15th, their FAQ stated both that "[n]o one will have their accounts deleted or lose functionality", and that if users did not accept it, they will "[...] encounter limited functionality on WhatsApp until [they] accept the updates. This will not happen to all users at the same time". These limitations included not being able to access ones chat list, and after a few weeks being unable to have incoming or outgoing calls and messages [86]. After the 15th, the in-app notification was still present for users who did not accept it, but no longer included the deadline.

[3]No reports were found of the in-app notification with the new date before February 18, based on the Google query "whatsapp privacy policy may 15 after:2021-01-15 before:2021-02-18". Our personal experience was that the pop-up was not shown between January 15 and February 18, and we have been unable to find any reports to the contrary.

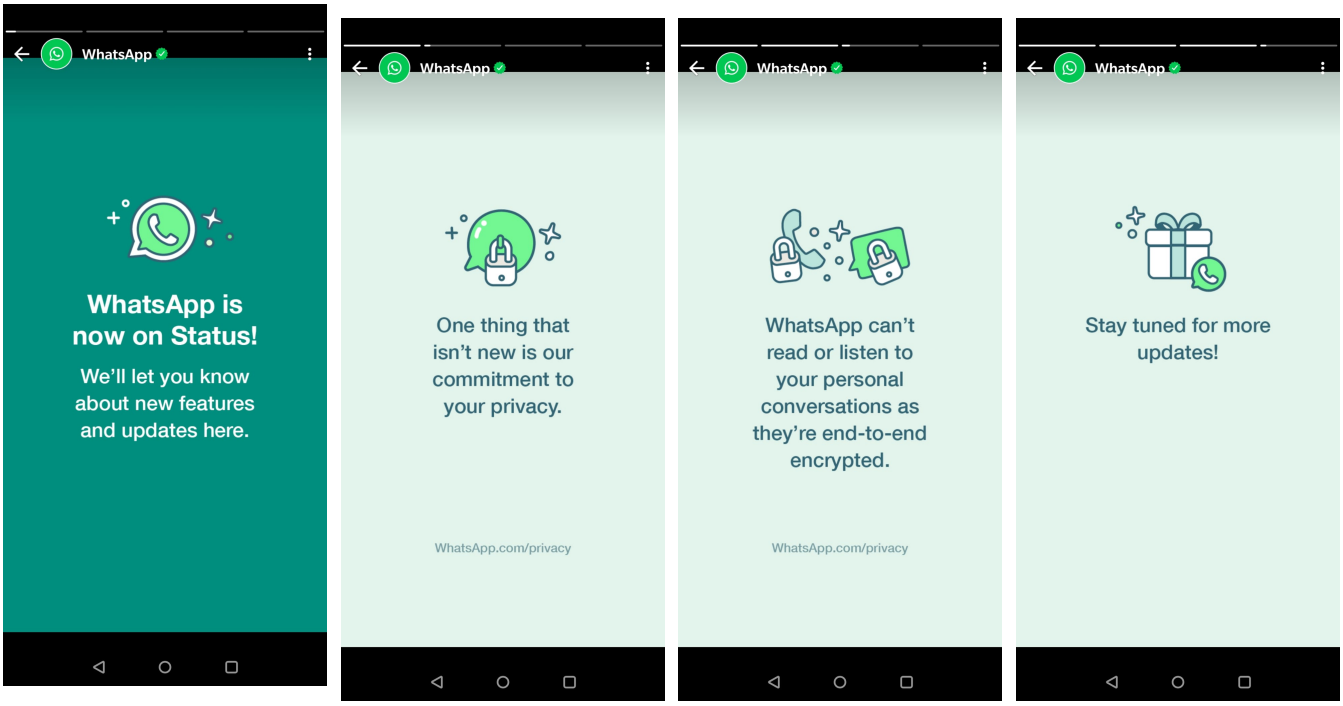


Figure 2: WhatsApp's Status (24-hour ephemeral posts) to inform users about its upcoming privacy policy update [33].

On May 26th, their website finally stated that because "the majority of users who have seen the update have accepted", they will only continue to display the update notification, but that they have no plans "for these reminders to become persistent and to limit the functionality of the app" [84]. Bureau Européen des Unions de Consommateurs (BEUC), the European umbrella organization for consumer interests, released a report in July arguing that even though it no longer plans to limit functionality, many users likely accepted the privacy policy under that threat, and that despite its promise to not make the notification permanent, it continued to show it on an almost daily basis. It argued that this put "undue pressure on users and unfairly impair[ed] their freedom of choice", practices which are prohibited under European consumer protection law [12]. The notification finally stopped appearing in the last two weeks of December, 2022 (for the authors, located in Denmark).

3 RELATED WORK

3.1 Competition in digital markets

There is a "profound international concern" among competition authorities across the globe that there is a lack of competition in digital markets, allowing a handful of large tech firms to exercise undue power over consumers and competitors [9]. Concrete harms include limited choice and control for consumers, a reduction in product innovation and quality, higher prices, and high barriers to entry for competitors.

Generally, this concentration of market power is attributed to specific characteristics in digital markets, most commonly network effects and informational asymmetry [9, 29, 37, 72]. *Network effects* refer to the idea that the benefit a consumer derives from a product or service is correlated with the number of other people who use that service [29]. Because of this effect, it is not enough for a new service to offer a cheaper or better product, but they also have to pass some threshold of active users before they are able to compete with other services that already have established networks. This has incentivized businesses to construct ecosystems of integrated complementary services in order to grow their networks, resulting in "walled gardens". *Informational asymmetry* refers to the competitive advantage of firms when they have more data about the users and usage of their service, which can be used as a revenue stream, to make real-time decisions, and to discover new areas for innovation and improvement. These characteristics of digital markets are said to encourage *market tipping*—when a single party takes most or all of the market share—and evidence shows that once market power becomes entrenched in this way it is exceedingly difficult to dislodge the incumbent [29].

As evidence of harms to consumers, businesses, and societies accumulates, there is a growing consensus that new regulatory instruments and processes need to be introduced to break open markets and stimulate competition [9]. Many regimes have put forth proposals for sweeping reforms in the last two years which, although varying, generally want to introduce specific obligations for the most powerful tech firms. For example, the European Commission's Digital Markets Act [23]) proposes *ex ante* rules to ensure fair competition within digital "gatekeepers", platforms that connect a large number of users to a large number of businesses (e.g., app stores), including that gatekeepers' platforms should enable interoperability with third-party services that compete with their own

(e.g., allowing for payment methods other than the ones controlled by the platform itself). For the user-centered HCI tradition, the most relevant aspects of such proposals are those that affect the design of software and the interaction patterns they support or inhibit. Data portability and software interoperability requirements—requiring firms to make it possible for users to move data between services and support the ability of one piece of software to interact with another—are two of the more prominent suggested interventions to counter anti-competitive network effects [16, 29]. What these specific obligations will look like and how far-reaching they are, however, is still unsettled. By studying the challenges users experienced in the aftermath of WhatsApps's privacy policy change, this paper provides empirical data on network effects and interoperability needs in the messaging app market.

3.2 Messaging app ecosystems and communication places

Multi-homing—using competing services side-by-side—is common in the messaging app market: people often use more than a single messaging app to communicate, although the total number of apps varies with age [60] and which apps are combined varies based on geographic region [24].

HCI research on messaging apps has recognized this multi-homing phenomenon and has started studying messaging apps together with their ecosystems. For example, Scissors and Gergle [68] describe how couples mix multiple apps to manage conflicts and Cramer and Jacobs [26] how couples use it to add emotional connotations to messages. Both Nouwens et al. [58] and Arnold and Schneider [6] show how users leverage the apps in their ecosystem as a way to create meaningful boundaries. Nouwens et al. [58] showed how individual apps come to have specific identities—which they call *communication places*—based on membership rules (i.e., who is allowed to enter), a perceived purpose (e.g., for work) and emotional connotations (e.g., formal, intimate). The concept of communication place is inspired by Harrison and Dourish's contrast between "space" and "place" Harrison and Dourish [42], where "space" is understood as *"the structure of the world"* and a place is *"a space which is invested with understandings of behavioural appropriateness, cultural expectations, and so forth"*. Users define the "placeness" of a messaging app through use, which is influenced by the design and functionality that provide the "space". These communication places are also affected by the other apps in the user's messaging app ecosystem: the contacts that should not enter an app may belong to another one, some apps may be for specific purposes while others for more general use, and how an app "feels" might be defined in contrast to how communication is experienced in others. Arnold et al. [7] studied social media and messaging app ecosystems through a large-scale survey in Germany and found similar patterns, showing that participants distributed contacts across apps based on the social closeness to the contact and the emotional connotations associated with the messaging app.

Building on these observations, Griggio et al. [39] finds that users customize their messaging apps and develop particular forms of expressions (e.g., based on custom emojis, stickers or bots) but experience *expression breakdowns* when these do not transfer between apps in their ecosystem. To support cross-app customization, Griggio et al. [40] built *Dearboard* [40], a mobile keyboard that allows two people in a close relationship to co-customize emoji shortcuts and color themes which they can access within any of their messaging apps. Study participants used *Dearboard* to build *intimate communication places* embedded with meaningful references to their shared history, common interests, and inside jokes.

This ecological lens is part of broader calls in HCI literature to study how and why people distribute their technology-mediated activities across multiple apps and devices rather than studying the use of each in isolation [14, 48, 52]. For example, Bødker and Klokmose [15] articulated the dynamics of artifact ecologies in movements between unsatisfactory, excited and stables states, and how the introduction of new devices or apps would stimulate a revision of potentially the whole ecology, e.g., a smartphone that over time renders both the digital camera and portable music player obsolete. In the context of social media ecologies, Zhao et al.'s [91] warn scholars that studying single platforms may hide important details about users online communication.

By studying how WhatsApp's 2021 privacy policy update affected users' ecosystem of messaging apps, rather than just WhatsApp, we expect to gain nuanced insights about how users choose alternative apps and lock-in factors that go beyond network effects and differences in functionality.

3.3 User attitudes towards privacy policies

Privacy policies are notorious for generally being ignored by users [10, 59]. While the way privacy information is presented in these policies contributes to this—they are often prohibitively long and require advanced reading comprehension [46]— privacy itself is also a complicated topic to reason about [57, 62]. For example, studies show that how people interpret the policies depends on their existing knowledge of the topic [65], and that they project their own expectations onto their content [54]. Beyond difficulties related to reading and understanding privacy policies, studies also show that there is a discrepancy between people's expressed beliefs about privacy and their actual behavior. While users generally express that privacy concerns are extremely important to them [4], in reality they often make pragmatic choices based on risk-benefit intuitions [49, 63], resulting in a discrepancy between users' ideal privacy and security preferences and their behavior when choosing and using digital technologies [4, 11].

Media controversies have become common when privacy policies and other company statements such as terms of services change. Together with data breach scandals, misinformation amplification, and content moderation practices these controversies are a core element fomenting the current "techlash" [30]. In some cases the changes to policies generate enough bottom-up user dissatisfaction that they evolve into mass mobilization. For example, when Yahoo! bought the popular web-hosting platform GeoCities in 1999 and changed the terms of services, the users of the platform organized a "haunting", replacing their content with protest messages and excerpts of the terms in dour gray designs [67], which successfully forced Yahoo! to make amendments. When Tumblr announced in 2018 that it would ban pornographic images and "female-presenting nipples", users organized a log-off protest, creating a 20% drop in traffic [45]. While the superficial outcome of these digital collective

actions are often easy to see—either the company makes changes to their policies or not—we know less about the dynamics of this process, i.e., how it affects people's use of the service in the short and long term and how it cascades across other apps in the user's ecosystem. The response to the 2021 WhatsApp Privacy Policy update presents a rare opportunity to study these dynamics because of the magnitude of the media attention, the seemingly extraordinary number of users changing their use of the technology, and the fact that it is happening at a time when technology regulation has become a top priority across the world.

4 METHODS

We conducted two surveys across four countries—Spain, the United Kingdom, Mexico, and South Africa—to capture how WhatsApp's privacy policy update affected users' behavior and attitude towards WhatsApp and other messaging apps.

4.1 Survey instrument design

The survey instrument consisted of two sections: 1) questions about users' app ecosystems (e.g., what apps participants use and with whom); and 2) questions about users' reactions to the privacy policy update (e.g., changes in their use of WhatsApp and other apps).

The questions asked in the first section were identical for both rounds in February and May. We wanted to have a sense of what participants' app ecosystems looked like to contextualize the participants' behavior regarding switching apps. For example, we considered it was important to know to what extent they depended solely on WhatsApp for their daily messaging and how aware they were about the existence of other apps. For this, we pre-selected a list of 13 apps that participants could select from, plus an option to specify other apps. The apps are WhatsApp, Signal, Telegram, Facebook Messenger (FB Messenger, or just Messenger), iMessage, Discord, Instagram, WeChat, Kik, Snapchat, Hangouts, SMS, and Slack. We were interested in seeing how participants distributed their communication across different stand-alone, general-purpose messaging apps (Signal, Telegram, Messenger, WeChat, Kik), messaging services that come pre-installed on their phones (iMessage/SMS), apps that are associated to bigger platforms (Messenger and Instagram with Facebook, Hangouts with GMail) and others that tend to be used for specific purposes (Discord for gaming, Slack for work).

The second section focused on whether people knew about the privacy policy update, how they wanted to respond to these changes, and whether they succeeded in doing this. The survey distributed in May was a slightly expanded version compared to February to draw out more nuances that were not captured by the original survey design. For example, in February and May we asked participants how they changed their use of WhatsApp (e.g., uninstalled/used it less) and their use of other apps (e.g., installed new ones/used existing ones more often). In May we added a question that asked whether participants *wanted* to move their communication from WhatsApp to other apps, which provided additional insight about their motivation, and not just their behavior.

We include both surveys in the supplementary material. Not all data collected through the survey was used for the analysis of this paper (see Table 8 in Appendix B for the included questions): this article focuses on the impact of WhatsApp's privacy policy update on participants' communication app ecosystem. Excluded questions focused, for example, on wider concerns around the update.

4.2 Data collection

WhatsApp announced their new privacy policy on January 4th. The first survey was released just after February 8th, the original deadline for users to accept the new policy (Spain: 09-02; Mexico/South Africa: 11-02; UK: 12-02). The second survey was released shortly after May 15th, the date of the final, pushed-back acceptance deadline (South Africa/UK: 26-05; Mexico/Spain: 29-05).

We used Prolific to handle anonymous participant recruitment[4]—an online crowd-sourcing platform for researchers that uses a number of methods to ensure fair hourly pay for its users. We collected the data using SurveyXact, the survey authoring platform approved and provided by our institution. This meant all survey data was stored on university-controlled servers. We had no access to any personally identifiable information, and Prolific had no access to the survey data. Participants were paid £1.25 for the first survey and £0.78 for the second survey.

4.3 Participants

We recruited 2000 participants for the first survey. The participants were pre-screened for 1) using WhatsApp, and 2) living in either the United Kingdom (where we could get a representative sample of the population), Spain, Mexico, or South Africa. We obtained demographic data through their Prolific profiles, such as country of residence, age, and sex; for most participants this also included data about their employment and student status (Table 1). These participants were recontacted for the second survey, which received 1588 responses. After discarding participants with incomplete or invalid responses, and those that did not complete the second survey, the final sample size was 1525.

We recruited from different countries to study people's reactions to the new terms of service beyond the particularities of a specific culture. Since the news media portrayed this as a global phenomenon (e.g., [5, 34, 75]), we wanted to collect data that represented diverse cultural and socio-economic contexts to broaden the applicability and impact of our findings. Moreover, these countries are in the top 10 countries with the largest user base of WhatsApp [3] and also had a pool of at least 10.000 potential participants in Prolific. The market penetration of WhatsApp was similar in the UK, Mexico, and South Africa (45%, 49%, and 58% respectively), but higher in Spain (70%). Section 5.1.1 shows descriptive statistics per country to contextualize our transnational interpretations. Data from multiple countries also allows for country-specific or comparative analyses, however, these are outside the scope of this paper.

4.4 Data Analysis

The data was filtered to ensure all included participants were WhatsApp users (at least in February) and we discarded all participants that had inconsistent answers in the first part of the survey (e.g., that used more apps with their closest contact than the total number of apps that they reported using).

Quantitative data was analysed using the programming language R. The R scripts that reproduce the results and the dataset are

[4] https://prolific.co/

Table 1: Participant demographics

Country	N	Age	Sex	Student?	Employed?
Mexico	404	M=26.61 SD=7.69	Male: 61.39% Female: 38.12% Prefer not to say: 0.49%	No: 41% Yes: 59%	Full-Time: 31% Not in paid work (e.g. homemaker, retired or disabled): 7% Other: 17% Part-Time: 19% Unemployed (and job seeking): 26%
South Africa	372	M=29.57 SD=10.01	Male: 42.47% Female: 56.99% Prefer not to say: 0.54%	No: 55% Yes: 44% N/A: 1%	Full-Time: 38% Not in paid work (e.g. homemaker, retired or disabled): 3% Other: 17% Part-Time: 15% Unemployed (and job seeking): 27%
Spain	367	M=29.53 SD=9.75	Male: 57.76% Female: 41.96% Prefer not to say: 0.27%	No: 42% Yes: 56% N/A: 1%	Full-Time: 34% Not in paid work (e.g. homemaker, retired or disabled): 4% Other: 19% Part-Time: 14% Unemployed (and job seeking): 29%
United Kingdom	382	M=41.46 SD=11.91	Male: 31.41% Female: 68.32% Prefer not to say: 0.26%	No: 91% Yes: 11% N/A: 1%	Full-Time: 58% Not in paid work (e.g. homemaker, retired or disabled): 11% Other: 4% Part-Time: 21% Unemployed (and job seeking): 6%

available in the supplementary material of this paper. When testing for significant differences in categorical data (e.g., apps' frequency of use), we used Pearson's Chi-squared test, with Yates' continuity correction for small sample sizes (i.e., 10 or below). We ran Welch's two sample t-tests for continuous data (e.g., number of users of each app, number of cross-app contacts). When reporting medians, we display the interquartile range in parenthesis.

One of the questions asked participants to express in their own terms the three most frustrating or difficult things about trying to move from WhatsApp to another app. We analyzed 569 free-text responses from 223 participants. Before the analysis, we discarded 67 responses for being unclear or off-topic, and we split responses that listed more than one challenge (e.g., "Difficult to transfer data. Friends reluctant to move. Lack of trust in other apps" was analyzed as three separate responses). Due to a problem with the implementation of the survey, we only received responses to this question from respondents in South Africa and the United Kingdom, and just a few from Mexico. The qualitative analysis consisted of a combination of deductive and inductive coding, where we pre-defined four broad categories of switching challenges for scoping an inductive, open coding of all responses. The pre-defined categories are "Network Effects", "Communication functionality", "Communication places" and "Privacy and security". The first three are inspired by factors that previous research, regulations and anti-trust investigations identify as potential sources of friction and app choice among users of multiple communication apps [7, 39, 58], and we included the last since we considered it to be a relevant theme to participants trying to leave WhatsApp due to privacy and lack of transparency on data handling. Based on our review of the concept of *communication place* in Section 3.2, we use the Communication Places category for answers that refer to challenges around defining and preserving membership rules for the contacts of different messaging apps, emotional and idiosyncratic connotations around an app, and other personal preferences resulting from the use of the app and not its design (e.g., regarding usage habits or conversation histories). We also coded responses outside of these categories that was relevant to switching challenges. All authors agreed on the pre-defined categories beforehand, one author performed the open coding and initial grouping of app switching challenges, and all discussed and agreed on the final list of switching challenges presented on Table 7.

5 RESULTS

The results are presented in three sections:

(1) *Users' Ecosystem of messaging apps*, which provides the wider context of how many communication apps participants use and what kind of relationships they have with the people they message;
(2) *Reactions to WhatsApp's new Privacy Policy*, which enumerates how many people were aware of the new update, how it affected their use of WhatsApp, and how it affected their use of other communication apps;
(3) *Challenges when switching away from WhatsApp*, which presents the various barriers that users experienced when trying to adopt other apps as alternatives to WhatsApp.

It is important to note that both surveys were conducted *after* the privacy policy changes were announced. Therefore, readers should be careful not to interpret February as the baseline and May as the impact of the update. Instead, the differences between these two

periods represents how people's perceptions and behavior evolved over time, concurrently with international media attention, WhatsApp's PR efforts, regulatory responses, and the behavior of their contacts. When it is possible to interpret the results compared to before the policy update, we specifically mention that participants were asked to think back to before the announcement.

5.1 Users' Ecosystem of Messaging Apps

5.1.1 Size of Communication App Ecosystems. Previous research has shown that people multi-home—they use multiple messaging apps side-by-side [58]—although there is little quantitative data about these ecosystems (see Arnold et al. [7] for one example).

Participants rated how frequently they used a range of apps on a Likert scale (Never, Rarely, Sometimes, Frequently, Very Frequently). We aggregated the frequency levels to have a more meaningful overview of how many apps participants used on a regular basis. We define the *ecosystem size* of a participant as the total number of apps that they reported using at least "rarely". *Regular apps* are those reported to be used at least "sometimes". *Frequent apps* are those reported to be used at least "frequently", and *very frequent apps* are only those reported to be used "very frequently". Our data shows that participants' ecosystems consisted of a median of five messaging apps, both in February and in May (Table 2). In February, four of those apps were used *regularly* (i.e., at least "sometimes"), but in May, this dropped down to three. Both periods showed a median of two frequent apps and one very frequent app.

The size of people's ecosystem and how often they use apps within them are similar across countries. The only significant difference is between the UK and South Africa, where a Mood's median test and a post-hoc pairwise median test shows South African respondents used one more app in total (χ^2 (3) = 95.943, p < .05) and one more app *regularly* (χ^2 (3) = 9.8201, p < .05) compared to the UK. There were also few changes in these ecosystems between February and May, again except for South Africa and the UK. In May, participants from South Africa used one less *very frequent* app and UK participants used one less *regular* app. We revisit these changes over time in Section 5.2.4.

Within this ecosystem of five apps, Instagram, Facebook Messenger, and SMS were used by roughly 75% of participants (all used WhatsApp, since this was a precondition for the study). Other relatively popular apps were Telegram (46.36%) and Discord (41.97%), followed by Snapchat (31.87%) and iMessage (27.08%) (see Figure 3). There was no significant change in these numbers between February and May, except for the category "Other".

In terms of frequency, WhatsApp had the largest share of people using it "very frequently" (78%), followed by a distant second Instagram (18%) and third Facebook Messenger (14.4%). In fact, for a large share of participants (40% in February, 44.5% in May), WhatsApp was the only app in their ecosystem that they used "very frequently". We found no significant changes between February and May, except for Instagram, which was used "very frequently" by less and "rarely" by more. This suggests that for most participants WhatsApp played the role of the "primary" app within their ecosystem of five messaging apps.

5.1.2 Distribution of relationships across apps. Previous research shows that people try to separate different types of contacts (e.g., friends, family, colleagues) by keeping them in different messaging apps [58]. Our results show that participants communicated with a median of 7 (3) out of a pre-defined list of 8 relationships overall, both in February and May. Participants communicated with a median of 2 (0.5) types of relationships *per app* in February, and a median of 2 (1.5) in May. WhatsApp, however, was once again an outlier compared to the other messaging apps. In February, participants used WhatsApp with a median of six types of relationships, suggesting that it is a place to connect with *anybody*. Other apps were less diverse: participants used Facebook Messenger with a median of three relationships types; Discord, iMessage, Instagram, SMS and Telegram a median of two, and the rest a median of one. In May, almost all medians stayed the same, except for Signal (decreased from two to one), Messenger (decreased from three to two) and Hangouts (increased from one to two). This suggests that WhatsApp is used as a general-purpose channel for multiple relationships, and the other apps are more dedicated to particular relationships. This contradicts the findings from Arnold et al. [7], which describe WhatsApp as "reserved for social ties relatively close to oneself". This might be because of cultural differences in the use of WhatsApp; Arnold et al. [7] surveyed German users, who might use WhatsApp differently (i.e., with more intimate relationships) than the four countries in our sample, especially since business-related use of WhatsApp is more prevalent in some countries than others, which add less intimate relationships to the WhatsApp space.

While participants tend to segregate their relationship types across different apps, this does not mean that specific apps are uniquely coupled with specific relationship types: all apps were used for all types of contacts (see Figure 4). Some of those apps had a relatively even proportion of each relationship type (e.g., WhatsApp, Telegram, Hangout), whereas others appear more commonly used for specific types of contacts (e.g., Slack for colleagues, and Snapchat for relatives and classmates).

Table 2: Medians of the number of apps in participants' ecosystems in February and May, per country and overall. "Regular" means at least used "Sometimes". "Frequent" means at least used "Frequently".

Survey	Ecosystem size	Regular apps	Frequent apps	Very freq. apps
February				
Mexico	6 (2)	4 (2)	2 (1)	1 (1)
South Africa	6 (3)	4 (3)	3 (2)	2 (1)
Spain	5 (2)	3 (1)	2 (2)	1 (1)
UK	5 (2)	4 (2)	2 (2)	1 (1)
Overall	**5 (3)**	**4 (2)**	**2 (1)**	**1 (1)**
May				
Mexico	6 (2)	4 (1)	2 (1)	1 (1)
South Africa	6 (3)	4 (2)	2 (2)	1 (1)
Spain	5 (2)	3 (2)	2 (2)	1 (1)
UK	5 (3)	3 (2)	2 (2)	1 (2)
Overall	**5 (2)**	**3 (1)**	**2 (2)**	**1 (1)**

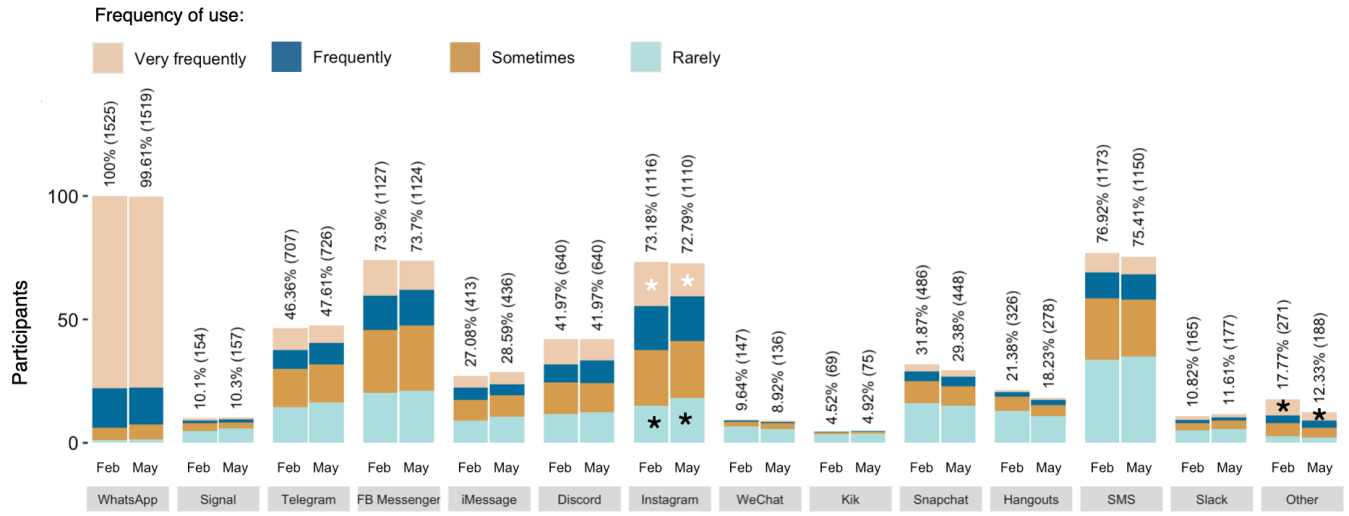


Figure 3: Number of participants using each app in February and May. Apps mentioned as "Other" included Viber, Skype, Slowly, Group Me, Duo, KakaoTalk, Tinder, Twitter DMs, Matrix, Tandem, Steam and WhatsApp Business. Pairs of asterisks (*) denote significant differences in frequencies (p<0.05).

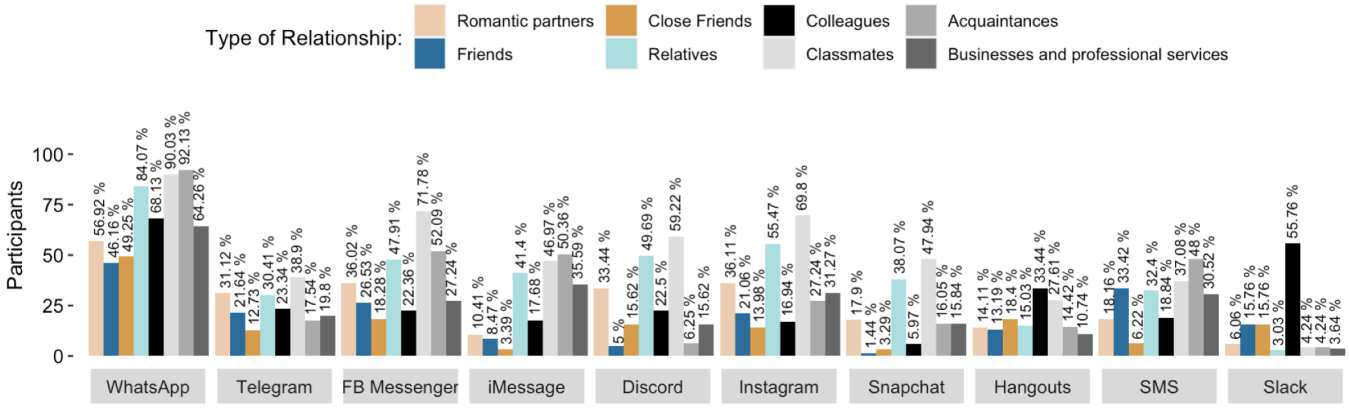


Figure 4: A normalized distribution of types of relationships per app. Participants could mention multiple types of relationships for each app, so the total sum of the bars exceeds 100%. The percentages are relative to the total number of people that mentioned using each app. We omit Kik, Signal, WeChat (which were used by the least number of participants) and Other for clarity.

5.1.3 Cross-app contacts. A large proportion of participants (88%) talked with some contacts across multiple apps. In February, participants reported having an average of 7.59 (sd=7.86) cross-app contacts[5] with whom they had a median of 3 (3) types of relationships. The type of relationships people had with cross-app contacts were close friends (64.72%), friends (54.3%), romantic partners (52.13%) and relatives (48.85%). The rest, in a much smaller proportion, were colleagues (18.1%), classmates (10.89%), acquaintances (11.28%) and customers (5%). This indicates that social closeness is correlated with cross-app messaging.

Participants communicated with less cross-app contacts in May ($t(2627.9)= 3.7149$, $p<0.05$), where the mean dropped to 6.53 (sd=6.94). The types of relationships that cross-app contacts belonged to did not change significantly, except for friends (4.01% less, $t(3048)= 2.2125$, $p<0.05$) and classmates (2.37% less, $t(3012.4)= 2.2031$, $p<0.05$). The median number of types of relationships for cross-app contacts also dropped to 2 (2).

In terms of how many messaging apps were used for their most extreme cross-app contact (i.e., the contact with whom they communicate across the highest number of apps), participants reported using a median of three apps, but only one app very frequently (Table 3. This is similar to what we observed in the overall messaging app ecosystems (see section 5.1.1): participants have a central app that is used the most, with a number of secondary apps that

[5]To get the average number of cross-app contacts per participant, we excluded 11 outliers in February and 3 in May with values above 100, which we believe might have resulted from misinterpreting the question for "how many contacts do you have overall across all your apps".

Table 3: Medians of the number of apps used with participants' closest contacts in February and May.

Survey	Ecosystem size (total apps)	Regular apps	Frequent apps	Very frequent apps
February	3 (2)	3 (1)	2 (1)	1 (1)
May	3 (2)	3 (1)	2 (1)	1 (1)

are used less often. There were no changes between February and May in this pattern. The most common types of relationship that participants had with their most-extreme contact were romantic partners (43.6%) and close friends (41.9%), thus from now on, we refer to these contacts as participants' "closest contacts".

5.1.4 Summary. Participants used an average of five messaging apps to communicate with their contacts, but only a single app was used very frequently. For most participants, WhatsApp was this primary app, and they used it to message a more diverse group of people than any other app. These patterns stayed quite stable between February and May: the size of the ecosystem remained the same, and the same apps were used with roughly the same frequencies. However, in February compared to May, participants were messaging with more people across multiple apps, and the diversity of relationship types was larger (particularly in Signal and Messenger). Most participants also communicate with a small group of contacts across multiple apps, primarily (close) friends and romantic partners. The sub-ecosystem with their closest contact consists of three apps, where (again) one is used more frequently than the others.

5.2 Reactions to WhatsApp's new privacy policy

5.2.1 Awareness and engagement with WhatsApp's new privacy policy. We found that 76.13% (1161) of participants were aware of the change to WhatsApp's privacy policy. In February, 44.6% of participants had read the terms at least partially (5.77% completely), which increased to 62.82% in May (Table 4). This meant that roughly one-third of users had not seen any part of the policy after the final acceptance deadline.

By WhatsApp's deadline on May 15th, 41.7% of participants reported that they had accepted the new policy. Another 12.65% accepted them after the deadline, making a total of 54.36%. Of these, 13.18% accepted the policy without reading any part of it. However, only 14.16% participants reported actively *not* accepting the privacy policy (31% without reading)—the remaining 31.48% did not know whether they had accepted them or not. Considering that WhatsApp was showing an in-app banner on an almost daily basis for those users who had not accepted the policy [12], it is likely that these users did in fact accept it at some point, bringing the total up to 85.84%. This seems to be in line with WhatsApp's statement on their website, where they write that "the majority of users who have seen the update have accepted" [80].

5.2.2 Wanting to leave WhatsApp. In May, we asked participants whether they agreed with the following statement: "The new privacy policy and terms of service made me want to move at least some of my WhatsApp communication to another messaging app".

Table 4: Answers to "Have you read WhatsApp's new terms of service and privacy policy?" in February and May. *The "No" row for February combines those that were not aware of the new terms (364) and those that were aware but did not read them (481).

Read new privacy policy?	February	May	Difference
Yes, I read them all	88 (5.77%)	137 (8.98%)	+55.68%
Yes, I read some parts	592 (38.82%)	821 (53.84%)	+38.68%
No*	845 (55.40%)	567 (37.18%)	-32.90%

More than a quarter of participants (26%, 396) agreed with wanting to move away from WhatsApp[6]. Another quarter was neutral (25.8%, 394), and just short of half (48.2%, 735) disagreed. A Chi-squared test showed no differences across countries. Among those who wanted to move, 52.53% accepted the new privacy policy, 26.01% did not, and 21.46% could not remember whether they had accepted them.

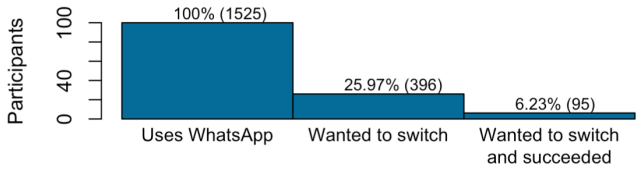


Figure 5: From a sample size of 1525 Whatsapp users, a quarter of them wanted to switch at least part of their communication to other apps, but only 23.99% of them (6.23% of all participants) managed to switch as much as they wanted.

Only 23.99% of those who wanted to move to other apps agreed with having managed to do so as much as they wanted (See Figure 5). On the other hand, 49.49% disagreed, and the remaining 35.47% were neutral. A Chi-squared test showed no differences across countries.

In other words, **less than a quarter of participants that wanted to switch felt they had succeeded at least to some extent, and almost half were actively unsatisfied with their current situation**.

5.2.3 Changes in the use of WhatsApp and other apps by May 2021. No data was collected *before* the announced changes to WhatsApp's privacy policy update. Therefore, we asked participants to reflect on how they *perceived* that their use of messaging apps had changed after they became aware of the update.

In May, the vast majority (82.69%, 1261) reported no changes in their use of WhatsApp compared to before the update. Roughly one in six participants (16.39%, 250) felt they had decreased their use of WhatsApp due to the update: 242 (15.87%) used it less often and a mere eight (0.52%) had uninstalled it. Fourteen participants (0.92%) reported using it more often.

The majority of participants (70.95%, 1082) also reported no changes to their use of *other* messaging apps. A bit more than a

[6]When referring to the participants that agreed with wanting to move at least part of their WhatsApp communication to other apps in response to the privacy policy update, we use the terms "move away", "leave", or "switch" for short.

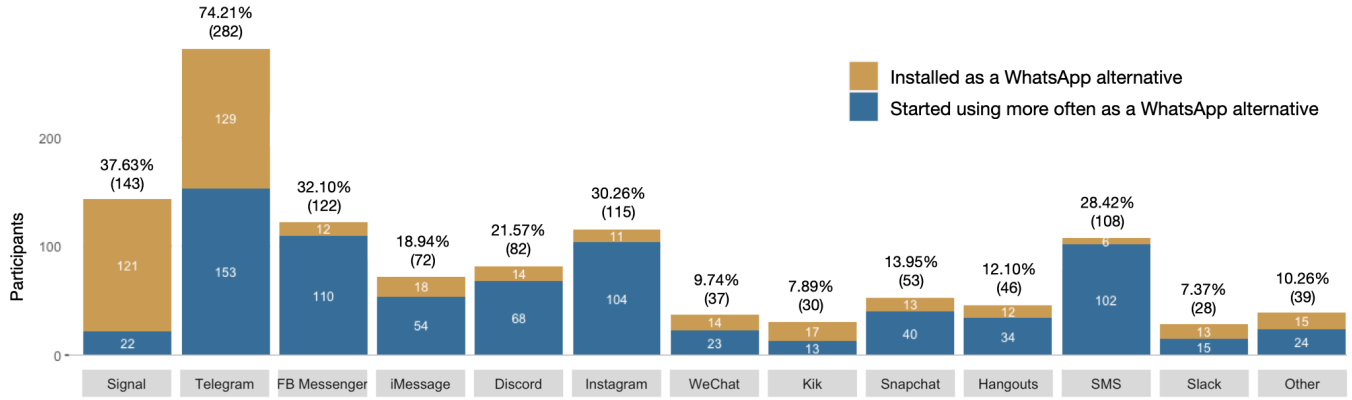


Figure 6: Apps tried as alternatives to WhatsApp. Each bar shows the number of participants that installed that app or that tried using it more often We suspect the question has been interpreted as "tried using" instead of "installed" when it comes to SMS.

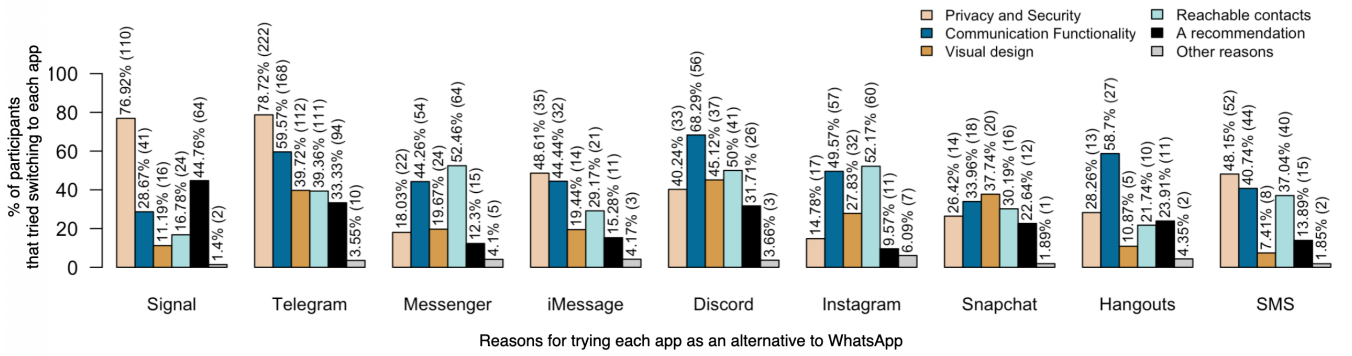


Figure 7: Reasons for choosing each app as a good alternative to WhatsApp. Each bar shows the proportion of the participants that tried that app as an alternative that chose it for each reason. Participants were able to select multiple reasons per app. For example, 76.92% of the participants that tried switching to Signal chose it for its Privacy and Security. The figure shows the top 9 apps selected as alternatives, and the rest are in Apendix A.

quarter felt they had increased their use of other apps (27.93%, 426): 16.59% (253) installed new apps, 14.29% (218) used other apps they already had more often, among which 2.95% (45) did both and 1.44% (22) also used some other apps less often.

These changes could have been caused by a number of different factors—perhaps a friend asked them to use a different app for reasons unrelated to the update—so we also asked more specifically about which apps they installed or used more often *as an alternative to WhatsApp* (Figure 6). We found that 24.92% (380) participants tried to explicitly switch from WhatsApp to other apps: of those, 22.1% (84) only installed new apps, 40% (152) only used other existing apps more often, and 37.9% (144) did both. Overall, 14.95% of all participants (228) installed new apps, 19.4% (296) started using an existing app more often, where 9.44% (144) did both.

Among the participants that tried to switch, Telegram was by far the most popular choice (74.21%). Signal was the second most popular alternative (37.63%) closely followed by Facebook Messenger (32.10%), Instagram (30.26%) and SMS (28.42%). Over half of those choosing Telegram (54.25%) already had it installed and tried using it more often, whereas most of those using Signal were new installations (84.61%). Participants tried to switch to a median of 2 (2) apps; the median number of new installations per participant was 1 (1), and the median number of existing apps used more often was 1 (2). In the case of those that managed to switch, they tried a median of 3 (3) apps; their median number of installed apps was 0 (1) and the median number of existing apps used more often was 2 (3), suggesting that switching to new apps is a less successful approach.

Participants reported having different reasons for picking a particular app as an alternative to WhatsApp (see Figure 7). Most of the participants that tried switching to Telegram (78.72%) and Signal (76.92%) did so primarily for its perceived privacy and security. More interestingly, almost half of the participants that tried switching to iMessage or SMS also did so for privacy and security reasons. While messages sent between Apple devices using iMessage are end-to-end encrypted, SMS are not. Facebook Messenger and Instagram mainly attracted users for their communication functionality (44.26% and 49.57%) and reachable contacts (52.46% and 52.17%).

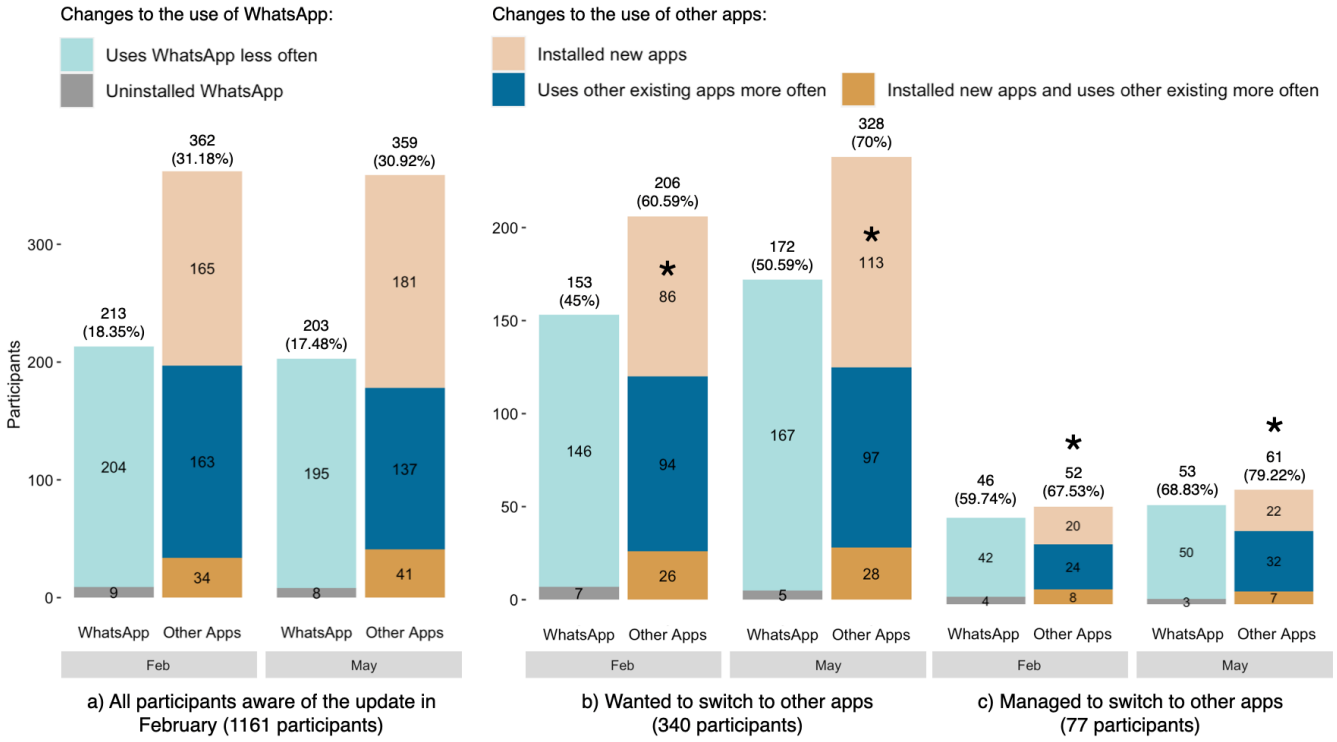


Figure 8: Comparison of how participants changed their use of WhatsApp and of other apps up until February and May among: a) all participants that reported their change of use of WhatsApp and of other apps in both surveys; b) only those that wanted to switch to other apps; c) only those that managed to switch to other apps. Pairs of asterisks (*) indicate significant differences at the 5% level.

5.2.4 Changes in the use of WhatsApp and other apps between February and May. The data in this section is based on the subset of participants who were aware of the privacy policy update in February (1161, 76.13%).

We wanted to know how changes developed between February and May: whether the number of people using WhatsApp less kept growing, or whether more people started to use other apps.

When looking at all participants at once, it appears that nothing changed between February and May (Figure 8, a).

However, when grouping participants based on their desire to switch and their success in doing so, we can see meaningful changes. Of the participants that *wanted* to move away from WhatsApp (340), we found that significantly more of them had installed new apps in May compared to February ($t(676.37) = -2.46$, $p < .05$), as seen in Figure 8, b. Of the participants that did not want to move away from WhatsApp (533) (Figure 9, b), a significantly smaller proportion were using WhatsApp less often in May than in February ($t(522.8) = 2.7$, $p < .05$). Of those that were neutral about moving away (288) (Figure 9, a), there was also significantly fewer who used WhatsApp less ($t(950.53) = 2$, $p < .05$), as well as significantly fewer who still used other apps more often ($t(542.8) = 2.36$, $p < .05$). This suggests that between February and May, there were increasing efforts in trying new apps among those who wanted to switch, and those who did not or did not particularly care initially tried to move some of their communication away from WhatsApp but did not sustain the change.

Of the participants that actually *succeeded* in switching away from WhatsApp (77), more people had reduced their use of WhatsApp in May than in February (from 46 (59.74%) to 53 (68.83%) in May), but the difference was not significant. However, there was a significantly larger group of people that had installed a new app or used an existing one more often ($t(143.06) = 2.17$, $p < .05$), going from 52 (67.53%) to 61 (79.22%). Of the participants that stated they did not succeed in moving from WhatsApp as much as they wanted to (174), significantly more of them had installed new apps in May ($t(345.29) = -1.97$, $p < .05$, Figure 9, d). More participants were also using WhatsApp less, but this difference was not significant—the same was the case for those who were neutral (89) about having managed to switch (Figure 9, c).

To understand why some were successful in moving from WhatsApp while others were not, we compared the size of their ecosystems and the frequency with which they used apps within it. Both groups had a median ecosystem size of six, but those that managed to switch used five apps regularly (i.e., at least sometimes) already in February, whereas those that did not manage to move away used four apps regularly, which dropped to three in May. Those that did not manage to switch also decreased the median of regularly used apps with their closest contact, going from three in February to

Table 5: Medians of ecosystem size, regular apps, frequent apps and very frequent apps in February and May for the participants that managed to switch and those that wanted to switch but could not. The second half of the table shows the medians for participants' sub-ecosystems with their closest contact.

	Managed to switch				Wanted to switch but did not manage			
	Ecosystem size	Regular	Frequent	V. Frequent	Ecosystem size	Regular	Frequent	V. Frequent
February	6 (3)	5 (3)	3 (4)	2 (1)	6 (3)	4 (2)	2 (1.75)	1 (1)
May	6 (3)	5 (3)	3 (2)	2 (1)	6 (3)	3 (1)	2 (2)	1 (1)
Cl. contact, February	4 (4)	3 (2)	2 (2)	1 (1)	3 (2)	3 (1)	2 (1)	1 (0)
Cl. contact, May	4 (4)	3 (2)	2 (2)	1 (1)	3 (2)	2 (1)	2 (1)	1 (0.75)

two in May. This may suggest that those who managed to switch are users capable and willing to maintain several apps in parallel, presumably for different contacts that prefer diverse apps.

Last, the medians that drop by one in Table 2, including the number of regularly used apps that change from four to three, provide extra support to the interpretation that participants could have been experimenting with alternatives in February, and in May they had more of their communication concentrated in fewer apps, suggesting frustrated attempts to adopt alternatives to WhatsApp.

5.2.5 Summary. Three quarters of the participants were aware of the changes to the privacy policy in February, but the majority had not read them, and in May almost a third had still not read them. We find that 25% of all the participants wanted to switch away from WhatsApp *but only a quarter of those managed to succeed by the time of the second survey* (i.e., 6,25% of all participants)—this might be because these people were already regularly using more apps, compared to those who did not succeed. More apps were used by the participants at the time of the first survey than at the second. This could imply that many participants were experimenting with alternative messaging apps but did not keep them.

5.3 Challenges when trying to switch from WhatsApp to other apps

We asked the participants that wanted to switch from WhatsApp, tried to install another app, or used another app more often (n=435) what challenges they faced in this process. Participants responded both in free-text form and by selecting from a list of 25 multiple-choice answers, which we grouped into four categories: Network effects, Communication Functionality, Privacy and Security, Communication Places and Other as described in Section 4.4.

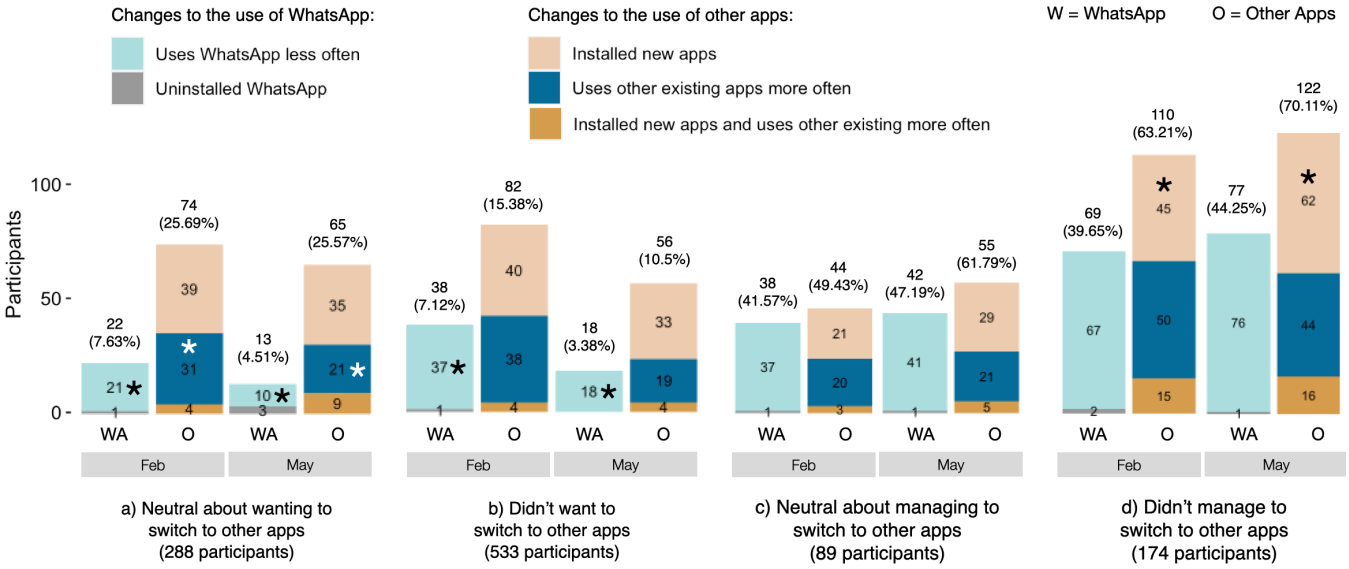


Figure 9: Comparison of how participants changed their use of WhatsApp (WA) and of other apps (O) up until February and May among: a) participants that felt neutral about wanting to switch; b) participants that did not want to switch; c) participants that were neutral about having managed to switch as much as they wanted; d) participants that did not manage to switch as much as they wanted. Pairs of asterisks (*) indicate significant differences at the 5% level.

Table 6: Summary of responses to the multiple-choice question "What kind of challenges did you encounter when trying to move at least part of your WhatsApp communication to another app?". The answers come from 435 participants that either wanted to switch to other apps or tried other apps as an alternative to WhatsApp.

	Challenges when switching apps (multiple choice)	Participants
label	**Network Effects**	**409 (94.02%)**
CN1	I invited some WhatsApp contacts to use another app but they didn't want to	201 (46.21%)
CN2	I invited some WhatsApp contacts to use another app and they did so for some time, but eventually we went back to using WhatsApp	163 (37.47%)
CN3	I couldn't reach some of my WhatsApp contacts anymore / as easily as before	108 (24.83%)
CN4	I missed my WhatsApp groups in the other app	103 (23.68%)
CN5	I missed out on events and conversations that happened on WhatsApp	79 (18.16%)
CN6	I tried moving a WhatsApp group to another app, but not all group members committed to using the other app	79 (18.16%)
CN7	It was harder/impossible to use other apps for contacting the shops, businesses and professional services I could contact via WhatsApp	58 (13.33%)
CN8	It was harder/impossible to do my work in an app other than WhatsApp	48 (11.03%)
	Communication Functionality	**256 (58.85%)**
CF1	I missed the way I could send emojis, GIFs and stickers on WhatsApp when using the other app	95 (21.84%)
CF2	I missed messaging features from WhatsApp (for example, the reply, forward or delete message function) that I didn't have in the other app	87 (20%)
CF3	I missed my WhatsApp stickers when using the other app	81 (18.62%)
CF4	I missed WhatsApp's status indicators (for example, read receipts and "last seen", "typing" and "online" status) that I didn't have in the other app	65 (14.94%)
CF5	I missed my WhatsApp customizations (for example, the conversation background or notification sound)	48 (11.03%)
CF6	The other app was hard to use/understand	47 (10.8%)
CF8	I missed the way I can do video calls on WhatsApp when doing video calls on another app	44 (10.11%)
	Privacy and Security	**77 (17.70%)**
PS1	The app I wanted to use as an alternative to WhatsApp didn't have end-to-end encryption or had worse security features than WhatsApp	21 (4.83%)
PS2	I missed privacy settings from WhatsApp (for example, disabling read receipts) which I didn't have in the other app	45 (10.34%)
	Communication Places	**319 (73.33%)**
CP1	It was hard to agree with different contacts on which app we should use as an alternative to WhatsApp	146 (33.56%)
CP2	I missed the conversation history I had on WhatsApp	125 (28.74%)
CP3	The other app didn't feel the same as WhatsApp	94 (21.61%)
CP4	Some of my WhatsApp contacts moved to another app I prefer to use with other people, not them	76 (17.47%)
	Other Challenges	**86 (19.77%)**
OC1	Using other apps is more expensive than using WhatsApp	15 (3.45%)
OC2	I wanted to move at least part of my WhatsApp communication to another app but didn't try to make it happen	44 (10.11%)
OC3	Other	3 (0.69%)
NP	**No problems**	**25 (5.75%)**

One of the 25 multiple-choice answers was *"I didn't encounter any challenge/problem when trying to use other apps as an alternative to WhatsApp"*. We found that 51 participants selected this option, but 26 of those simultaneously selected other challenges as well. While we intended this answer to represent no challenges at all, we later realized it could have been interpreted as not experiencing any challenge with the alternative app itself. For this reason, we consider the answers of these participants as valid after treating the data as follows: For the 26 participants that also selected other answers, we only consider the other answers. For the rest, we consider them as having experienced no problems while trying to switch to another app.

Table 7: Summary of the free-text responses to the question "In your own words, what were the 3 most frustrating/difficult things about trying to move from WhatsApp to the other app(s)?". This list of challenges covers 569 answers from 223 participants from South Africa and United Kingdom, and only 2 from Mexico.

Challenges when switching apps (free-text answers)	Occurrences	Participants
Network Effects	**235 (41.3%)**	**168 (75.33%)**
Only a few contacts switched	117 (20.56%)	105 (47.09%)
Convincing contacts to switch	75 (13.18%)	65 (29.15%)
Institutional and social dependence on WhatsApp	24 (4.22%)	19 (8.52%)
Lost contact after switching	14 (2.46%)	12 (5.38%)
Communication Functionality	**113 (19.86%)**	**95 (42.6%)**
Learning how to use a new app	51 (8.96%)	49 (21.97%)
Different or missing functionality	30 (5.27%)	28 (12.56%)
Usability and visual design	25 (4.39%)	24 (10.76%)
Technical breakdowns	7 (1.23%)	7 (3.14%)
Privacy and Security	**19 (3.34%)**	**12 (5.38%)**
Lack of trust in other apps	15 (2.64%)	12 (5.38%)
Learning about the privacy policy of other apps	4 (0.7%)	4 (1.79%)
Communication Places	**133 (23.37%)**	**105 (47.08%)**
Preserving WhatsApp's chat history and shared media	56 (9.84%)	50 (22.42%)
Loss of control over the distribution of contacts across apps	37 (6.5%)	32 (14.34%)
Breaking habits	16 (2.81%)	16 (7.17%)
Other apps not feeling as good as WhatsApp	24 (4.22%)	21 (9.42%)
Other challenges	**73 (12.83%)**	**64 (28.7%)**
Set up efforts	33 (5.8%)	30 (13.45%)
Increase in mobile data costs	23 (4.04%)	23 (10.31%)
Making informed app choices	17 (2.99%)	17 (7.62%)

We present the results from the multiple-choice question in Table 6 and the summary of the qualitative analysis on the free-text answers in Table 7. While both tables show counts of the participants that related to each type of challenge, we believe it is important to note that both sets of data have limitations in terms of generalizability: The free-text responses provide greater validity and represent the challenges that participants cared about the most, but only cover participants from South Africa and United Kingdom (see section 4.4). Moreover, the reported counts on Table 7 should not be interpreted as a representation of the most popular types of challenges in switching apps, since participants were invited to report only the three most frustratingly difficult ones, so they may have experienced more. Instead, the counts should give a sense of how many perceived each type of challenge as being the most frustrating when trying to switch apps.

The multiple-choice answers represent participants from all four countries and are more helpful to identify popular challenges. However, they are restricted to the types of challenges we anticipated and expressed in our terms, not the participants'. Overall, we believe these two sets of data combined provide rich insights into the range of challenges that participants experienced while switching apps, and we discourage the reader from dismissing the potential importance of types of challenges with lower counts. Next, we describe the most frustrating challenges we derived from the free-text answers (Table 7).

5.3.1 *Network effects.*

Only a few contacts switched. Participants that tried other apps had to keep using WhatsApp because not enough contacts switched with them. In some cases, participants mentioned important contacts that were missing in other apps: *"My mum always calls me on WhatsApp"*, *"Older relatives are reluctant to have more than one messaging app, which forces me to use Whatsapp to communicate with them"*, *"My friends decided to stay with WhatsApp so I gave up"*. Others referred to the proportion of contacts still reachable only on WhatsApp: *"Everyone uses WhatsApp"*, *"70% of my WhatsApp contacts were not available on Signal"*.

Convincing contacts to switch. Investing effort in persuading others to also switch was perceived as a challenge of its own: *"Having friends and family still stuck with WhatsApp is a challenge because I need to convince them to change."* In some cases, convincing others also meant helping them to switch: *"Teaching elderly family members how to use new apps is too frustrating."* Some answers also reflected the frustration of a "lost battle": *"Certain friends being tied/loyal to WhatsApp for no discernible reason"*, *"Some people don't want to move because "Nobody else uses it""*.

Institutional and social dependence on WhatsApp. Further stressing that moving away from WhatsApp is not an individual but a social choice, some participants explained how they depended on WhatsApp for work, studies, contacting businesses, and engaging with communities: *"My job requires me to use WhatsApp as part of work groups"*, *"Most of my college classes have whatsapp groups where important information is communicated, so I am forced to use Whatsapp daily"*, *"Businesses still use WhatsApp business so it makes contacting them more difficult"*, *"Church group used WhatsApp call conferencing during hard lockdown"*, *"Having to leave groups (neighborhood watch, etc) that only exist on WhatsApp"*.

Lost contact after switching. Some participants switched apps at the cost of compromising or deteriorating the communication with some people: *"Many people have kept WhatsApp, so now my communication with people has been limited to close friends and relatives"*, *"Maintaining contact with people who don't want to move"*

5.3.2 *Communication Functionality.*

Learning how to use a new app. A lot of participants underlined the challenge of understanding how to navigate a new interface: *"Getting used to the designs of the newly installed app [was challenging]"*, *"[The] time taken to learn new features"*. Anticipating the

effort of learning a new interface was enough to discourage some of even trying: *"I'm not tech savvy and learning of "new" app is stressful for me"*, *"I've used WhatsApp for years and it hasn't been easy to try and learn something new."*

Different or missing functionality. Differences in the functionality across apps also implies adapting to different ways of communicating and expressing oneself. Some experienced this as a general challenge: *"There are no other apps that do the same thing"*, *"Getting used to limited or changed functionalities."*. Others pointed out more specific features that they missed from WhatsApp: *"Lack of app customisation"*, *"No stories in apps like telegram"*, *"Used to the visual design / emojis of WhatsApp"*.

Usability and visual design. Apart from functional differences, some complained about the varying visual design between apps: *"The other apps are just not as easy to use. Also the interface is not as appealing"*. *"Other apps do not look as user friendly as WhatsApp"*.

Technical breakdowns. Last, some found *"glitches"* and breakdowns such as *"slow network problems"* in other apps, which may have added to the general frustration of the unfamiliarity of a new app: *"Tried making an important call on Signal with work acquaintance and could not make it work"*.

5.3.3 Privacy and Security.

Lack of trust in other apps. When looking for alternatives, many felt it was hard to trust apps they were not familiar with: *"Having to trust a new app with my data felt risky"*, *"The way that the app forces you to give permissions to grant read/write access to your phone's memory and personal files."* A general feeling of defeat discouraged some of even trying to switch: *"I feel like other apps are using exactly the same privacy policy, so why bother anyway."* The lack of trust in other apps also made it hard for some participants to get their contacts to switch: *"People fear other platforms because other people might steal their images or messages"*.

Learning about the privacy policy of other apps. Making informed choices in terms of how apps treat personal data requires a great deal of effort. A few participants reported *"Reading through the terms and conditions of the new apps"* was frustrating, or even worse, not being able to: *"Privacy terms are not published for us to see"*. Even though very few participants reported struggling with reading other apps' privacy policies, we believe it is a crucial factor for envisioning ways to help users make more informed app choices.

5.3.4 Communication Places.

Loss of control over the distribution of contacts across apps. Many reported challenges related to losing control over *where* they could communicate with *whom*, which we interpret as detriments to the sense of *place* that participants had developed around their existing apps. Such challenges suggest that, as both participants and their contacts tried switching to alternative apps simultaneously, they imposed new *membership rules* to each other's apps, which often disagreed. For example, some complained that after convincing contacts to leave WhatsApp, they realized that those contacts had chosen different alternative apps: *"Trying to move all you contacts to find out that most of ur contacts are not moving to the same app u using"*. For some, understanding who was available in each app was a challenge in itself: *"Trying to find contacts on Messenger"*, *"Difficult to know that other contacts were using the new app"*.

Others struggled with juggling too many apps after the redistribution of some contacts. Because *"not everyone uses the same apps "*, they had to maintain more apps simultaneously: *"Trying to maintain conversations in different Apps can be confusing"*, *"Extra task of having to remember which contacts are in which app"*. This, of course, included WhatsApp, which they had to keep using in addition to the new apps in their ecosystem: *"Most contacts stayed on Whatsapp and was frustrating to switch between apps"*.

Breaking habits. An interesting challenge was breaking the habit of using WhatsApp. We believe this is especially relevant in a situation where users tried to adopt new apps with the purpose of moving away from WhatsApp, and perhaps not due to a genuine interest in the new apps themselves: *"I opened my phone and went to WhatsApp"*, *"Remembering not to use the app"*. Some also mentioned how their contacts struggled with sticking to the new apps: *"Messaging a friend using sms and they respond via whatsapp"*, *"Remembering we have changed to another app"*.

Preserving WhatsApp's chat history and shared media. Many tried transferring their conversation histories to other apps, which we see as attempts to bringing some of the "placeness" of WhatsApp to other apps. While some apps such as Telegram added support to this within weeks of the announcement of the update, it is tedious and sometimes not seen as enough: *"The chat history was a nightmare to move as some info is personal"*, *"Storing and moving of voice messages"*, *"I could not move all of 6+ years of backed up data from whatsapp to another messaging app."* Others mentioned fears of losing their communication data if they left WhatsApp: *"I was afraid of losing all my conversations"*, *"The loss of personal pictures"*.

Other apps not feeling as good as WhatsApp. Last, some expressed disappointments or struggles related to the adoption of alternative apps in terms of how they felt and how they experienced them: *"It is boring"*, *"I didn't like any other platform"*, *"Other apps were not as fun as whatsapp"*.

5.3.5 Other challenges.

Set up efforts. Some participants pointed out the effort that it takes to start with a new app from scratch and *"The stress of it all"*: *"Basically just to much effort to switch"*. Many examples of such efforts relate to adding contacts to the new app, but also other settings: *"Storing all contacts i had on WhatsApp to new apps"*, *"I need to enable notifications for all of the new apps"*.

Increase in mobile data costs. It is very important to consider that for many, switching apps implied spending more money on mobile data: *" A lot of phone plans come with exclusive whatsapp data, which is much cheaper than the usual data bundles you would need to buy to use Signal and Telegram"*, *"Being worried about charges for sending photos and videos"*. This also could have made participants' contacts more reluctant to switch with them: *"People rarely have enough airtime to SMS."*

Making informed app choices. Last, choosing where to switch to was not trivial and it could take time and effort to decide *" Too many alternatives to choose from trying out new apps like that is*

tedious and time consuming", "There's so many different reviews on them all.", "Researching the different apps and choosing one based on security, functionality and desgin".

5.3.6 Summary. The most common barriers to switching are associated with network effects. Participants struggled to convince contacts to switch to other apps and change their communication habits to stay there. Beyond network effects, personal preferences regarding functionality (including means of expression such as emojis or stickers), how other apps "feel" and the organization of contacts across different apps are also important factors that make switching difficult. Surprisingly, privacy was a less common concern, though some participants highlighted how hard it is to *trust* other apps and make informed choices based on their privacy policies.

6 DISCUSSION

The response to WhatsApp's January 4 privacy policy update by media, regulators, and users seemed unprecedented, but ultimately it does not appear to have had a disruptive impact on the messaging app market. Different elements of our data all seem to point to the same result: **the largest effect of the policy controversy was not that WhatsApp was used considerably less, but rather that other apps were used more**. Five months after the update announcement, only 16% of users had reduced their use of WhatsApp, whereas 27% reported increased use of other apps—a mix of both installing new ones or more frequently using ones they already had installed. This outcome is not necessarily a problem, if it aligns with the interests of the users. However, our data shows that **25% of users wanted to move away from WhatsApp, but only a quarter of those succeeded**. This supports the growing concerns among market regulators that there is a lack of competition in digital markets, and how it harms consumer choice and control. Next, we discuss how our data contributes new nuanced evidence of barriers to switching between "walled-garden apps", and we call for research on novel designs and messaging technologies that fundamentally support freedom of choice in the services that mediate our digital communication.

6.1 Barriers to switching apps beyond network effects

Network effects are a commonly cited anti-competitive aspect of messaging app markets—the fact that a messaging app only becomes a realistic competitor if enough people are using it. Our data supports this: **network effects were by far the most common challenges users faced**, as well as the most frustrating ones when trying to leave WhatsApp. Among those that wanted to switch, more installed new messaging apps over time; however, their use of WhatsApp did not decrease, likely because the majority of users—who did not want to switch—seem to have rolled back to using WhatsApp as much as they did before the update announcement.

However, discussions on network effects generally focus on the number of people in the network, whereas our data shows that particular contacts, groups or organizations may represent important barriers for a user to switch. Not surprisingly, a common challenge was to move important contacts that did not want to switch to a new app (e.g., *"My mum always calls me on WhatsApp"*). Our results suggest that the biggest social pull towards WhatsApp actually came from weaker ties. WhatsApp was the most popular app to message colleagues, classmates, acquaintances, and businesses. Convincing these more casual contacts, especially when they are part of formal institutions such as their work, school, or church, is much more difficult. Given this scenario, switching to other apps with *everybody* on WhatsApp was always an impossible task. Quality and quantity of the network are of course correlated—the more people use an app, the more likely it is to be the default choice with anyone—but **our data suggests that the relationship you have with the contacts in an app influences the strength of its network effect**.

Multi-homing—using similar apps side-by-side—is generally considered to show network effects are not causing a lack of competition, because it indicates that users can easily switch to another app. For example, in the decision to allow Facebook to buy WhatsApp in 2014, the European Commission acknowledged there were network effects in the market for messaging apps, but that multi-homing was prevalent because it was easy to download new apps, apps were generally free or cheap, that different interfaces were not difficult to learn to use, and that information and reviews on apps were easy to find [32]. Our study provides quantitative data about the practice of multi-homing in 2021, and shows that five apps is the median number of messaging apps people use concurrently, with one central app that is used the most and four other apps that are used to varying degrees. While it is true that people continue to use multiple apps, this perspective on multi-homing that focuses on presence of competition rather than evidence of harm does not capture the real challenge that users faced: **participants were not unable to use more apps—they were unable to stop using WhatsApp**. This was made particularly difficult because for many participants, WhatsApp was the central app in their ecosystem, and simply increasing the use of other apps (which many tried) did not help them to use WhatsApp less.

Additionally, while multi-homing is common, the process in 2021 is not as easy as described by the European Commission. **Participants struggled to balance many factors when deciding which app to use as an alternative to WhatsApp**, such as what functionality was available, whether they could keep expressing themselves as usual, how good or comfortable it "felt", whether it would be more expensive in terms of mobile data costs[7], and how to preserve their chat histories. A particularly crucial challenge mentioned by participants was selecting alternative apps based on their privacy policies—understandable considering this was the source of the controversy prompting many to want to leave WhatsApp. Some participants highlighted that it was hard to find and read the privacy policies of other apps when choosing where to switch to. This was also made evident in the fact that about 30% of participants chose to switch to Instagram, Messenger, and SMS. The first two are also owned by Facebook and work under privacy policies that allow Facebook to process the messages in users' conversations [35], and SMS is secure between the sender and mobile provider but is not end-to-end encrypted. One could interpret this

[7] Mobile data providers in the United Kingdom, South Africa, and Mexico waive the data costs from WhatsApp (so-called "zero-rating", which is contentious under net neutrality regulation.

as users of messaging apps making careless decisions, or as a consumer market where there is no clarity or transparency about data processing practices, creating a situation where it is very difficult for the average user to make informed decisions. Ultimately, **the root cause for many of the difficulties participants faced is the forced app symmetry between communication partners**. Because switching away from an app is not an individual choice, participants were *caught in the network*. In order to use a different messaging app, they had to find out which apps their contacts were switching to, negotiate new *communication places* with them, help them install new apps, teach them new functionality, and juggle with many apps to be inclusive of other people's app preferences.

6.2 Interoperability as a multidisciplinary solution

Messaging interoperability decouples the user base of an app from all other aspects that make up its value. It would let users choose apps based on their functionality, privacy policies, or any idiosyncratic preferences, without limiting the contacts they can reach.

Privacy organizations (e.g., [31]), researchers (e.g., [16]), and regulators have started to champion legally-required interoperability as one important measure against the negative consequences of network effects. In the context of messaging apps, the two most relevant pieces of recent regulation are the "European Electronic Communications Code" (EECC), and the "Digital Markets Act" [23]. Although both of these are scoped to the European Union while WhatsApp is used across the world, regulation by the EU tends to have extraterrestrial effects that can make it a global standard, such as was the case of the GDPR [38].

The EECC is an EU directive adopted in 2018 which is required to have been transposed into the national laws of each Member State by December 2020, which means it should currently be in effect across the EU. It completely replaces existing regulation for the telecommunications sector to address the changes that have happened in this area since the 1980s, which would cover messaging apps [69]. One of the explicit aims of the Directives is to create a market where there is "interoperability of electronic communications services" [22, article 1(2a)]. However, there are no obligations for messaging apps to support specific interoperability with other apps, and most of the Directive simply instructs the relevant national authorities to "encourage" the use of standards and implementation of interoperability [22, article 39(2)].

The recently proposed Digital Markets Act is a little more forceful. The DMA applies to "gatekeepers", which means providers of "core platform services" that connect a large user base with a large number of businesses which have had more than 45 million users in the EU for the past three years [23, article 3.1 and 3.2]. WhatsApp would fall under this definition of gatekeeper. Article 6.1(f) requires gatekeepers to let users and "providers of ancillary services" to interoperate with the same operating system, hardware, or software features that gatekeepers are able to use to offer their own ancillary services on their platform. This would apply to, for example, the integration of payment services on WhatsApp: Facebook is required to make it possible for alternative payment services to also be used on that platform, which tries to counteract the competitive benefits of bundling software. However, there are no specific obligations that would require that messaging apps facilitate interoperability with direct competitors.

We believe that competition regulation should provide more specific definitions of what interoperability means and what type of functionality should be interoperable between messaging apps. For example, most apps allow users to share media from conversations with contacts in other apps, which could be considered as a way of interconnecting one app with another. However, this would not suffice to break free from network effects, since it forces the user to have both apps. Our data suggest that interoperability measures should be implemented in such a way that users can communicate with contacts in other apps without facing *expression breakdowns* (e.g., by ensuring that the stickers and emojis sent from one app look the same for the receiver) and without losing control over who can contact them where. *How* to achieve this, however, is still unclear—which calls for HCI researchers to study the limitations of interoperable messaging and its impact on interpersonal communication.

Interoperable messaging raises important questions for HCI researchers. On one hand, what is the set of functionality that could be considered "enough" for messaging apps to interconnect? Over the last three decades, research on HCI and computer-mediated communication have demonstrated how the design of technology shapes the way people communicate and relate to others online: Text-based communication allowed for new ways of managing impressions with carefully crafted messages while concealing facial expressions [76]. The introduction of SMS opened the door to a sense of *connected presence* where people could be reached at anytime, anywhere [51]. Status indicators (e.g., "online", "typing") increased expectations of immediacy [44] and brought new privacy concerns [19], but also supported new expressions of social connectedness [56, 61]. Emojis, stickers, and GIFs became popular means for non-verbal communication, which people appropriated to express conversational tone [25], intimacy [40, 90] and cultural norms [47, 55]. Will this knowledge still stand in a scenario where sender and receiver have asymmetrical user interfaces and functionality? For example, HCI research could inform competition regulation by studying whether interoperability of text messages would be enough, or whether other features that mediate social boundaries, relationship maintenance and non-verbal communication should be interoperable as well.

On the other hand, HCI research could explore technical solutions for enabling rich interoperability between messaging apps. Current approaches for interoperable messaging rely on standard protocols, such as matrix.org, an open standard for "secure, decentralised, real-time communication"[2], which supports various messaging apps that provide comparable functionality to market leaders such as WhatsApp, Telegram, or Signal (e.g., Element.io[1]). While standard protocols such as Matrix enable new apps to join a network of interoperable apps, they restrict the interconnected functionality to a fairly fixed set. In contrast to standard protocols, the HCI scholarship proposes interesting approaches to enriching the functionality of a piece of software at runtime, which may inform designs that help communication partners address asymmetries in the functionality of their apps. Such approaches include sending self-contained functionality in the form of *buttons* [53], synchronizing malleable interfaces across all connected users [50, 64], and

re-purposing system-wide services such as keyboards [40], notifications [18], or always-on-top "applets" Brudy et al. [17] to serve app-agnostic functionality. We invite designers and academics to explore these and other novel paths to breaking network effects and enabling freedom of choice among messaging tools.

7 LIMITATIONS

Both of these surveys were conducted after the privacy policy update was announced, which means there is no baseline comparison. The very first measurement was taken one month after the privacy policy, so it is plausible that changes to participants' behaviour and perception had already occurred. The results of this study should be read as focusing on the long-term effects of the controversy.

The list of most frustrating challenges in switching apps identified in Table 7 only cover data from the UK and South Africa, however, we believe they may be also relevant to Spain and Mexico, as well as other countries where people have similar patterns of messaging app use. Spain and the UK have comparable app ecosystem sizes and distributions of regularly and frequently used apps; the same applies to Mexico and South Africa (see Section 5.1.1). Moreover, we found no significant differences across countries regarding how many wanted to move away from WhatsApp and how many managed to do it (see Section 5.2.2).

Compared to the population of the countries included in this study, our sample has a higher proportion of unemployed participants, likely an effect of using an online recruitment platform. Therefore, financial considerations might have played a more relevant role in the centrality of WhatsApp to the participants' communication habits: in all of the countries in this study, WhatsApp is offered by some mobile service providers as part of a "zero rating" package, which means that messaging via WhatsApp is included in the the prepaid or subscription costs.

8 CONCLUSION

We studied how WhatsApp's changes to their privacy policy in January 2021 affected users' communication patterns in WhatsApp and other messaging apps within their ecosystem. We conducted two surveys with more than 1500 users across Spain, the United Kingdom, South Africa, and Mexico. Our results show that, on average, users have five communication apps in their ecosystem, of which one is used very frequently. Roughly 75% of participants were aware of the update to WhatsApp's privacy policy, but very few of them had actually read the entire document. Despite this, however, a quarter of participants wanted to move away from WhatsApp, yet very few of them actually managed to achieve this. While those that wanted to leave WhatsApp showed an increased use of alternative apps over time, their use of WhatsApp stayed roughly the same to accommodate the majority that did not want to switch.

The primary barrier that users experienced when trying to change their use of WhatsApp were based on network effects—their inability to communicate with their desired contacts through other apps. However, learning how to use another app, having to deal with missing functionality, reviewing other apps' privacy policies and losing control over the distribution of contacts across a bigger ecosystem of apps were also important concerns. Interoperability is generally considered to be a promising solution to these problems, but existing and proposed regulation in the European Union falls short of providing specific obligations that could make a meaningful difference.

Working towards a future with interoperable messaging apps requires a multi-disciplinary approach. Technology regulators need to intervene in the market and require more up-front interoperablity obligations, since the current market dynamics have proven incapable of providing these capabilities themselves; technology designers should start taking advantage of existing protocols to provide more decentralised and asymmetric messaging apps; and technology researchers should consider how such designs would affect the way users currently manage their interpersonal relationships, which are born in a technology environment with strong network effects.

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A REASONS FOR CHOOSING OTHER APPS AS GOOD ALTERNATIVES TO WHATSAPP

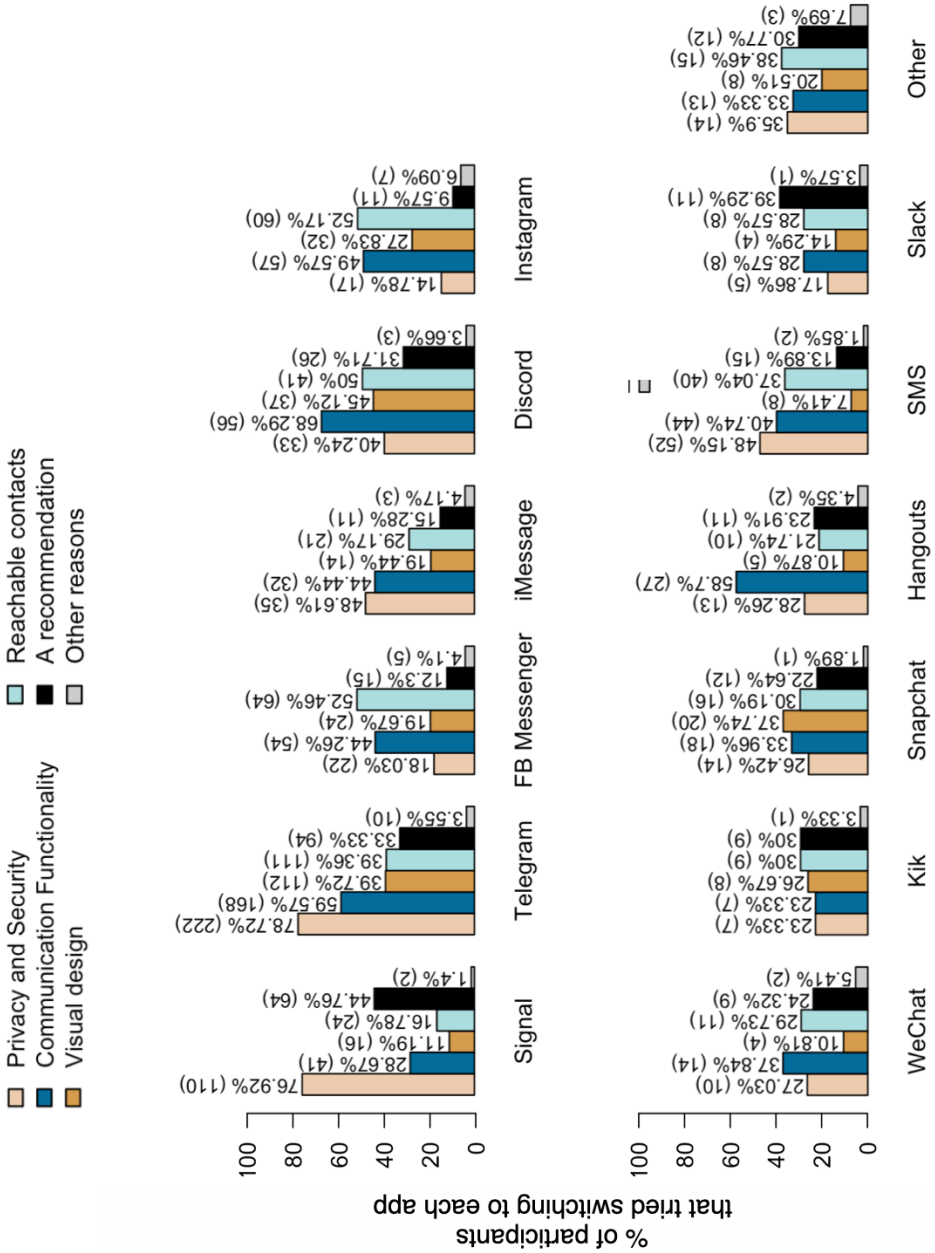

Figure 10: Reasons for choosing each app as a good alternative to WhatsApp. Each bar shows the proportion of the participants that tried that app as an alternative that chose it for each reason. Participants were able to select multiple reasons per app. For example, 76.92% of the participants that tried switching to Signal chose it for its Privacy and Security.

B SURVEY INSTRUMENT

Table 8: Survey questions. The first part collects data about participants' app ecosystems and the second part about their reactions to the WhatsApp's privacy policy update.

Question	Feb	May	Type
How often do you use the following mobile apps?	X	X	Matrix: 14 apps, 5-point frequency scale.
Who do you communicate with in each of the following mobile apps?	X	X	Matrix: 14 apps, 8 types of relationships
Do you use more than one app with the same person? For example, using WhatsApp and Instagram with the same friend	X	X	Closed: Yes, No
How many people do you chat with via more than one app?	X	X	Open, Numeric
What kind of relationships do you have with the people that chat with on more than one app?	X	X	Closed, Multiple Choice: 8 types of relationships
Think of the person that you chat with across the highest number of apps: What's your relationship to that person?	X	X	Closed, Multiple Choice: 8 types of relationships
Were you aware that WhatsApp changed their terms of service and privacy policy before answering this survey?	X		Closed: Yes, No
Have you read WhatsApp's new terms of service and privacy policy?	X		Closed: Yes, I read them all; Yes, I read some parts; No
I am concerned about WhatsApp's new privacy policy and terms of service		X	5-point Likert scale: Strongly agree; Agree; Neither agree or disagree; Agree; Strongly Agree
Did you accept WhatsApp's new terms of service and privacy policy?		X	Closed: Yes, before May 15th; Yes, after May 15th; No / Not yet; I don't know.
The new privacy policy and terms of service made me want to move at least some of my WhatsApp communication to another messaging app		X	5-point Likert scale: Strongly agree; Agree; Neither agree or disagree; Agree; Strongly Agree
I managed to move my WhatsApp communication to another app(s) as much as I wanted		X	5-point Likert scale: Strongly agree; Agree; Neither agree or disagree; Agree; Strongly Agree
How did the change to WhatsApp's terms and privacy policy affect your use of WhatsApp?	X	X	Closed: I uninstalled WhatsApp; I use WhatsApp less often; I use WhatsApp more often; Nothing Changed
How did the change to WhatsApp's terms and privacy policy affect your use of other messaging apps?	X	X	Closed, Multiple Choice: I installed new apps; I use other apps I already had more often; I use other apps I already had less often; Nothing Changed
Did the new terms of service inspire you to install any of these apps or use them more often to try as an alternative to WhatsApp?		X	Matrix: 14 apps, 4 options: I installed this app to try it as an alternative to WhatsApp; I already had this app but tried to use it more often as an alternative to WhatsApp; The new terms of service didn't affect how much / whether I use this app; I installed this app for other reasons
What made you consider these apps as a good alternative to WhatsApp?		X	Matrix: 14 apps, 5 options: Privacy and Security; Communication functionality; Visual design; The contacts I could reach in this app; A recommendation from someone I trust; Other reasons
What were the 3 most frustrating/difficult things about trying to move from WhatsApp to the other app(s)?		X	Open
What kind of challenges did you encounter when trying to move at least part of your WhatsApp communication to another app?		X	Closed, Multiple Choice: 25 types of challenges.