Purpose Mode: Reducing Distraction Through Toggling Attention Capture Damaging Patterns on Social Media Websites

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Social media websites thrive on user engagement by employing Attention Capture Damaging Patterns (ACDPs), e.g., infinite scroll, that prey on cognitive vulnerabilities to distract users. Prior work has taxonomized these ACDPs, but we have yet to measure how the presence of ACDPs impacts perceived distraction nor how mechanisms that suppress ACDPs reduce distraction. We conducted a two-week, mixed-methods field study with 29 participants to model how people get distracted when browsing social media websites, and how ACDPs might play a role. In the first week of the study, we sample participants' *in-situ* perceptions of distraction, subjective perceptions of the browsing session (e.g., satisfaction), and the presence/absence of ACDPs. Participants reported feeling distracted 28% of the time, and that subjective perceptions and some ACDPs (e.g., notifications) highly correlated with when they felt distracted. In the second week of the study, participants were given access to Purpose Mode — a browser extension that allows users to "toggle off" ACDPs. Participants reported feeling distracted only 7% of the time and spent 21 fewer daily minutes browsing these websites. We discovered that Purpose Mode empowered users to feel more in control over their social media browsing and made participants feel less irritated and frustrated.

CCS Concepts: • **Human-centered computing → Empirical studies in HCI**; **Interactive systems and tools**.

Additional Key Words and Phrases: distraction, digital wellbeing, social media, attention capture damaging patterns, adaptable web interfaces

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1 INTRODUCTION

> A wealth of information creates a poverty of attention.
>
> *Herb Simon*

If the multi-trillion dollar attention economy were the Roman Colosseum, its most successful gladiators would be today's massive social media websites — Facebook, X (formerly known as Twitter), YouTube, TikTok, and so on. These websites can provide significant benefits: they can combat loneliness, improve well-being, and accelerate economic productivity [4, 15, 49]. But they can just as well do the opposite: the competition for user attention is fierce, and prior work has shown that these websites employ Attention Capture Damaging Patterns (ACDPs) — i.e., deceptive design patterns (formerly known as Dark Patterns[1]) that prey on people's cognitive vulnerabilities to keep them hooked and engaged, irrespective of their initial intentions [47]. For example, design patterns like video autoplay and algorithmic recommendations can lead users to consume content for much longer than they intended or wanted [10]. Moreover, the use of ACDPs to engage users in mindless content consumption is rarely in the user's best interest — it can waste time, increase regret, and lead users to feel out of control [7, 10, 47]. In short, by participating in modern social media, users get trapped in a web of distractions [48].

Inspired by prior work [47], we define distraction in this work as *a negative draw on users' attention that stems from the deceptive and/or coercive design of digital interfaces*. There is a growing body of literature on modeling attention and distraction in online web browsing and building third-party tools to support "digital self-control." Prior work has shown that addressing distractions online can be complex and context-dependent [26], and that people can be vulnerable to distractions even if there are no explicit ACDPs in place [12]. A recent review of tools that aim to support digital self-control and well-being reveals that there are two broad approaches to building support mechanisms that promote user agency: external and internal. *External* support mechanisms help users manage and monitor their website use and allow them to specify blacklists that lock them out of specific websites [38]. However, the user agency-enhancing effects of external support mechanisms have been found to decrease over time, and users often abandon these tools [13, 30]. Moreover, people are resistant to solutions that require constant self-policing [25, 30, 56]. *Internal* support mechanisms aim to directly modify and/or re-design distraction-inducing user interface elements (e.g., by hiding the newsfeed on Facebook). In the context of mobile applications, prior work has shown that internal support mechanisms can be more effective at improving user agency and supporting more intentional use of social media [37, 64].

Separately, there have been attempts to formally taxonomize ACDPs. This formal codification creates an opportunity for the community to measure the impacts of each of these design patterns on end-user distraction, and to design internal support mechanisms that systematically tackle each of these deceptive patterns in turn. Indeed, prior work studying distractions of social media has treated social media at-large as a distraction source [1, 28, 54]. But, to date, we have little understanding of how specific ACDPs impact perceived distraction, nor how internal support mechanisms designed to address those ACDPs can mitigate these distractions.

Accordingly, in this paper, we aim to answer two key research questions:

- RQ1 How do ACDPs impact users' perceived distraction when browsing social media websites?
- RQ2 How do internal support mechanisms that remove ACDPs affect people's use and experience on social media websites?

[1] https://www.deceptive.design/about-us#:~:text=History,name%20was%20changed%20to%20deceptive

To answer RQ1, we conducted a mixed-methods two-week field study with 29 participants to investigate how specific ACDPs (e.g., infinite scroll), along with other contextual and perceptual factors, correlated with users' perceived distractedness when browsing social media websites. During the study, when our participants were browsing social media websites, we logged a variety of contextual factors, including the presence of specific ACDPs employed on the site. In addition, we asked participants to complete, up to six times a day, ecological momentary assessment (EMA) questionnaires to self-report their browsing experience at the moment. The questionnaire asked participants to reflect on their in-situ subjective user experience on the page (e.g., satisfaction), and if they felt that they were distracted when browsing the page at that moment. Guided by these questionnaires, at the end of the first week, we conducted 45-minute interviews with participants to better understand why they did or did not feel distracted while browsing on social media websites during that week. We collected data for four popular social media websites—Facebook, X/Twitter, LinkedIn, and YouTube.

To answer RQ2, we built a browser extension, Purpose Mode, that allows users to "toggle off" common ACDPs on these social media websites (see Figure 1 and Figure 3). For example, Purpose Mode allowed participants to disable autoplaying videos on YouTube and infinite scroll on Facebook. After the first week of the field study, we had the same 29 participants use Purpose Mode for the second week. Through a mixture of EMA questionnaires and log data, we analyzed participants' experience and use of the tool, as well as its impacts on perceived distraction and the time they spent on these social media websites. At the end of the second week of the field study, we conducted 60-minute exit interviews with all of the participants to allow participants to embellish their EMA responses on how Purpose Mode impacted their browsing experience and use of social media websites.

During the first week of the field study — before participants had access to Purpose Mode — they reported feeling distracted in 28% of the EMA questionnaires they answered. Their subjective perceptions of the browsing experience at the moment, such as a sense of control, were highly correlated with their perceived distractedness, and were more predictive of perceived distraction than contextual measurements (e.g., the presence or absence of most ACDPs, the specific website that they were visiting). While the presence of most ACDPs did not significantly correlate with when participants felt distracted, we found that there was one ACDP — notifications — that had a significant correlation with perceived distraction. Curiously, while most ACDPs did not significantly correlate with reported perceptions of distraction, in interviews with participants where we attempted to understand why they *did* and *did not* feel distracted during the field study, we found that participants often did implicate ACDPs when they felt distracted. One interpretation of this distinction between the qualitative and quantitative results is that participants are habituated to the presence of ACDPs: while these ACDPs don't bother participants most of the time, when they *do* feel distracted, it appears to be because of an ACDP.

We also found that Purpose Mode significantly reduced perceived distraction when browsing social media websites — i.e., participants reported feeling distracted in only 7% of the EMA responses collected during the second week of the study. In addition, by using Purpose Mode, participants spent 21 fewer daily minutes on social media websites on average. Besides mitigating distractions and cutting use time, we also found that Purpose Mode helped participants feel less irritated and frustrated, and increased their sense of control when browsing social media websites. Nevertheless, the tool also sometimes made the websites less usable, and made completing some tasks on social media websites more challenging.

To summarize, our work makes two main contributions:

- Using ecologically valid data collected from a two-week field study and interviews with 29 participants, we constructed quantitative and qualitative models to predict and explain *how* people get distracted when browsing social media websites, and the role of ACDPs therein.
- We built, deployed, evaluated, and open sourced[2] Purpose Mode, a tool that creates a toggle-able ACDPs experience that allows users to remove ACDPs on social media websites. We show that Purpose Mode significantly reduces perceived distraction, and supports users in browsing social media websites in line with their intention.

2 RELATED WORK

2.1 Understanding Distractions and Attention Deceptive Patterns on Social Media

Distraction, or *digital interfaces that a designer uses to exploit and capture attention* [47], has long been a challenge for users to work and browse in digital services. Regarding the harms of distraction, prior works have researched people's attention model and related behaviors when interacting with computers. Cao et al. conducted a large-scale analysis of remote workplace meetings, revealing workers' tendency toward multi-tasking [9]. Prior studies have also studied people's regretful use of social media services and found that users' regrets were often related to their tendency to be distracted, such as being sidetracked from their original intentions and staying on the website longer due to recommendations [11].

Indeed, destructive user interface (UI) and interaction design could induce users' unintentional behaviors [34]. To that end, researchers have taken a closer look at UI design ethics. Gary et al. referred to the UI design elements aiming to deceive end-users as Dark Patterns [20]. Dark patterns have been widely identified in numerous digital service uses, including online purchasing and privacy/security settings [21, 42, 65], and are also common on social media [46]. Prior works have tried to characterize dark patterns in different digital services, such as online shopping and mobile applications, and produced taxonomies to reveal the omnipresence of dark patterns and their harms (e.g., [16, 42, 43]). Many of such dark patterns target potential financial (e.g., purchasing items without users' consent) or security harm (e.g., configuring weak security setups) to users. More recently, researchers also identified dark patterns with intentions to cause "attentional" harm — to maximize time spent on services via drawing users' attention [43]. Monge Roffarello et al. termed these types of dark patterns Attention Capture Damaging Patterns (ACDPs) and conducted a meta-analysis of ACDPs in the literature. The authors identified eleven ACDPs prevalent in digital services, such as social media, online gaming, and mobile applications [47]. While we currently lack a systematic view of ACDPs specifically for social media websites, prior work has studied various types of design patterns manipulating users' attention via digital interfaces relevant to these social media services.

In the context of social media websites, and web browsing more generally, prior works touched on three aspects of a digital interface that can lead to attention stimuli and/or distractions: 1) features and functional elements, 2) content, and 3) layout and visual elements. For each aspect, we review some common design dark patterns employed on social media websites that aim to capture users' attention.

Social media platforms have employed design best practices to provide features that optimize user engagement. Prior work also found that, from end-user perspectives, these features can also induce distractions. *Infinite Scroll* is a notorious example that has been widely adapted on social media websites. The feature facilitates the browsing experience by automatically loading new contents, which is also criticized as distracting as it promotes passive and mindless scrolling [3, 51] and results in endless use sessions [5, 47]. Prior studies also found infinite scroll could harm

[2]https://github.com/hankhplee/purpose-mode

people's mental wellness, such as triggering users' regret of purposeless scrolling [11, 56]. *Notification* is another popular feature that can be abused by services/platforms to "keep users always updated," and has been widely studied on mobile devices [31, 44]. In the context of social media, prior works have found that intrusive notifications without user control could prompt unintentional social media use and lead to frustration [64]. *Autoplay*, a feature for video to play endlessly, is employed on video streaming platforms and social networks for more and prolonged video engagement. Prior works found neverending autoplay compromises user's agency by removing the need for autonomous decision-making [8, 37], leading users to spend time exceeding their expectations [37, 47, 52], and undermine user's control of watching contents [22]. In addition, autoplay is usually activated by default and difficult to deactivate [45].

The playfulness and personalized experience of social media websites rely on their *Recommendations*, which have been substantially investigated from the perspective of effectiveness — e.g., evaluation of prediction accuracy and response time through algorithmic means, and model personalization across platforms [2]. Prior research has found recommendations could also cause extensive use. For example, Chaudhary et al. suggested a long scroll of recommendations on video streaming services overloads users and leads to platform overuse [10]. In addition, Monge Roffarello et al. highlighted the difficulties of blocking recommendations by using third-party tools [47]. *Advertisements*, a mix of promotion and intentionally curated content by digital platforms, have also been identified as an interruptive design as they often disguise themselves as normal news/social feeds [20]. From an attention-capturing point of view, prior works suggest that advertisements promoted via personalized recommendation could distract users from their original intentions by inducing users to click on them [18, 47], slow down information retrieval [18], and ultimately increase the use time and lead to frustration.

Finally, *Interface Layout* was not usually identified as a design dark pattern that captured users' attention (e.g., [47]). The visual appearance of layouts, however, such as color saturation and blurriness, has been shown to influence people's attention. For example, Khan et al. investigated the effect of blurriness on human visual attention, and found that people's attentions tend to be driven by sharp objects on an interface [24]. In the context of web browsing, prior works have created "Reader Mode" or "Reader View" by removing unuseful elements on webpages, replacing font color and size, and replacing background color to provide a calm and consistent browsing experience [19, 32]. Nevertheless, such a feature is only for text-rich webpages (e.g., news articles, blog posts), excluding all pages of social media websites.

Prior work found that people are aware of dark patterns but feel powerless to deal with them [6]. In addition, while there is a steadily increasing body of work focused on developing anti-dark pattern tools [35], there is still little understanding of how people get distracted *in-situ*. Without this insight, we run the risk of building interventions that should work in theory, but do not in practice.

Indeed, people now browse social media websites for various intentions, ranging from leisure to professional uses, and may have different needs for protecting attention resources accordingly. By studying *when* and *why* users get distracted during social media browsing, we can bridge the gap and understand how to design mitigations against ACDPs on social media websites that are actually helpful.

2.2 Digital Well-being Interventions

With growing awareness of self-agency in digital service use, tools for digital well-being have been created to support users' diverse needs of controlling intentional use [38, 39] Prior works have shown the effectiveness of various types of digital well-being and productivity interventions, including monitoring and reminding time use, blocking specific websites, creating immersive browsing, and so on [27, 32, 40, 50, 63]. Notably, Kovacs et al. found that the use time users 'saved' from such tools would likely not be spent on other equally problematic activities, suggesting the value of such

tools in attention-focusing assistance [29]. Nevertheless, the negative side effects and limitations of such self-control tools have also been identified, appealing for further improvement. For example, Mark et al. asked workers to block non-work-related websites via a blocker software for a week, finding that while workers' focus and productivity increased, they were also burdened with higher workloads and stress [41]. Similarly, Lyngs et al. found that while goal reminders and newsfeed removers in social media browsing increased user agency, they could trigger people's annoyance and fear of missing updates [40].

Regarding how an interface design can undermine users' digital well-being, researchers have proposed methods to manipulate interface design on social media to increase self-control agency. For example, Zhang et al. and Lyngs et al. studied the effectiveness of *internal* design mechanism changes (i.e., removing newsfeed) and *external* mechanism supports (i.e., reminders of time spent) to mitigate UX dark patterns on social media, and suggested a better feasibility of using internal design mechanisms to increase user agency [40, 64]. Lukoff et al. developed SwitchTube, a mobile YouTube client providing adaptable interfaces, demonstrating a digital well-being-centered interface design that enhances users' agency on video consumption [36].

Despite emerging attempts to manipulate interface design to support an *overall* user agency and digital well-being, to our knowledge, our work presents the first interventions that put people's *attention resources* at the center. Specifically, we built, deployed, and evaluated in the wild the interventions against ACDPs shared across the four popular but different social media websites — Facebook, X/Twitter, LinkedIn, and YouTube.

3 METHOD

To answer our research questions — how do people get distracted when browsing social media websites (RQ1), and how can we mitigate such distractions through internal support mechanisms (RQ2) — we surveyed the deceptive design patterns used in these websites that aim to make users spend their attention in ways that go against their interests. In this work, we define distractions as *deviate users' attention from their initial intentions or goals* when using social media websites. We selected a set of four popular social media websites: Facebook, YouTube, X/Twitter, and LinkedIn, which have been actively studied in HCI (e.g., [36, 40, 64]), and provide a set of diverse types of social media websites (e.g., YouTube is a video-dominant platform, while LinkedIn is tailored toward professional networking).

3.1 A technology probe to address ACDP on social media websites: Purpose Mode

We built a browser extension, Purpose Mode, with features designed to address distraction-oriented design patterns, in part from Monge Roffarello et al. [47]'s ACDP typology. The typology provides working definitions of deceptive patterns that target users' attention resources.

The first author mapped the ACDPs identified by Monge Roffarello et al. to specific design features on four mainstream social media websites: Facebook, YouTube, X/Twitter, and LinkedIn. In addition, the first author reviewed existing browser extensions to support self-control on these mainstream social media websites, curated and analyzed by prior studies [38, 39]. These existing tools were then qualitatively analyzed through the lens of the ACDPs they aimed to address. The analysis assessed whether a tool targeted the ACDPs identified in Monge Roffarello et al.'s taxonomy, or new distraction-oriented patterns not yet included in the taxonomy. The research team met regularly to discuss the ACDPs identified across the four social media platforms.

In total, we identified seven ACDPs from Monge Roffarello et al.'s typology that were present in all or most of the selected social media websites. These ACDPs were Infinite Scroll, Neverending Autoplay, Guilty Pleasure Recommendations, Disguised Ads and Recommendations, Recapture Notifications, Attentional Roach Motel, and Fake Social

Notifications. Additionally, we identified two distraction-oriented patterns not fully captured in the original typology — Cluttered Layout and Color Saturation. Then, as a group, the research team discussed the potential effectiveness and technical feasibility of addressing each identified design pattern via browser-based interventions, and decided to exclude three of the nine design patterns we identified. We did not include Disguised Ads and Recommendations, because resolving such a pattern requires tremendous Adblocking engineering efforts, and there are already many ad-blocking tools that aim to tackle them. We did not address Fake Social Notifications since removing such a design pattern requires reading into users' contact information in direct messages, which may raise privacy concerns. We excluded Attentional Roach Motel, as such a pattern focuses on canceling and logging out of an account, because we wanted to focus on patterns that users are exposed to in their everyday social media use.

As a result, we created interventions to address six distraction-oriented design patterns mapped and contextualized to X/Twitter, Facebook, LinkedIn, and YouTube: 1) Homepage Infinite Scroll, 2) Video Autoplay, 3) Homepage Recommendations, 4) Notification, 5) Cluttered Layout, and 6) Color Saturation. Note that expanding the ACDP taxonomy was not the main goal of this work, and the two new design patterns we identified on social media websites — Cluttered Layout and Color Saturation — still require further research to validate if they *often lead the user to lose track of their goals, lose their sense of time and control, and later feel regret* to be formally codified as ACDPs [47]. Still, our findings suggest the two design patterns are indeed potential ACDPs. In this paper, for the convenience of conveying deceptive design patterns targeting users' attention that we studied and designed for, we refer to them as ACDPs, specifically in the context of social media browsing. Below, we summarize the definition of each pattern and how Purpose Mode provides the countering intervention, respectively.

3.1.1 Homepage Infinite Scroll. Infinite Scroll automatically loads more algorithmically-curated content when users scroll to the end of a page, especially on the homepage of websites that offer news/social/video feeds [10, 47]. This ACDP has been found to divert users' attention to more mindless browsing [47, 51]. Purpose Mode offers a **Homepage *Finite* Scroll** feature that disables infinite scroll on the homepage of a social media service — i.e., the landing page where users enter these websites — and replaces it with a "Show more" button, which a user has to click on to see more posts (see Figure 1A).

3.1.2 Homepage Recommendations. Guilty Pleasure Recommendations are personalized content suggestions that target users' interests to keep them on the websites beyond their initial intention for navigating to the site [10, 37, 47]. This pattern often goes hand-in-hand with Infinite Scroll — the recommendations targeting users' interests are shown as they scroll down the homepage. Purpose Mode offers a **Hide Homepage Feed** feature, a common approach to support self-controlled use on social media websites [40] — by removing news/social/video posts on the homepage (See Figure 1B).

3.1.3 Video Autoplay. Video Autoplay refers to the ACDP that aims to attract users' attention by automatically playing new videos when the current one finishes (i.e., YouTube), or by automatically playing videos embedded in the news/social feeds once they appear on the screen (i.e., Facebook, X/Twitter, LinkedIn) without any user interaction [10, 37, 47]. To address video autoplay, Purpose Mode offers a **Block Autoplay** feature that fires an automated procedure to disable video autoplay for users (See Figure 3 lower right)[3], which prior work has found to be hidden or inaccessible [10, 47].

[3]By enabling Block Autoplay on YouTube, Purpose Mode helps users toggle off the autoplay through the slider embedded in the YouTube video player; By enabling Block Autoplay on Facebook, X/Twitter, and LinkedIn, Purpose Mode helps users disable the autoplay functionality on the websites via their respective service setting pages.

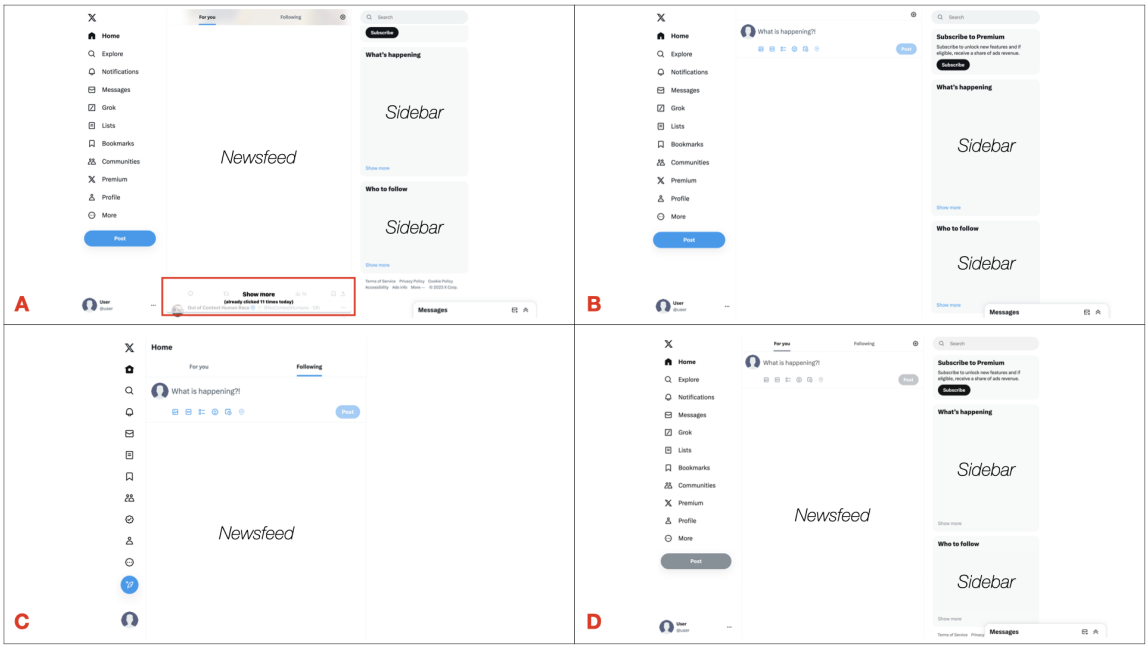

Fig. 1. Mockup of Purpose Mode features on X/Twitter: **A) Homepage Finite Scroll** disables the infinite scroll on the page and replaces it with a "Show more" button (highlighted in red). Users can click on the button to load more posts on the newsfeed. **B) Hide Homepage Feed** removes newsfeed. **C) Compact Layout** removes sidebars and provides a condensed UI. **D) Desaturation** grayscales the page. Purpose Mode works on four popular social media websites, including X/Twitter, Facebook, LinkedIn, and YouTube.

3.1.4 Notification. Notifications are sent to users, regardless of their current activities/actions on the websites, to capture their attention for additional engagement on the websites, ranging from others' activities on social networks, to promotions of content that the users have never interacted with [37, 47]. Purpose Mode provides users with a **Hide Notifications** feature that disables all visible notifications (e.g., in-app notifications and visual cues for updates and messages) on supported websites.

3.1.5 Cluttered Layout. Cluttered Layout is a design pattern not covered in the original ACDP taxonomy, in which peripheral content and interactive elements — not directly related to the "main content" of a webpage — compete for user attention. Popular web browsers like Brave, Safari, and Firefox offer a "Reader Mode" feature to simplify the presentation and layout of a webpage by removing visual clutter to improve readability. However, this feature is only available for very few text-rich pages (e.g., news, blog posts), and creates a frictional and disoriented browsing experience due to a considerable change to the interface [19, 32]. Enhancing the concept Reader Mode, Purpose Mode provides a **Compact Layout** feature that seamlessly transforms a cluttered social media webpage into a de-clutter one by removing peripheral content, enabling users to focus only on the main content. On X/Twitter, we define the main content as the thread of news/social feeds centered on the page, and the feature removes the page's sidebars (e.g., 'Who to follow'). The feature also replaces the navigation bar's buttons with icons requiring less screen space (see Figure 1C). Similarly, on Facebook and LinkedIn, we define the main content as the news/social feeds, such that the feature only

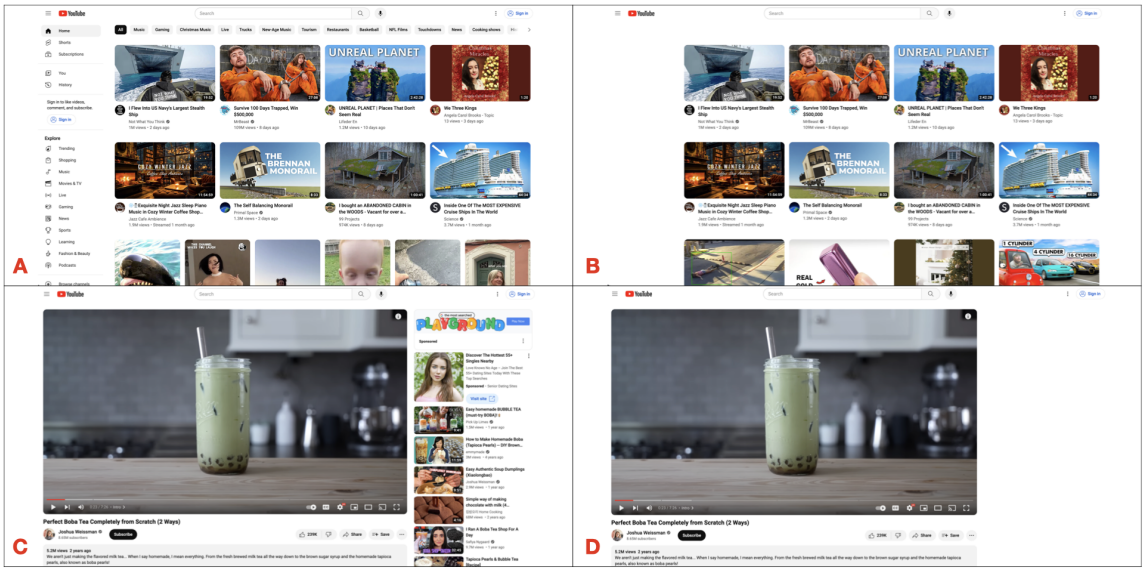

Fig. 2. With and without the Compact Layout (CL) feature enabled on YouTube: A) Without CL on the Homepage. B) With CL on the Homepage. C) Without CL on the Video page. D) With CL on the Video page.

keeps the essential buttons to use the website (e.g., direct messages) and removes the sidebars (e.g., the contact catalog) and news/profile recommendations to create a condensed and de-cluttered page.

For YouTube, we define the main content as the video feeds centered on the page. The feature removes the page's sidebar (e.g., the subscription list) and recommended/promoted content (e.g., Shorts) (see Figure 2B). In addition, on pages where the user watches videos (Video pages) (see Figure 2D), we define the main content as the video being played. The feature removes the page's sidebar (e.g., recommended videos) and comments. During our pilot testing, however, we learned that some users also see the comments as part of the main content — accordingly, we provide an option for users to keep the video comments when browsing in Compact Layout on Video pages.

3.1.6 Color Saturation. Saturated colors, while they have not formally been seen as an ACDP in the literature, have long been used as stimuli for technology use and engagement (e.g., colorful icons and images). In an empirical longitudinal study, prior work has found that by "grayscaling" phone interfaces, participants reduced social media use [23]. In addition, browser extensions like Grayscale the Web[4] use grayscale as a solution to reducing excessive web browsing. Accordingly, Purpose Mode offers a **Desaturation** feature, which grayscales the whole webpage when users visit the four supported social media websites (see Figure 1D).

3.2 Purpose Mode Implementation

Purpose Mode was implemented as an extension for Chromium-based browsers (e.g., Chrome, Brave). We used CSS selectors to locate and modify webpage elements deemed relevant to a given feature. Note that Purpose Mode only modifies the layout of the webpage and does not affect the content — e.g., the algorithmically-curated content feeds to which users were exposed. Each feature provided by Purpose Mode could be separately configured across websites

[4]https://chromewebstore.google.com/detail/grayscale-the-web-save-si/mblmpdpfppogibmoobibfannckeeleag

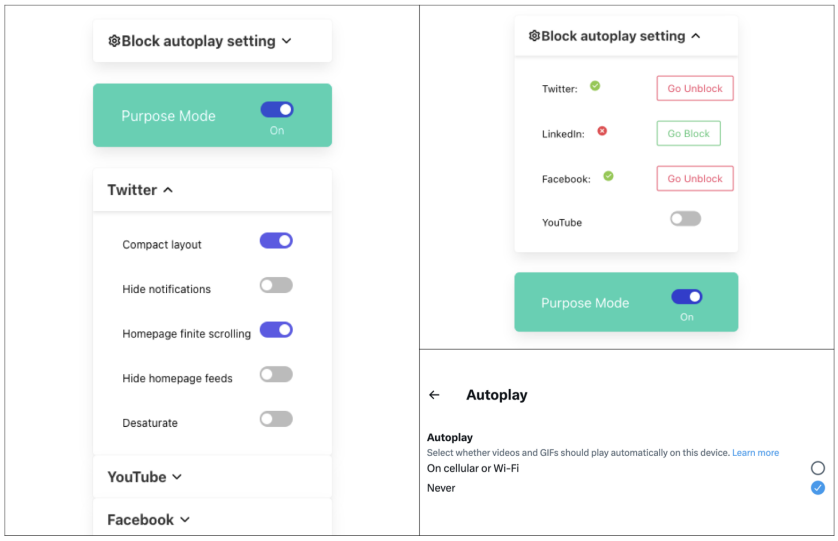

Fig. 3. In Purpose Mode, each feature can be enabled/disabled separately for each supported website. Changes are applied to the webpage in real-time (left), except for Block Autoplay (upper right), because the feature will guide users to the service setting page and automatically turn off/on autoplay functionality (lower right, example of X/Twitter).

— e.g., a user could enable Compact Layout on Facebook but not on YouTube. Users could configure Purpose Mode through a popup interface that is rendered when clicking on the extension icon in their browsers (see Figure 3).

3.2.1 Ecological Momentary Assessments (EMA). Through the browser extension, we also collected ecological momentary assessments (EMAs) to prompt our participants to reflect on perceived distractions in-situ as they were browsing one of the supported social media sites — Facebook, LinkedIn, YouTube, and/or X/Twitter. Up to six times per day, and with at least an hour between prompts, participants would be prompted to complete a questionnaire if they had visited one of these sites for at least 30 seconds. Prompts were delivered via in-browser notifications and through the extension icon. The EMA questionnaire asked for self-reported objective and subjective measures related to the participant's most recent visit to one of the supported social media websites. For example, we asked participants about *why* they initially navigated to the website, and their sense of satisfaction with the browsing session. To refresh participants' memory, the questionnaire first presented a screenshot of the webpage they viewed, which was the subject of the questionnaire (see Figure 4). These screenshots were discarded once participants submitted their EMA prompts for privacy reasons. To ensure that we only collected reactions to browsing activities that were fresh on participants' minds, the questionnaire could only be answered within five minutes of participants first receiving the notification. Each EMA questionnaire consisted of five multiple-choice items and two free-text response questions (See Table 1).

[5]We provide detailed explanations and examples for each browsing intention option in the EMA questionnaire: Finding: Looking for specific facts or information (e.g., weather, location); Researching/ Information gathering: Researching some broader topic (e.g., job hunting, planning a vacation); Browsing: Pure browsing out of personal or work-related interest with no specific goal in mind (e.g., for self's routine/habit/passing time/entertainment); Communicating (e.g., messaging, blogging and posting updates)

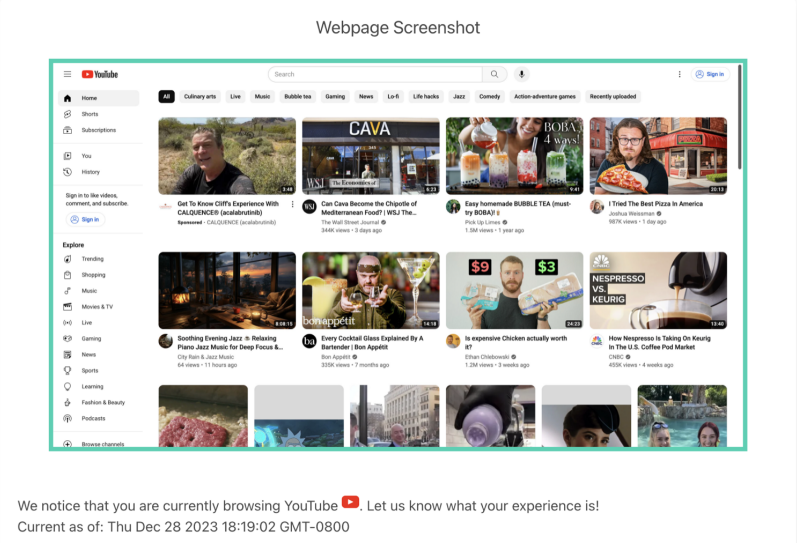

Fig. 4. An EMA prompt with the webpage screenshot.

Our research team internally piloted and tested Purpose Mode throughout the development process on two of the most popular Chromium-based web browsers — Google Chrome[6] and Brave[7]. Purpose Mode works the same on both browsers. We also tested Purpose Mode in a one-week pilot study with six participants to ensure the system was robust across a range of real-world browsing scenarios before we ran the full study.

3.3 User Study

We conducted a mixed-methods study with 29 participants consisting of: i) a two-week-long field study in which participants installed Purpose Mode and answered up to six EMAs per day to contextualize their use of Purpose Mode and their in-situ perceptions of distractedness in, agency over, and satisfaction with their browsing experience; and ii) two semi-structured interviews with one at the end of the first week and the other at the end of the second week of the field study, respectively (See Table 2). The first interview explored contributing factors to participants' perceptions of distractedness in their social media browsing experiences, and the second examined whether Purpose Mode features impacted these perceptions and their use of social media websites.

To answer **RQ1** — how do the users' browsing context and subjective perceptions of the website, correlate with their perceptions of distractedness when browsing that website — we created explanatory regression models correlating participants' ratings of perceived distractedness with two sets of factors:

Browsing Context: users' specific browsing context, including the presence of ACDPs on a webpage, the site being browsed, time, days of the week, and their self-reported browsing intention.

Subjective Perceptions: users' self-reported perceptions of how their use of the website instilled a sense of agency, satisfaction, and goal alignment [36].

[6]https://www.google.com/chrome/
[7]https://brave.com/

Table 1. Ecological Momentary Assessments Questions

	Questions	*Scale / Response*
Browsing Intention Description	Please briefly describe what you are currently doing on [the site]:	[free texts]
Browsing Intention	Which of the following best describes your purpose for browsing [the site] at the moment:[5]	• Finding • Researching/Information gathering • Browsing • Communicating • Other [free texts]
Distractedness	Reflecting on your current browsing experience on [the site]: Do you find this page distracting for the purposes of you browsing [the site] at the moment?	• Yes • No
Distractedness Explanation	Please explain what things about [the site] lead you to feel distracted OR not distracted (based on the last question)	[free texts]
Agency	How much do you feel out of or in control?	1: Very out of control 2: Out of control 3: Neither out of nor in control 4: In control 5: Very in control
Satisfaction	How much do you feel dissatisfied or satisfied?	1: Very dissatisfied 2: Dissatisfied 3: Neither dissatisfied nor satisfied 4: Satisfied 5: Very satisfied
Goal Alignment	How much does the current browsing experience conflict with or support your personal goals?	1: Very in conflict 2: In conflict 3: Neither in conflict nor supported 4: Supported 5: Very supported

Table 2. Study Timeline

	Start	**Week 1**	**End of week 1**	**Week 2**	**End of week 2**
Purpose Mode Setup	Install the browsing extension	Disable all features	Enable all features	Enable/disable features freely	Uninstall the browser extension
Study Activities	Study onboarding	Answer EMAs	1st interview	Answer EMAs	2nd interview

Moreover, to help contextualize our regression results, we analyzed participants' responses to the first semi-structured interview.

To answer **RQ2** — how do Purpose Mode features affect participants' use and experience on social media websites — we first analyzed participants' log data to understand how they used each feature during the study, e.g., time spent with each feature. Then, we analyzed participants' EMA responses and the second semi-structured interviews conducted

after participants used Purpose Mode for a week to understand how the tool mitigates distractions, as well as other effects on their social media browsing.

3.3.1 Field Study Data Collection. To model the relationship between a user's browsing context, their subjective perceptions of a webpage, and their perceptions of distractedness while browsing that webpage, we collected the following data from each EMA prompt.

Perceived Distractedness. Drawing from prior art on damaging design / dark patterns (See Section 2.1), we define "perceived distraction" in this work as *the negative attentional impacts on users due to digital interfaces that a designer uses to capture users' attention* [47]. Given this definition, we operationalize "perceived distractedness" as users' self-perception that their attention deviated from their original browsing intention on social media websites. We used a binary construct to measure perceived distractedness to simplify participants' self-reporting during the field study. Doing so served the purposes of our research goals: to understand when and why people feel distracted when browsing social media.

We also consider other relevant user experience constructs that prior work used to model users' digital well-being, such as agency and satisfaction [36, 40, 64]. These experiences are independent of users' perceived distractedness on social media websites. For example, a user may feel satisfied while reading their social media feeds, yet still be distracted by ads displayed on the side; a social media interface might offer little user control without necessarily distracting them from communicating with their contacts and reading job postings. Nevertheless, we hypothesize that these factors influence users' perceived distractedness given their strong connection to digital well-being and self-control (see Subjective Perceptions below).

Browsing Context. As mentioned, browsing context includes the presence of ACDPs, as well as users' context and browsing intention.

The presence of ACDPs: When Purpose Mode sent out an EMA questionnaire for participants to answer, it also recorded, via CSS element selectors, if any of the ACDPs described in Section 3.1, existed on the webpage. Each of the ACDPs was encoded as a binary variable. For example, a webpage: *has homepage infinite scroll* when a user is on the homepage of a social media website and has not enabled the Homepage Finite Scroll feature; *has homepage recommendations* when a user is on the homepage and has not enabled Hide Homepage Feed; *has video autoplay* when there is at least an embedded video on the page and the user has not enabled the Block Autoplay feature; *has notification* when there is at least one notification on the page and the user has not enabled Hide Notifications; and, *has cluttered layout* and *has saturated colors* when the user has not enabled the Compact Layout and Desaturation features, respectively.

Context: In addition, we collected a range of variables to capture factors outside of the website design that might impact a user's perceptions of distractedness, including time of day, whether it was a weekend day, and the site they were visiting. Prior work has found that users perceived different levels of interruptions from technologies (e.g., mobile notifications) depending on their contexts, such as their activities at hand and the time of the day [17, 44, 58].

Browsing intention: We also asked participants to self-report their main browsing purpose at the time when they were visiting one of the supported webpages. We provided participants with a set of pre-defined common web browsing intentions applied to social media websites from prior work [53]: *Fact finding and looking for specific information, Information gathering and researching some broader topic, Pure browsing for self's routine/habit/passing time/entertainment,*

Communications, and *Other (free text)*. Through a post-hoc analysis, we categorized free-text answers into the aforementioned categories when appropriate (e.g., labeling "looking for specific items in a free item group" as *Fact finding and looking for specific information*).

Subjective Perceptions. Prior studies have measured and analyzed subjective perceptions to model users' sense of self-control and digital well-being in their use of digital technology [36, 40, 64]. Following this prior work, we selected the three subjective measurements concerning users' in-situ user experience when using social media websites — their sense of **agency** over their browsing experience, **satisfaction** with their browsing experience, and **goal alignment** between their browsing experience and their original intention for browsing. We hypothesized that these subjective perceptions would correlate with their perceived distractions on the websites.

Usage Logs. Beyond participants' responses to EMAs, Purpose Mode also recorded usage logs, which we used to tabulate meta-information about users' browsing sessions and configuration of the tool — e.g., the amount of time a user spent on each supported social media website, the number of toggles of each feature.

3.3.2 Interviews. To better understand *why* users get distracted when browsing social media websites (RQ1), as well as how Purpose Mode mitigates perceived distractions and affects the use of the websites more generally (RQ2), we conducted two semi-structured interviews with each participant.

The first interview occurred at the end of the first week of the field study — before participants had the opportunity to use the features provided by Purpose Mode. We used participants' field study EMA responses to guide the interview, asking them to expand on their questionnaire responses (e.g., Why did you think [the site] is/is not distracting at the time?). The interview lasted roughly 30-45 minutes, covering at least two responses (when applicable) for each supported website the participant used during the study period. To refresh participants' memories, we showed participants their EMA questionnaire responses associated with a specific line of questions as we interviewed them, and asked questions that helped interviewees contextualize and recall the browsing experience (e.g., "What were you doing on [the site]?").

The second interview occurred at the end of the second week of the field study — after participants had a week of experience using Purpose Mode features. We asked participants to walk us through if, and how they used each feature. We also showed participants aggregated statistics compiled from their usage logs (e.g., time spent on a website with a specific feature enabled). The interview centered on questions about participants' experiences with the specific features provided by Purpose Mode (e.g., "Can you elaborate on why you chose to disable the Desaturation feature for YouTube?"). When applicable, we also sought to gauge participants' perceptions on how their browsing behaviors on social media websites changed because of the use of Purpose Mode features (e.g., "How did your use of the Homepage Finite Scroll feature affect your browsing on Facebook?"). The second interview lasted 45-60 minutes.

3.4 Study Procedure and Recruitment

We recruited participants by advertising on the research team's social network profiles (e.g., X, LinkedIn, Facebook) and from a local university. We recruited 30 participants in total, but one of them (P24) terminated their participation shortly after the study began. The remaining 29 participants (15 men, 12 women, and two non-binary) who participated throughout the two weeks of the field study came from diverse age groups (M=28.97; SD=7.66) and backgrounds (see Appendix Table 6). Because Purpose Mode was built and tested on Google Chrome and Brave, for system reliability, we only recruited participants who use Google Chrome (N = 17) or Brave (N = 12) as their primary web browser. Participants received up to $42.50 in compensation for participating in our study: $0.30 for each EMA prompt to which

they responded during the two-week field study (6 per day for 14 days, up to $25.20), and $10 for each of the two interviews. Finally, we received informed consent from participants to video and audio record both interviews. The audio recordings were later transcribed for data analysis in a de-identified manner. The study protocol was approved by an IRB.

Our study was fully remote (see Table 2 for an overview of the study timeline). Participants first attended an onboarding meeting with the research team, in which we introduced the study and installed Purpose Mode on their browsers. We also provided a tutorial on our EMA to ensure participants understood how to answer each question accurately (see Section 3.2.1). Specifically, we clarified that "distraction" in this study referred to having their attention unwittingly drawn to elements on the website that made it difficult to concentrate, that caused them to spend more time than intended on the social media website, or otherwise caused them to lose control of their browsing. To further contextualize their responses, we asked participants to specify their browsing intentions at the start of each EMA questionnaire (see Table 1). Based on participants' responses in the interview studies (see Section 3.3.2), we are confident that this approach enabled all participants to accurately report and elaborate on their perceived distractedness as defined for this study.

For participants who actively used more than one browser profile (P9, P23, P30) or device (P10, P26), we installed Purpose Mode on each of the browser profiles or devices as the installed browser extension would not be automatically shared across profiles/devices[8].

The first week of the field study was meant for baselining participants' social media use and perceptions of distractedness. As such, participants were not introduced to features provided by Purpose Mode, and all features were disabled to ensure an unbiased assessment of their typical social media behavior. This first week started immediately after the onboarding meeting. At the end of the first week, all participants finished their first interview, where the research team also introduced, demonstrated, and set up Purpose Mode features. To ensure our participants understood and used each of these features, they were asked to enable all features in Purpose Mode on the social media websites they regularly visited (e.g., a participant who regularly visited X would be asked to enable all the features on X). They were also told that it was not mandatory to use any of the features during the study period — they could use only the ones they wanted to use. At the end of the second week, all participants returned for their second interview. After the interview, the research team removed Purpose Mode from their browsers and provided compensation.

3.5 Analysis

We had three data streams to analyze to answer our RQs. First, we collected 1,025 EMA responses from our participants throughout the field study. These responses comprised of, for example, participants' in-situ perceptions of distractedness. Second, we had interview transcripts for both the first and second interviews for 29 participants. These transcripts comprised of, for example, *why* participants felt distracted within a given browsing experience, and why they enabled or disabled a specific feature provided by Purpose Mode. Third, we had telemetrically collected usage logs that comprised of, for example, how long participants spent on supported social media websites before and after they were able to access the features provided by Purpose Mode, We employed a mixed-methods analysis on these data streams to answer our two RQs.

[8]In the data analysis procedure and results described later, data points from the same participant but different profile/device will be given the same Participate ID; however, for clarity, we will present log data of different profile/device separately for the rest of the paper.

3.5.1 Quantitative Analysis. Out of the 1,025 EMA responses we collected from our participants, we removed eight records that participants self-reported as inapplicable for analysis — i.e., instances where they were not paying attention to the screen, or were waiting for the page to be fully loaded. Our final dataset consisted of 1,017 EMA responses, or about 35 responses per participant on average (sd=19.3).

To model the relationship between browsing context and subjective perception factors to participants' perceived distractedness, we fit three random-intercepts logistic regression models: the Context Model (i.e., all Browsing Context factors in Section 3.3.1), the Perception Model (i.e., all Subjective Perceptions factors in Section 3.3.1), and the Combined Model (i.e., both Browsing Context and Subjective Perceptions factors). For all three models, we also added a main effect of whether participants *have access to Purpose Mode features* to account for the difference between the first and second week of the field study that will affect their perceived distractedness due to the use of the tool. To account for repeated measures, we included Participant ID as a random intercept term. For all categorical variables (e.g., Browsing Intention), we selected the most common factor level as the baseline reference. We pre-registered our random-intercepts logistic regression analysis using AsPredicted[9] before collecting and analyzing the dataset.

3.5.2 Qualitative Analysis. Guided by our research questions, we conducted open coding (e.g., [14]) on participants' explanations of i) why they were or were not distracted on the webpage, ii) how and why Purpose Mode was helpful (or not) in mitigating distractions, and the browsing behavioral changes due to the use of Purpose Mode.

Two researchers together performed the initial coding on the transcripts of four of the first-week interviews and four of the second-week interviews. They iteratively constructed a codebook in active discussion with other research team members. Two additional researchers joined the coding process when the initial codebook was constructed. These two other researchers were trained with the initial codebook and independently coded the eight interviews on which the initial codebook was built. The codes were then iteratively refined and discussed when disagreements occurred until all researchers agreed on all of the codes in the codebook. The four researchers coded the remaining 50 interviews (25 first-week interviews; 25 second-week interviews), with 12 of them (six first-week interviews; six second-week interviews) double-coded by at least two researchers to ensure the codebook was consistently applied. All research team members regularly met and discussed emerging themes during the coding process. In this paper, we present the key themes guided by our research questions, and include the codebook in Appendix Table 7.

4 RESULTS

4.1 How do people get distracted when browsing social media websites? (RQ1)

We answer RQ1 by looking into *when* (Section 4.1.1) and *why* (Section 4.1.2) people got distracted when browsing social media websites. Through our quantitative modeling analysis of *when* users got distracted, we found that users' sense of agency and satisfaction strongly correlated with their perceived distractedness when browsing social media websites. We also observed smaller, but still significant, correlations between their perceived distractedness and contextual factors such as ACDPs and browsing intentions. We qualitatively analyzed interview transcripts to understand *why*, and identified reasons that users got distracted based on their browsing experience with respect to their perceptions and attitudes toward distracting elements on webpages, and browsing intentions alignment.

[9]Access our analysis pre-registeration on https://aspredicted.org/TNT_J6D. We slightly deviate from the pre-registration by adding the factor to consider whether a participant *has access to Purpose Mode features* to account for the difference between participants' first and second week of the field study, and may affect their perceived distractedness.

4.1.1 When do ACDPs, browsing context, and perceptions of agency, satisfaction, and goal alignment correlate with users' perceived distraction? During the study period, each of our participants used at least two of the four social media websites, and on a daily average, spent 1.96 hours (sd = 4.45) browsing these websites (see Appendix Table 8). When browsing social media, participants reported feeling distracted in 19% (193) of the EMA responses (per participant: mean=20.5%, sd=10.7). However, we observed a stark difference in perceived distractedness with versus without access to Purpose Mode — participants reported being distracted for 27.9% of EMAs reported in the first week (when they did *not* have access to Purpose Mode), versus 7.1% in the second week (when they *did* have access to Purpose Mode). Indeed, in all three models we fit — Context, Perception, and Combined Models (see Table 3) — whether a user *has access to Purpose Mode features* has significant main effects in predicting their perceived distractedness, suggesting that the use of the tool could mitigate distraction when browsing social media websites. We provide more discussion in Section 4.2.2.

Besides having access to Purpose Mode features, to examine how well the ACDPs, along with other browsing context and perception factors, correlated with participants' perceived distractedness, we first compared model fit across the three models — Context, Perception, and Combined.

Model Comparisons: Context, Perception, and Combined. Overall, users' perceptions of agency, satisfaction, and goal alignment were more predictive of their perceived distractedness than context factors. Table 3 summarizes the results from the three models we fit. For independent variables captured on a 5-point Likert-scale (i.e., agency, satisfaction, goal alignment), a positive coefficient implies that the log odds that a participant's perceived distractedness is predicted to increase for every one-point increase above the neutral score (3); a negative coefficient implies the opposite. For categorical and binary factors (i.e., ACDPs, browsing intention, site being browsed), the model coefficient presents the predicted difference in log odds that a participant reported feeling distracted for a given factor level relative to a baseline level ('false' for binary factors). Positive coefficients would imply an increased probability of feeling distracted relative to the reference level and vice versa.

Table 3 shows the pseudo-R^2 value for each model, with higher values indicating better model fits. Our results show that the Perception Model — the model with only subjective perception factors (R^2=0.71) — explained much more of the variance in users' perceived distractedness than the Context Model — the model with only browser context factors (R^2=0.33). In addition, when the perceptions and context factors were all included in a single Combined Model, the fit (R^2 = 0.72) increased only modestly when compared to the Perception Model. Nevertheless, measuring context factors does not require direct human-in-the-loop assessments, and thus, it is worth exploring factors predictive of perceived distractedness in the Context Model.

In the Context Model, we found unique main effects for the presence of specific ACDPs and the site being browsed. Each ACDP factor is a binary measurement — i.e., whether the webpage contained that ACDP or not. ACDPs with positive main effects suggest that users were more prone to being distracted when encountering them on the webpage. We observed a significant main effect for *Has Notification* (b = 0.68) and a marginal main effect for *Has Cluttered Layout* (b = 0.75), indicating that the presence of these two ACDPs on a page correlates with an increased perception of distractedness (See Table 3). One explanation for why participants felt distracted on webpages with notifications and cluttered layouts is because both ACDPs expose the user to out-of-band information that may be unrelated to the

[10]The model failed to converge when we first fit. To resolve this issue, when fitting the Perception Model, we centered the three subjective user experience factors with their means rather than their neutral scores (3), thus yielding a lower intercept.

Table 3. Non-standardized coefficients of the mixed-effects logistic regressions modeling users' perceived distractedness against contextual, perceptual, and combined factors.

Model	M (SD) / Distribution	Context	Perception	Combined
(Pseudo) r square/ conditional r square		0.33	0.71	0.72
Intercept		**-2.17*****	**-1.90**^{***10}	0.45
Has access to Purpose Mode features	42.97%	**-1.14****	**-1.01*****	**-1.23****
Browsing Context Factors				
Browsing Intention				
Pure Browsing	59.00%	0 r		0 r
Communication	9.73%	-0.45		0.40
Fact Finding	19.17%	-0.04		0.16
Information Gathering	12.09%	0.06		0.49
Site				
YouTube	51.92%	0 r		0 r
Facebook	20.85%	**0.71****		0.18
LinkedIn	15.83%	0.41		0.09
X/Twitter	11.41%	**0.78***		0.22
Time (hour)	14.40 (6.63)	-0.02		-0.01
Is Weekend	27.14%	-0.11		0.14
Attention Capture Damaging Patterns				
Has Autoplay Video	32.74%	-0.16		-0.11
Has Notification	29.89%	**0.68****		**0.72***
Has Homepage Recommendations	33.14%	0.53		0.56
Has Homepage Inifinite Scroll	25.57%	0.25		-0.11
Has Cluttered Layout	70.50%	**0.75**$^{+}$		-0.47
Has Saturated Colors	90.46%	-0.34		-0.17
Subjective Perception Factors				
Agency	4.02 (0.85)		**-0.99*****	**-1.01*****
Satisfaction	3.79 (0.91)		**-1.39*****	**-1.33*****
Goal Alignment	3.70 (0.92)		**-0.46***	**-0.46**$^{+}$

Significance: $^{+}$p<.1; *p<.05; **p<.01; ***p<.001; r: reference

task at-hand (e.g., 'trending topics' promoted on the sidebar, or notifications about something different than what is presently on the page). More qualitative insights will be discussed in Section 4.1.2.

For the Site factor, we selected the most common social media site in our dataset — YouTube — as the baseline reference level. We observed two significant factor levels in the Context model: Facebook (b = 0.71) and X/Twitter (b = 0.78), suggesting that participants reported feeling more distracted on those sites when compared to YouTube. One explanation for this finding is that, relative to LinkedIn and YouTube, Facebook and X/Twitter have a greater range and diversity in their site purposes, offering more opportunities for distraction in turn. For example, beyond its social newsfeed, Facebook has a marketplace, instant messaging, and community groups.

Since the Combined Model was the most predictive, we focus much of the remainder of our analysis on the factors that were found to be significant in the Combined Model.

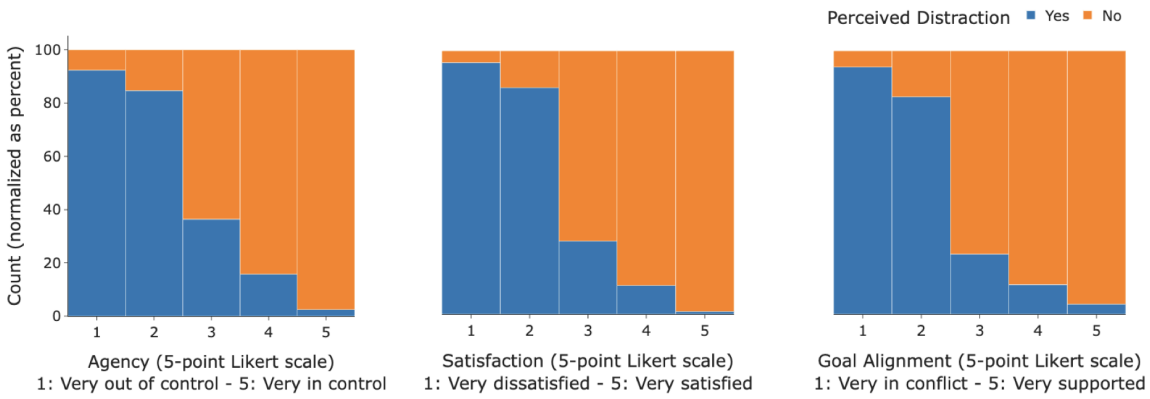

Fig. 5. Distribution of perceived distraction (%) as they varied by self-report perception measurements: agency, satisfaction, and goal alignment. Higher agency, satisfaction, and goal alignment with an increased perceived distractedness.

Factors that predict perceived distractedness. When including all of the factors we measured in the Combined Model, we found that subjective perception factors most strongly correlated with users' perceptions of distractedness (see Table 3). We discuss each significant factor below.

Subjective Perceptions: Users' perceptions of agency ($b = -1.01$), satisfaction ($b = -1.33$), and goal alignment ($b = -0.46$) highly correlated with how distracted they felt when browsing a social media website. In particular, as might be predicted from prior work on measuring well-being in technology use [36, 40, 64], users felt less distracted when they experienced higher levels of agency, satisfaction, and goal alignment. Figure 5 shows this inverse relationship: as users' self-reported sense of agency, satisfaction, and goal alignment decreased, their perception of distractedness increased.

Browsing Context: In the Combined Model, the only significant main effect among browsing context factors was for the ACDP of *Notification* ($b = 0.72$) — i.e., users are generally more likely to feel distracted when a social media page contains notification(s). The main effects we found in the Context Model, i.e., Site being browsed and the *Cluttered Layout*, did not have significant effects on perceived distractedness when controlling for people's perceptions of agency, satisfaction, and goal alignment in the Combined Model.

Thus, a reasonable follow-up question might be: does browsing context, then, correlate with people's perceptions of agency, satisfaction, and goal alignment? If so, then this measurable context may at least have an indirect effect on users' perceived distractedness.

To answer this peripheral question, we modeled the relationship between browsing context factors with subjective perception factors (i.e., agency, satisfaction, goal alignment) by fitting three random-intercepts ordinal logistic regression models, accounting for repeated measures with a random-intercept term for Participant ID. Since we did not pre-register this analysis, we employed Bonferroni correction with a total of 30 hypothesized predictors among the three models — i.e., .05/30 = .0017. Thus, we only highlight the effects of factors with p<.0017. Table 4 summarizes the three models we fit — Agency, Satisfaction, and Goal Alignment.

Overall, the significant main effects of browser context — i.e., browsing intention, the site being browsed, and the presence/absence of ACDPs — on subjective perceptions of agency, satisfaction, and goal alignment were shared across all three models.

Table 4. Non-standardized coefficients of the mixed-effects logistic regressions modeling users' perceived agency, satisfaction, and goal alignment against contextual factors.

Browsing Context \ Perceptions	**Agency**	**Satisfaction**	**Goal Alignment**
DV 5-Likert distribution (1: 2: 3: 4: 5)	13: 52: 121: 545: 286	22: 57: 249: 478: 211	16: 57: 357: 375: 212
McFadden pseudo r square	0.08	0.09	0.09
Browser Intension			
Pure Browsing	0 r	0 r	0 r
Communication	**1.22*****	**1.37*****	**1.31*****
Fact Finding	0.34	0.28	0.34
Information Gathering	0.57*	0.50*	0.67**
Site			
YouTube	0 r	0 r	0 r
Facebook	**-0.85*****	**-1.06*****	**-0.75*****
LinkedIn	-0.71**	**-0.93*****	-0.06
X/Twitter	**-0.90*****	**-1.17*****	**-0.97*****
Time (hour)	0.00	0.12	0.07
Is Weekend	0.29	0.11	-0.03
Attention Capture Damaging Patterns			
Has Video Autoplay	-0.11	0.10	0.05
Has Notification	-0.24	-0.52**	-0.28
Has Homepage Recommendations	-0.11	-0.22	-0.25
Has Homepage Infinite Scroll	-0.46	-0.36	-0.45
Has Cluttered Layout	**-1.71*****	**-1.84*****	**-1.59*****
Has Saturated Colors	-0.24	-0.11	-0.31

Significance: $^{+}$p = .05; *p<.05; **p<.01; ***p<.001; r: reference

For ACDPs, we found significant negative main effects for *Has Cluttered Layout* (b =-1.17, -1.84, -1.59) in all three models, indicating that users tend to feel less in control, unsatisfied, and misaligned with their browsing goals when browsing a social media page with a cluttered layout. For browsing intention, we found a significant main effect for *Communication* in all three models (b =1.22, 137, 1.31), indicating that, compared to when users are browsing for the sake of browsing (*Pure Browsing*), when users were sending messages or writing posts/comments, they were more likely to feel in control, satisfied, and aligned with their goal of using the site. Finally, for the site being browsed, we found significant negative main effects for all social media sites outside of the reference level (YouTube). In other words, as compared to browsing YouTube, when users browsed Facebook, LinkedIn, and X/Twitter, they reported feeling less in control, less satisfied, and less aligned with their browsing goals.

In sum, we found that while one ACDP directly correlated with users' perceptions of distractedness on social media websites (i.e., notifications), users' in-situ perceptions of agency, satisfaction, and goal alignment were the strongest overall predictor of whether or not they felt distracted. These subjective perceptions, in turn, could be heightened by the presence of another ACDP (i.e., cluttered layout) as well as users' browsing intention and the social media site they were browsing.

4.1.2 Why do users get distracted when browsing social media websites? Key elements of perceived distractedness. We analyzed the semi-structured interviews to understand why participants felt distracted when browsing social media

websites. Our analysis covered users' experiences and attitudes toward distracting webpage elements, as well as how well their browsing experiences aligned with their intentions.

Distracting Elements on Social Media Websites. The presence of distracting elements, such as notifications, was a commonly reported reason for why participants felt distracted when browsing social media. Participants shared elements on pages as being particularly distracting — some of these aligned cleanly with Monge Roffarello et al. [47]'s ACDP taxonomy (i.e., notifications, infinite scroll, autoplay, recommendations), others were not (i.e., cluttered layout, short videos).

Echoing our quantitative findings where we found main effects in **cluttered layout** and **notifications**, participants also commonly brought up the two ACDPs as a reason for why they felt distracted.

While cluttered layout was not fully captured by Monge Roffarello et al. [47]'s ACDP taxonomy, many participants shared that when going to social media seeking specific information and/or to keep updated, the presence of a cluttered layout loaded with significant amounts of peripheral information led to distraction (17/29). For example, P28 commented on the homepage of Facebook: *"there's so many different types of things on your feed. There's like ads, and then there's like different friends posting pictures or stories [Facebook short videos] even... it's inherently distracting... it's hard to focus on the homepage."* Participants also pinpointed specific elements that contributed to the overall cluttered webpage, such as the sidebar that *"took almost one-third of the whole screen"* (P11), or *"people's comments about the video"* (P6).

Notifications were distracting both from their quantity and format served on social media websites (12/29) that *"[it] always annoys me to have a bunch of notifications"* (P27), or *"[I] will have the urge to go clear them [notifications] every time"* (P4). In the same vein, real-time updates such as incoming message popups and live stream comments can cause intrusive experiences to users' attention (5/29).

In our quantitative analysis, cluttered layout and notifications are the two ACDPs that are (marginally) significant in predicting perceived distractedness in the Context and Combined Models (see Section 4.1.1). In our qualitative analysis, several other distracting webpage elements also surfaced, including **infinite scroll**, **autoplay videos**, **short videos**, and **feed recommendations**.

For example, some participants shared that, even with specific goals in mind, they still got distracted when encountering infinite scroll (7/29). P8, who was on Facebook to reply to a message, mentioned: *"in my mind, I need to finish that first. But sometimes, I will end up just scrolling through or looking for other postings... So that made me feel distracted."* Others found autoplay videos distracting (11/29), specifically those embedded in the news/social feeds on Facebook, X/Twitter, and LinkedIn. Videos are played automatically when users scroll through the feed, as P28 noted: *"I somehow just decided or like didn't decide to switch off. I just let it play through for however many minutes."*

The presence and focus of a stream of "short" videos also led to some users feeling distracted (10/29). Short videos — often lasting less than a minute — differed significantly from the original longer-form videos with respect to the video length and presentation style. For example, compared to the original horizontal videos, short videos come in vertical format. Due to their visual differences, short videos tended to "stand out" on the page. P20 noted *"there's a clear difference in the style of content of the shorts"*, and said that short videos presented were *"asking me if I want to be in this completely different mindset. It's like if you're trying to relax and somebody offers you an energy drink... it's sort of repulsive."*

Finally, many participants mentioned feed recommendations as the main source of their distractions (26/29). Regardless of whether the recommended content aligned with participants' actual interests, participants shared instances in which they found such recommendations distracting. For example, P26 felt distracted when reviewing connection

requests on LinkedIn because of *"some interesting posts by my other friends [on the newsfeed]."* On the other hand, unfit recommendations distracted participants by making them wonder why they got the feed recommendation in the first place. For example, P12 was distracted by posts of influencers that he never had and was not interested in engaging with, saying that *"it keeps on featuring on my homepage feed... I also wonder why: if I'm not even liking it, not even reading it, why it keeps on coming on my feed?"*

We found discrepancies between our quantitative and qualitative findings regarding how ACDPs affect participants' distractedness. Specifically, besides notifications and cluttered layout, feed recommendations were frequently brought up in participants' interviews as a source of distraction. However, we did not find a strong correlation between the presence of these ACDPs and participants' self-reported perceived distractedness in our quantitative models. Our participants explained such discrepancies, in part, as being because they became gradually **habituated and indifferent toward distracting elements** (15/29). For example, P5 mentioned he got less distracted by the cluttered layout on LinkedIn because *"I was becoming more and more used to that initial clutter... as the more and more I go to LinkedIn, it's more normal to look at... it's becoming less and less distracting because I'm so used to looking at it once I look at LinkedIn."* Slightly different from habituation, participants also expressed that they became indifferent to these distracting elements, such as the recommended posts they saw on the webpage: *"they're trying really hard to distract you. But it doesn't work because it's [recommended posts] not useful."* (P9).

Browsing Intention Alignment. Users also reported feeling distracted when social media sites presented them with content that did not align with their browsing intentions: e.g., showing professional-relevant content when hoping to take a small mental break from work, or showing irrelevant content when trying to find specific information. This misalignment occurred when social media sites showed participants unexpected, irrelevant, or inaccurate content.

While participants were often browsing social media websites to kill time or take a break, they discussed having specific expectations of the content they were hoping to encounter. They reported feeling distracted, then, when the content **the website showed them deviated from these expectations** (17/29). For example, P8 elaborated on the reason she felt distracted on Facebook due to such deviation: *"for Facebook, I really want to focus on the updates from my friends, or from the groups I joined. But for those recommended posts, it is a random post, it's more like for entertainment, which is kind of wasting my time."*

Other times, participants reported seeking specific information and felt distracted when **the website prioritized displaying content irrelevant to their specific information needs** (10/29). For example, P12 felt distracted on the LinkedIn homepage because *"you go with a certain intent, right? ... I'm applying for jobs in product management. My assumption is my 70, 80, 90% content would be around this."* Nevertheless, he found himself distracted when seeing posts of self-promotions *"because I'm looking for certain content, and I have to spend some extra energy to find my specific content among all the noises that have been thrown on the recommendation page."*

Finally, another common reason that users reported feeling distracted was when the website **showed inaccurate search results** (6/29). Our participants shared examples of when they tried to search for specific information/content on the website. Instead of curating content that accurately reflected users' needs, the website distributed promotional or advertising content. For example, P6 shared an example when she looked for a specific user profile, but LinkedIn, with the hope of increasing her engagement *"just pulled up so many different things. It pulled up top posts and recommended... it was just more posts from top contributors, and that was just not relevant."*

On the contrary, participants also shared instances where they did *not* feel distracted: these experiences occurred when a social media site provided an experience in-line with users' intentions, as well as when the task-at-hand was less prone to distractions.

Our participants shared that they felt less distracted when **a social media site provides an expected experience** (26/29). In situations where users had less direct control over their experience — e.g., when interacting with algorithmically-curated feeds — users reported feeling less distracted when the content they were fed was aligned with their current intents or interests. For example, P25 noted that while *"there was a lot that I was looking for [on X]"*, she was able to find information about a local sports event and the weather and found the experience not distracting because *"they were a time-specific event that was happening at that moment... it was a heavy topic."*

Users also reported feeling less distracted when they had more direct control over the content they would be shown: e.g., when browsing posts in a specific interest group, profile of a specific user, or a specific search result. For example, when P28 explained why they were not distracted on a Facebook group where people give away free things: *"it is inherently a little bit more focused, because at least this group is very specific topic... every post is about people giving things away. You're not going to see a mix of random topics."* Our participants also mentioned functionalities on the website that allow them to remove distractions and pay full attention to the tasks at hand. For example, YouTube's "Theater mode" and "Full screen" features allow users to view videos without seeing the sidebar and comments.

Finally, users reported feeling less distracted when they were engaged in a **task that was less prone to distractions** (18/29). Participants shared examples when they were so focused on the task-at-hand, e.g., focusing on reading a post, that they could mentally block the distractions they encountered. Conversely, others discussed not feeling distracted when they had **no specific purpose** (16/29) for navigating to the website — in these cases, they were generally open to distraction (e.g., relying on feed recommendations).

4.2 How does Purpose Mode affect people's use and experience on social media websites? (RQ2)

To answer **RQ2**, we first contextualize participants' use of and experiences with incorporating Purpose Mode in their day-to-day social media browsing. We report on the descriptive analysis of participants' usage of Purpose Mode in the second week of the field study, more specifically, the adoption of specific features and their toggle behaviors (Section 4.2.1). Then, we answer the questions concerning *how* Purpose Mode, a technology probe that helps users remove ACDPs, affects their use and experience when browsing social media websites (Section 4.2.2).

4.2.1 Overview of how participants use Purpose Mode. While not mandatory, we found participants frequently use Purpose Mode features during the study period, with the configurations they found preferable early on in the study.

Time spent on each Purpose Mode feature: participants used the features 62% of the time. As a reminder, participants were free to use or not use any of the six Purpose Mode features while participating in our study. We started by analyzing how much time participants spent using each of these features. We only take into account time spent with a feature activated on its corresponding target site — i.e., a total time spent of 10 seconds for "YouTube Desaturation" means that a participant actively browsed YouTube for a total of 10 seconds with the Desaturation feature activated. In addition, to ensure participants had ample time to explore the use of Purpose Mode on a given website, we only report on data for websites that participants spent at least ten minutes browsing in the second week of the field study.

Overall, we found that some features were universally popular, while others were more polarizing (See Appendix Table 9 for the time participants spent on each social media website with a given feature enabled). Four out of our six features — i.e., Homepage Finite Scroll, Block Autoplay, Hide Notification, and Compact Layout — were, on average,

enabled for over 70% of the time that participants used on our supported social media websites. Specifically, participants almost always enabled the Block Autoplay feature when browsing all four social media websites, and the Compact Layout feature when browsing X/Twitter. On the contrary, the Desaturation and Hide Homepage Feeds features were enabled less consistently — 35% and 25% of the time, respectively. Still, some participants used the features for more than 90% of their active browsing time, while others used them for less than 10% of that time. This rift in usage suggests that the benefits of some features (e.g., Compact Layout) are more generalizable across users, websites, and browsing contexts, while other features (e.g., Desaturation) are more situationally useful and require more user customizability.

Overall, Purpose Mode features were, on average, used for about 62% of participants' overall social media browsing time. This proportion was consistent across websites, as well (Facebook: 62%, LinkedIn: 62%, X: 65%, and YouTube: 60%).

Purpose Mode feature toggles: participants keep their customized configurations. We next take a closer look at whether and how participants enabled or disabled a given Purpose Mode feature. Recall that at the beginning of the second week of the field study, we guided each participant to enable all features in Purpose Mode on the supported social media websites and encouraged them to freely toggle on/off to get familiarized with each feature. For the analysis, we removed the toggles made during this training phase, and only considered changes participants made during the field study.

Overall, participants did not toggle Purpose Mode feature often, with an average of around nine times (mean = 9.32, sd = 6.57) throughout the study. Appendix Figure 7 shows the number of toggles of each feature, by each participant. For websites that participants spent more than 10 minutes in the second week, features applied to YouTube were the most toggled, with an average of about five times (mean = 4.69, sd = 4.08), followed by Facebook (mean = 3.53, sd = 3.10) then LinkedIn (mean = 2.80, sd = 1.74), and features applied to X were used the most consistently with the least toggles (mean = 2.22, sd = 1.30). Among the six feature categories of all supported sites, participants toggled Hide Homepage Feed, Compact Layout, and Desaturation more with an average of about twice (mean = 1.91, 1.66, 1.69), and toggled Homepage Finite Scroll and Hide Notifications about once (mean = 1.31, 1.06) throughout the study. None of our participants disabled the Block Autoplay feature on any website during the field study.

We also take a closer look at *when* our participants toggled features throughout the second week of the study — did users experiment with features only early on, or did they toggle features on and off throughout the study? To that end, we summarize the number of toggles (across all features) that occurred on each day of the second week of the field study in Table 5. Many participants made the majority of their toggles on the first two days of the study, suggesting that users may experiment more in their initial uses of Purpose Mode before settling on a more permanent configuration that they only sparingly revisit afterward. As P22 stated: *"once I had it set up the way that I needed it, I didn't need to change it anymore... I figure out how to make it function the way I wanted it to."*

Still, some participants did toggle features even after the first few days. They would toggle features on to **mitigate encountered distractions** and off to **restore website utility**. For example, P23 mentioned she enabled the Desaturation feature prior to navigating to Facebook one day to reduce her temptation to engage with a specific type of content: *"It [Desaturation] was like a last-minute resort, especially for Buzzfeed articles. Because I didn't have to read up on some of them, I didn't want to do random quizzes... that was a waste of time. So I desaturated it in advance."* On the other hand, while P28 enjoyed removing video comments when browsing YouTube in general, they hid or revealed those comments by toggling on and off one part of the Compact Layout feature[11] when browsing YouTube because *"the videos that I was*

[11]To make our toggle analysis consistent across the four social media websites, we did not count the toggles of the Hide Video Comment feature on YouTube (Section 3.1.5) as toggles of Compact Layout.

Table 5. The number of times that participants toggled any feature for each day in the second week of their field study.

	# of toggles on day...								
PID	1	2	3	4	5	6	7	7+	Total
P01	5	5	–	–	–	–	–	–	10
P02	10	6	–	–	2	–	–	–	18
P03	2	–	–	–	–	–	–	4	6
P04	–	4	–	–	–	–	–	–	4
P05	3	–	–	–	–	–	1	2	6
P06	–	–	–	–	–	1	–	–	1
P07	18	1	2	–	–	–	–	–	21
P08	–	7	–	–	–	–	–	–	7
P09	1	–	–	1	–	–	–	–	2
P09^{w}	4	–	1	1	–	–	1	–	7
P10	–	4	1	–	–	–	–	–	5
P10*	3	–	–	2	–	–	–	–	5
P11	5	1	–	3	1	1	–	–	11
P12	–	–	3	–	–	–	–	–	3
P13	3	2	1	1	2	–	–	–	9
P14	8	–	–	1	–	–	–	–	9
P15	2	–	5	3	3	3	–	–	16
P16	–	1	–	2	6	–	1	14	24
P17	4	–	1	–	–	–	1	–	6
P18	9	–	–	–	–	–	–	–	9
P19	–	–	–	–	–	–	2	–	2
P20	4	–	–	–	–	–	–	–	4
P21	4	3	1	–	–	–	1	–	9
P22	5	–	1	–	–	–	–	–	6
P23	–	–	–	8	4	3	9	–	24
P25	6	–	–	3	–	1	–	1	11
P26^{w}	1	–	–	6	9	–	–	–	16
P27	2	5	2	2	6	–	–	–	17
P28	1	–	–	–	–	–	–	2	3
P29	3	6	–	–	–	–	–	2	11
P30	–	–	–	7	–	–	–	9	16

^{w}: a work-related device/browser profile; *: a second device that the participant kept on all the time only for YouTube

watching, I kind of realized that I am interested in what other people are saying or how others receive the video... So I have definitely toggled on and off just to see other people's input."

4.2.2 Purpose Mode's effects on distraction mitigation and behavior changes on social media. In this section, we discuss how Purpose Mode affects users' use and experience on social media websites. Besides Purpose Mode's main functionality — mitigating ACDPs — we found that it also created more focused and efficient browsing experiences, alleviated distress and improved well-being, and increased users' sense of control. Participants also identified ways Purpose Mode failed: i.e., by decreasing the utility of a website, and increasing the task loads needed to navigate through the websites.

How does Purpose Mode features mitigate distractions? Purpose Mode is designed to mitigate distractions caused by common ACDPs such as video autoplay, cluttered layout, and infinite scroll. There was a significant decrease in perceived distraction once our participants were able to use Purpose Mode features to browse social media websites — the percentage of EMA responses in which participants reported feeling distracted dropped significantly from 27.9%

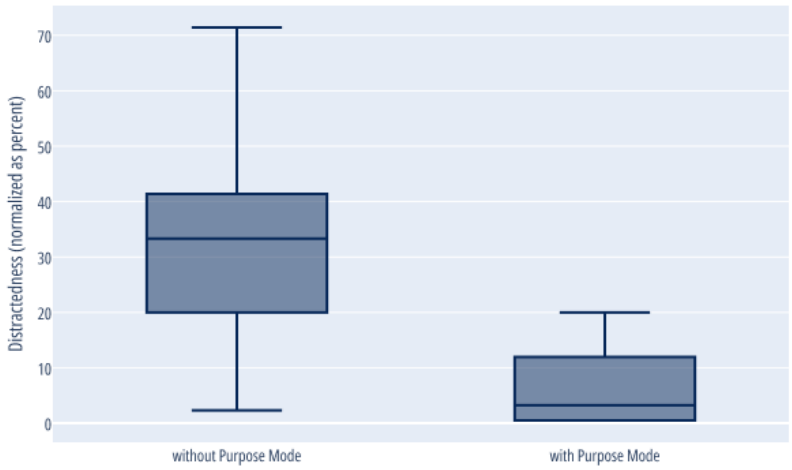

Fig. 6. Distribution of each participant's overall perceived distractedness (%) when not using (week 1) and using (week 2) Purpose Mode.

pre-Purpose Mode to 7.1% post-Purpose Mode (see Figure 6 for the distribution of each participant's overall perceived distractedness with and without Purpose Mode).

Almost all of our participants (28/29) explicitly mentioned that using Purpose Mode to remove ACDPs from social media websites was helpful. P5, for example, pin-pointed how Finite Homepage Scroll helped him resolve and get more critical of the temptation of scrolling infinitely to browse more content on YouTube: *"it just reduced the amount of time that I spent scrolling and stuff... if it wasn't in the first couple pages of the recommended, then I would tend to either try to find something specific, go somewhere else, or just choose what's recommended... if I'm not finding it within my recommended first couple pages, am I really going to find something that extremely catches my eye or something that I really want to watch? And if it's so far down?"* Block Autoplay helped users avoid getting distracted by videos they would otherwise pay no mind: "*autoplay on Facebook has never really been useful for me. And occasionally, I've gotten into watching videos on Facebook for five minutes, but it's really just because I'm curious as to what they'll show me. I don't usually watch videos on Facebook*" (P20). Hide Notifications helped participants resist impulses to engage in peripheral tasks, as P9 mentioned: *"I get five million notifications. I just left this (Hide Notifications) on and was not annoyed by [notifications]... So now that I don't have notifications, I don't feel compelled to go and click on it for the sake of clearing the notification and not actually looking at the content."* Similarly, participants mentioned that Compact Layout allowed them to focus on the "main content" of a social media site. For example, P21 contrasted his experience in browsing YouTube before and after enabling the feature: *"it's just less distraction. So if I just turn it [Compact Layout] off, all these things [e.g., subscriptions section] appear... especially when you click on a video, then it becomes even more clear, simply because now you don't have any recommendations coming and everything. It's just one video."*

The Hide Homepage Feed and Desaturation features were less used than others. Still, some participants utilized these features as well. For example, P23 mentioned she enabled Hide Homepage Feeds on YouTube *"because I didn't want to get distracted by seeing what was on my homepage... I need to watch something educational, take notes, and move on to the next task. There's no room for distraction or killing time. So I had turned it [Hide Homepage Feed] on because that way I would also know what to look for, and not let the algorithm take me wherever."* Desaturation made the potentially

distracting content on the social media website less engaging: "*It makes me less distracted by a very provocative color of content. Because everything seems to be pretty toned down, I didn't get necessarily motivated to scroll up and scroll down... That's the biggest motivation that I kept using it.*" (P11).

When does Purpose Mode fall short of removing distractions? Participants found Purpose Mode to be helpful at removing distractions more often than not, but did identify situations where it did little.

In situations where participants did not feel distracted to begin with, Purpose Mode was not perceived to be particularly helpful (nor as unhelpful) (19/29). For example, P22 mentioned when she watched videos on YouTube, Purpose Mode features *"weren't really preventing me from being distracted or causing me to be distracted, because generally I'm not [distracted]."* Likewise, if participants were not as exposed or susceptible to ACDPs, they felt similarly indifferent towards Purpose Mode. For participants who seldom received notifications, for example, the Hide Notifications feature did not make much difference.

In situations where participants were exposed to ACDPs, Purpose Mode was deemed not particularly helpful when participants had already taken similar remedies to address the distractions (9/29), such as using theater mode when watching videos on YouTube to avoid all the comments and sidebars (e.g., P17), or turning off autoplay videos through service settings (e.g., P9).

How does Purpose Mode affect how users' social media browsing behaviors? **Less time spent (12/29):** Participants spent around two hours every day on social media websites over the course of the two-week field study. When using Purpose Mode, however, they spent an average of 21.5 fewer daily minutes (N = 29; sd = 46.26) on social media websites overall. Specifically, they spent an average of 2.6 fewer daily minutes (N = 25; sd = 4.46) on Facebook, 7.5 minutes (N = 18; sd = 26.19) on LinkedIn, 7.1 minutes (N = 12; sd = 16.30) on X, and 12.6 minutes (N = 27; sd = 35.61) on YouTube (see Appendix Table 10 for the differences in the averaged time-spent-on-site between the first and the second week of the field study of each participant). During post-study interviews, participants also mentioned that they felt they had spent less time on social media sites when using Purpose Mode, and shared multiple reasons as to why. For those who went on social media with no specific goals, Purpose Mode *"removed a chunk of what I was doing on Facebook, which was purposelessly browsing the feed"* (P28). For participants who went on social media websites with specific objectives, e.g., to find particular information and sell second-hand goods, Purpose Mode helped them finish the intended tasks in less time by eliminating distractions and irrelevant content: *"Twitter just had a lot of extra stuff everywhere. ...it [Compact Layout] allowed me to look for just whatever I came in for much more efficiently"* (P25).

Some participants mentioned that Purpose Mode had a reflective effect by making them aware of their social media website use habits; this reflection, in turn, may have led them to consciously limit their use of the websites. For example, P27 said that the features, especially Homepage Finite Scroll, *"made me very conscious of how much I was scrolling, and made something a choice that wasn't a choice before, which I think caused me to spend less time on."* Other participants (2/29) mentioned that Purpose Mode helps them make decisions faster by reducing the number of choices they have to make. For example, P18 found Homepage Finite Scroll helpful on YouTube by allowing him to more decisively make a choice as to what video to select *"it just makes a decision quicker and easier, and [I] load up less tabs to be watched at an unknown date."*

Alleviating distress and improving well-being (25/29): ACDPs can not only distract — they can overwhelm. Prior to using Purpose Mode, some participants (4/29) described their social media experiences as inducing "sensory overload." For example, P29 described her browsing experiences as: *"very bright. It's very colorful. It just seems like it's screaming at me... It's a lot at one time."* Purpose Mode curtailed this sensory overload by muting sensory stimuli

through, e.g., the Desaturation and Block Autoplay features. In turn, thirteen participants commented that Purpose Mode made them feel less irritated (e.g., P9), less frustrated (e.g., P29), and less anxious (e.g., P16, P20). Conversely, participants described the use of Purpose Mode as instilling *"a sense of calm"* (P28).

With Purpose Mode features, participants (24/29) found themselves to be more focused. P10 elaborated on his experience of using Facebook with the Compact Layout feature enabled: *"it feels a lot cleaner, it feels a lot more structured, it feels a lot easier to actually pay attention to the content that I want to consume, instead of being distracted by whatever else they've managed to squish onto the screen."*

In short, Purpose Mode appeared to alleviate emotional distress and generally appeared to improve well-being when participants browsed social media sites.

Increased sense of control (12/29): Twelve of our participants reported that with Purpose Mode, they felt as though they had more control over their social media browsing experiences. For example, P18 mentioned *"it's nice not getting hooked into something that I wouldn't have engaged with willingly. And it's just nice to be in control"*. To that end, the Homepage Finite Scroll and Block Autoplay features were two of the most commonly used and discussed when users explained how Purpose Mode increased their sense of control over their social media browsing experiences. Both features **created checkpoints** for users to evaluate their social media usage and curtailed the ability for social media sites to automatically flood them with new content without explicit consent. For example, when sharing his experience with using the Block Autoplay feature, P10 said that *"it ensures that you as an individual have agency over what you watch, by essentially forcing you to be the one to actually click on a video to watch instead of just letting YouTube decide what you should watch."*

Where Purpose Mode failed: Decreasing website utility and increasing task load: Purpose Mode **decreased the utility** of social media sites in some ways for most participants (28/29). Colors, for example, can communicate important information about the content to which a user is exposed. Removing color, in turn, can make it more difficult for users to interpret content where colors are important. P23 turned off the Desaturation feature when selling furniture on Facebook market, explaining *"I had to have the color on so that I could also see what the listed object color was."* Colors also make content more vibrant and engaging. As P27 explained: *"I like seeing the colors and videos and things that I'm going to watch. I think that's like part of the experience, particularly for YouTube."*

Some participants shared that the removal of the homepage — as the Hide Homepage feature does — makes social media sites unusable. Without homepages, participants can no longer rely on system recommendations and need to manually search for information. However, manual search can be difficult if participants navigate to the website without a specific intent. P21 said *"I found that I don't know what to watch. I need some recommendations to start with."*

Besides decreasing the utility of social media sites, some participants found Purpose Mode **increases task load** when browsing social media websites (12/29). For example, the Homepage Finite Scroll feature requires users to actively click on a button to load additional content, whereas previously, no such active interaction was necessary. For example, P13 expressed irritation after using Homepage Finite Scroll for some time *"because I had to click every time to scroll it."* This dichotomy — between participants appreciating Purpose Mode features for requiring them to be more intentional in their browsing, and feeling irritated by it for the same reason — highlights the need for individual configurability and personalization when building tools like Purpose Mode. There can be no one-size-fits-all solution. We discuss how to craft tools to help users configure distraction-free browsing experiences in Section 5.2.

5 DISCUSSION

Our findings bridge gaps in studying and mitigating the impact of ACDPs on users' perceived distractedness. Extending beyond prior work, our work sheds light on when and why users are distracted by ACDPs on social media platforms in situ. Moreover, we designed a tool to reduce perceived distractedness on social media websites, and demonstrated its effectiveness through a field trial. To that end, we discuss how our findings expand our understanding of the relationship between ACDPs and users' perceived distractedness (Section 5.1). Additionally, Purpose Mode features are built to be adaptable and adjustable to users' real social media website use, moving beyond the limitations of previous interventions and studies, which were often single-platform-specific or lacked personalization (e.g., [36, 40, 64]). Thus, our findings shed light on creating tools like Purpose Mode that can be personalized to meet individual needs across different social media contexts in practice (Section 5.2), as well as on what building an ACDP-free social media website experience entails in the long run (Section 5.3).

5.1 ACDPs are weak predictors of reported distraction, but are commonly blamed when participants feel distracted

During the first week of the field study — prior to having access to the distracting mitigating features we implemented in Purpose Mode — participants reported being distracted in 28% of their EMA responses.

To understand what led participants to feel distracted, we analyzed how perceptual and contextual factors correlated with reported distraction. We found that perceptual factors — i.e., people's sense of agency, satisfaction, and goal alignment — correlated more strongly with how distracted they felt than contextual factors — i.e., the website they were browsing and whether it featured ACDPs hypothesized to cause distractions based on prior literature [47]. Even though only few of the ACDPs we measured were observed to have a statistically significant correlation with how distracted participants reported feeling, our mid-stream interviews with participants illustrated how participants viewed many ACDPs — like video autoplay, feed recommendations, and infinite scroll — as leading them to feel less in control and more distractable.

We hypothesize that this discrepancy can be explained by habituation: participants have become so habituated to ACDPs when browsing social media websites that they don't feel particularly distracted when exposed to them moment-to-moment, but when asked to reflect on the times they *do* feel distracted, ACDPs come to focus in their reasoning. Future work will be necessary to test this hypothesis, but data from the second week of our field study do appear to implicate ACDPs as having a larger effect on how distracted people feel than our regression model might imply.

5.1.1 Eliminating ACDPs with tools like Purpose Mode greatly reduces reported distraction. In the second week of our study — once participants were afforded access to the ACDP-mitigating features we implemented in Purpose Mode — they reported feeling distracted in only 7% of their EMA responses — compared to 28% in the first week without using Purpose Mode. Thus, participants reported feeling distracted far less frequently when the ACDPs in social media websites were forcibly eliminated or muted by Purpose Mode.

Purpose Mode demonstrates that affording users agency over the presence or absence of ACDPs in social media websites can improve users' subjective browsing experiences by reducing distraction. Purpose Mode's helpfulness was also highlighted by participants' desire to continue using Purpose Mode: almost all of our participants (28 out of

29) informally expressed interest in continuing to use Purpose Mode after the study ended. Some participants even proactively asked the research team *not* to remove Purpose Mode from their browsers[12].

5.2 Configuring distraction-free browsing experiences

As our findings reveal, people's perceptions of distractedness when browsing social media websites can be context-dependent. For example, users wanted the Desaturation feature to be active for only some kinds of content, and only some of the time. Yet, while Purpose Mode was designed to make it easy to toggle features on and off in real-time, participants rarely adjusted the settings they settled upon early in the study. The few times they did, it was to disable a Purpose Mode feature in order to access functionality that it removed (e.g., comments on a video). In short, as prior work suggests, default settings anchor [59], whether or not they are in-line with user preferences.

To improve the efficacy of tools like Purpose Mode, then, it will be necessary to reduce the number of configuration decisions users must make. One promising approach to that end might involve collaborative filtering techniques [55] where the default settings for each site are configured to be similar to those configured by other "similar" users. Prior work in usable privacy, for example, has shown that a personalized privacy assistant that automates decision-making for permissions by assigning users to one of a small set of "profiles" based on their prior decisions greatly reduces burden while improving configuration accuracy [33].

Moreover, with modern advances in computational understanding of user interfaces (e.g., [60]) and instructable large language models, we envision an opportunity for incorporating interactive machine learning techniques where users can specify their preferred preferences in natural language to improve the accuracy of these models in real-time.

5.3 Toward ACDP-free social media websites

The evidence we present in this paper illustrates that ACDPs both distract and harm. Indeed, when using Purpose Mode, participants reported feeling distracted far less frequently than when not. Moreover, participants reported feeling less anxious and irritable, and feeling more sense of control. So, how might we envision a world where social media services — for all the benefits they provide users — continue to exist but without ACDPs?

Our findings suggest there may be some incentive alignment for social media services to provide users with more agency over whether ACDPs should be enabled on social media sites. For example, when using Purpose Mode, some participants shared that they wanted to use these websites even more because there were fewer distractions. As P29 noted: *"I had to look up something for work. Before, I would just look on another website, because I know on YouTube would make me really frustrated with all of the things going on with it. I would be really overstimulated. But now, with all the whitespace, and no [video] comments... just the way it looks, now it's a lot better. And now I just find myself going to YouTube exclusively."* Some social media websites are indeed exploring alternative paid-subscription business models that allow for a more customizable and ad-free user experience (e.g., X, YouTube, Facebook, and Instagram in some European countries).

Nevertheless, the economic incentives of maximizing engagement under surveillance capitalism [66] make it unlikely that social media services will act entirely independently to mitigate the presence of ACDPs. Regulation must play a role. Privacy regulations provide one possible model forward — the GDPR in the EU, and the CCPA in the U.S., for example, require online service providers to provide users with greater awareness of cookie use and controls to mitigate their use. While the effectiveness of "cookie banners" is questionable for a variety of reasons [57], a regulation that

[12]To comply with our IRB protocol, we did have to remove the browser extension from all of our participants' browsers.

requires social media sites to provide users with controls to reduce the presence of ACDPs in their browsing experiences might be a necessary first step in reducing the attentional harms these design patterns entail. A necessary precursor to these regulatory interventions may be sustained collective action where users contribute experiences of harm and demands for redress — again, we might turn to the usable privacy literature to explore how to systematize these harms and organize collectives [61, 62].

As we await more permanent solutions in the form of regulation and ethical design, we envision a need for third-party tools and services to provide users with relief against ACDPs in the short term. For example, browsers like Brave now allow users to apply pre-defined, as well as self-defined CSS selectors to remove any website elements they want[13]. Similarly, third-party ad blockers and tracking blockers are widely used and may consider incorporating features like those implemented in Purpose Mode to provide users with additional protections against exploitative surveillance capitalism.

Finally, while we only focused on social media websites in this work, we note that ACDPs that were once primarily on social media (e.g., video autoplay, homepage recommendations) are now expanding to other types of digital products and services. For instance, e-commerce platforms like Amazon have introduced features such as shopping livestreams and videos to create a more engaging and interactive shopping experience[14]. Additionally, platforms that blend social media with e-commerce have also emerged[15]. In other words, as the boundary of what counts as social media broadens, so too do the potential harms of ACDPs in these spaces.

5.4 Limitations

Our work has several limitations. First, for our EMA sampling, to not overwhelm our participants, we randomly sampled at most six times on a given day when they browsed social media websites; thus, our dataset did not cover all browsing contexts they might have encountered during the study period. We also did not consider their social media use on other devices, e.g., smartphones.

Second, we did not randomize the order of the study weeks. For all participants, the first week was spent collecting their baseline social media use without any intervention, and the second week was spent with Purpose Mode features available (see Section 3.4). This decision was made to avoid post-intervention effects, as prior exposure to Purpose Mode could have altered participants' social media behaviors, even in the absence of active interventions [40]. However, the lack of randomization may have introduced an order effect, as participants may have been primed to think about distraction when they began using Purpose Mode. Future research should explore whether the ACDP-removal effects observed with Purpose Mode persist in the long term. Additionally, participants may have been influenced by demand characteristics — the expectation that the tool should reduce distraction[16]. To mitigate this, we encouraged participants to selectively toggle features on and off according to their preferences during the study. We also asked them to reflect on instances where Purpose Mode fell short or failed to meet their expectations (see Section 4.2.2). Finally, because we also collected objective behavioral measures beyond self-reports, such as *time spent browsing*, we can cross-validate the self-report data. For example, one would expect that if participants did indeed perceive *less* distracted, they would spend less time on social media websites — and we found that to be true.

Third, we built Purpose Mode as a Chromium-based browser extension, thus excluding a number of potential participants who do not primarily use a Chromium-based browser. Still, the user experiences of the four social media

[13] https://brave.com/shields/
[14] https://www.cnbc.com/video/2023/02/14/us-livestream-shopping-takes-off-on-tiktok-amazon-live-and-youtube.html
[15] https://www.scmp.com/tech/big-tech/article/3272070/chinas-xiaohongshu-carves-out-niche-increasingly-crowded-e-commerce-market
[16] https://en.wikipedia.org/wiki/Demand_characteristics

websites we studied are consistent among major browsers (e.g., Firefox browser). In addition, we recruited a broad array of participants who varied in the use of these social media websites, e.g., time spent, and purposes of browsing. Fourth, we built Purpose Mode features by manually identifying and modifying HTML and CCS elements. This process can be error-prone and requires periodic adjustments. Fifth, the browsing intentions of the browsing context factors we collected for quantitative analysis were self-reported. In theory, this factor could be automatically inferred. Since our goal was to create explanatory models, we opted for self-reporting to ensure higher fidelity in our data. Finally, our participants were all based in the United States of America. Future work can validate and expand our findings in cross-cultural/language contexts of social media website use.

6 CONCLUSION

In this paper, we 1) conducted a two-week, mixed-methods study with 29 participants to model *when* and *why* users get distracted when browsing social media websites; and 2) built a browser extension, Purpose Mode, which offers internal support mechanisms to remove attention capture damaging patterns (ACDPs) on these websites. We ran a one-week field study to evaluate the effectiveness of the browser extension with the same 29 participants. We found that users' subjective perceptions of the browsing experience at the moment, such as the sense of control and satisfaction, and some ACDPs, such as notifications, were highly correlated with when they felt distracted. We also found the reasons why users felt distracted related to their experience and attitudes toward distracting elements on the page, as well as how well their browsing experience aligns with their browsing intentions. By using Purpose Mode, participants' overall perceived distractedness when browsing social media websites dropped from 28% to 7%, and they spent an average of 21 fewer daily minutes on these sites. Besides mitigating distractions and reducing use time, Purpose Mode also helped participants feel less irritated and frustrated, and increased their sense of control when browsing social media websites. These insights demonstrate the efficacy of Purpose Mode goes beyond simply mitigating distractions, and empowers users in curating a distraction-free browsing experience that is meaningful to them.

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REFERENCES

[1] Monica Agarwal, Bithika Bishesh, Swati Bansal, and Deepa Kumari. 2021. ROLE OF SOCIAL MEDIA ON DIGITAL DISTRACTION: A STUDY ON UNIVERSITY STUDENTS. *Journal of Content, Community and Communication* (2021).

[2] Anitha Anandhan, Liyana Shuib, Maizatul Akmar Ismail, and Ghulam Mujtaba. 2018. Social media recommender systems: review and open research issues. *IEEE Access* 6 (2018), 15608–15628.

[3] Amanda Baughan, Mingrui Ray Zhang, Raveena Rao, Kai Lukoff, Anastasia Schaadhardt, Lisa D Butler, and Alexis Hiniker. 2022. "I Don't Even Remember What I Read": How Design Influences Dissociation on Social Media. In *Proceedings of the 2022 CHI Conference on Human Factors in Computing Systems*. 1–13.

[4] Ransome Epie Bawack, Emilie Bonhoure, Jean-Robert Kala Kamdjoug, and Mihalis Giannakis. 2023. How social media live streams affect online buyers: A uses and gratifications perspective. *International Journal of Information Management* 70 (2023), 102621.

[5] Mohammed Bedjaoui, Nadia Elouali, and Sidi Mohamed Benslimane. 2018. User time spent between persuasiveness and usability of social networking mobile applications: a case study of Facebook and YouTube. In *Proceedings of the 16th International Conference on Advances in Mobile Computing and Multimedia*. 15–24.

[6] Kerstin Bongard-Blanchy, Arianna Rossi, Salvador Rivas, Sophie Doublet, Vincent Koenig, and Gabriele Lenzini. 2021. "I am Definitely Manipulated, Even When I am Aware of it. It's Ridiculous!" – Dark Patterns from the End-User Perspective. In *DIS*. ACM. https://dl.acm.org/doi/pdf/10.1145/3461778.3462086

[7] Harry Brignull. 2020. Deceptive Patterns. https://www.deceptive.design/

[8] Christopher Burr, Nello Cristianini, and James Ladyman. 2018. An analysis of the interaction between intelligent software agents and human users. *Minds and machines* 28 (2018), 735–774.

[9] Hancheng Cao, Chia-Jung Lee, Shamsi Iqbal, Mary Czerwinski, Priscilla NY Wong, Sean Rintel, Brent Hecht, Jaime Teevan, and Longqi Yang. 2021. Large scale analysis of multitasking behavior during remote meetings. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems*. 1–13.

[10] Akash Chaudhary, Jaivrat Saroha, Kyzyl Monteiro, Angus G. Forbes, and Aman Parnami. 2022. "Are You Still Watching?": Exploring Unintended User Behaviors and Dark Patterns on Video Streaming Platforms. In *Designing Interactive Systems Conference*. ACM, Virtual Event Australia, 776–791. https://doi.org/10.1145/3532106.3533562

[11] Hyunsung Cho, Daeun Choi, Donghwi Kim, Wan Ju Kang, Eun Kyoung Choe, and Sung ju Lee. 2021. Reflect, not Regret: Understanding Regretful Smartphone Use with App Feature-Level Analysis. *Human-Computer Interaction* 5 (2021). https://dl.acm.org/doi/pdf/10.1145/3479600

[12] Gregory J. H. Colflesh and Andrew R. A. Conway. 2007. Individual differences in working memory capacity and divided attention in dichotic listening. *Psychonomic Bulletin & Review* 14, 4 (2007). https://link.springer.com/content/pdf/10.3758/BF03196824.pdf

[13] Emily I. M. Collins, Anna L. Cox, Jon Bird, and Daniel Harrison. 2014. Social networking use and RescueTime: the issue of engagement. In *Proceedings of the 2014 ACM International Joint Conference on Pervasive and Ubiquitous Computing: Adjunct Publication (UbiComp '14 Adjunct)*. Association for Computing Machinery, New York, NY, USA, 687–690. https://doi.org/10.1145/2638728.2641322

[14] Juliet Corbin and Anselm Strauss. 2008. Basics of qualitative research. 3rd edn Thousand Oaks.

[15] Munmun De Choudhury and Sushovan De. 2014. Mental health discourse on reddit: Self-disclosure, social support, and anonymity. In *Proceedings of the international AAAI conference on web and social media*, Vol. 8. 71–80.

[16] Linda Di Geronimo, Larissa Braz, Enrico Fregnan, Fabio Palomba, and Alberto Bacchelli. 2020. UI dark patterns and where to find them: a study on mobile applications and user perception. In *Proceedings of the 2020 CHI conference on human factors in computing systems*. 1–14.

[17] Tilman Dingler and Martin Pielot. 2015. I'll be there for you: Quantifying Attentiveness towards Mobile Messaging. In *Proceedings of the 17th International Conference on Human-Computer Interaction with Mobile Devices and Services*. ACM, Copenhagen Denmark, 1–5. https://doi.org/10.1145/2785830.2785840

[18] Olivia Foulds, Leif Azzopardi, and Martin Halvey. 2021. Investigating the Influence of Ads on User Search Performance, Behaviour, and Experience during Information Seeking. In *Proceedings of the 2021 Conference on Human Information Interaction and Retrieval*. ACM, Canberra ACT Australia, 107–117. https://doi.org/10.1145/3406522.3446024

[19] Mohammad Ghasemisharif, Peter Snyder, Andrius Aucinas, and Benjamin Livshits. 2018. SpeedReader: Reader Mode Made Fast and Private. http://arxiv.org/abs/1811.03661 arXiv:1811.03661 [cs].

[20] Colin M Gray, Yubo Kou, Bryan Battles, Joseph Hoggatt, and Austin L Toombs. 2018. The dark (patterns) side of UX design. In *Proceedings of the 2018 CHI conference on human factors in computing systems*. 1–14.

[21] Colin M Gray, Cristiana Santos, Nataliia Bielova, Michael Toth, and Damian Clifford. 2021. Dark patterns and the legal requirements of consent banners: An interaction criticism perspective. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems*. 1–18.

[22] Paula Hanly. 2019. 'Switching off': A diary study investigating the effect of the Netflix auto-play feature on binge-watching and mindful attention awareness. (2019).

[23] Alex J. Holte and F. Richard Ferraro. 2020. True colors: Grayscale setting reduces screen time in college students. *The Social Science Journal* 60 (2020). Issue 2.

[24] Rizwan Ahmed Khan, Eric Dinet, and Hubert Konik. 2011. Visual attention: Effects of blur. In *2011 18th IEEE International Conference on Image Processing*. IEEE, Brussels, Belgium, 3289–3292. https://doi.org/10.1109/ICIP.2011.6116373

[25] Jaejeung Kim, Hayoung Jung, Minsam Ko, and Uichin Lee. 2019. GoalKeeper: Exploring Interaction Lockout Mechanisms for Regulating Smartphone Use. *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies* 3, 1 (March 2019), 1–29. https://doi.org/10.1145/3314403

[26] Young-Ho Kim, Eun Kyoung Choe, Bongshin Lee, and Jinwook Seo. 2019. Understanding Personal Productivity: How Knowledge Workers Define, Evaluate, and Reflect on Their Productivity. In *CHI*. ACM. https://dl.acm.org/doi/pdf/10.1145/3290605.3300845

[27] Young-Ho Kim, Jae Ho Jeon, Eun Kyoung Choe, Bongshin Lee, KwonHyun Kim, and Jinwook Seo. 2016. TimeAware: Leveraging Framing Effects to Enhance Personal Productivity. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems*. ACM, San Jose California USA, 272–283. https://doi.org/10.1145/2858036.2858428

[28] Christina Koessmeier and Oliver B. Büttner. 2021. Why Are We Distracted by Social Media? Distraction Situations and Strategies, Reasons for Distraction, and Individual Differences. *Frontiers in Psychology* 12 (2021). https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2021.711416

[29] Geza Kovacs, Drew Mylander Gregory, Zilin Ma, Zhengxuan Wu, Golrokh Emami, Jacob Ray, and Michael S. Bernstein. 2019. Conservation of Procrastination: Do Productivity Interventions Save Time or Just Redistribute It?. In *CHI*. ACM. https://hci.stanford.edu/publications/2019/conservation/conservation-chi2019.pdf

[30] Geza Kovacs, Zhengxuan Wu, and Michael S. Bernstein. 2018. Rotating Online Behavior Change Interventions Increases Effectiveness But Also Increases Attrition. *Proceedings of the ACM on Human-Computer Interaction* 2, CSCW (Nov. 2018), 95:1–95:25. https://doi.org/10.1145/3274364

[31] Hao-Ping Lee, Kuan-Yin Chen, Chih-Heng Lin, Chia-Yu Chen, Yu-Lin Chung, Yung-Ju Chang, and Chien-Ru Sun. 2019. Does *Who* Matter?: Studying the Impact of Relationship Characteristics on Receptivity to Mobile IM Messages. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems*. ACM, Glasgow Scotland Uk, 1–12. https://doi.org/10.1145/3290605.3300756

[32] Qisheng Li, Meredith Ringel Morris, Adam Fourney, Kevin Larson, and Katharina Reinecke. 2019. The Impact of Web Browser Reader Views on Reading Speed and User Experience. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems*. ACM, Glasgow Scotland Uk, 1–12. https://doi.org/10.1145/3290605.3300754

[33] Bin Liu, Mads Schaarup Andersen, Florian Schaub, Hazim Almuhimedi, Shikun Aerin Zhang, Norman Sadeh, Yuvraj Agarwal, and Alessandro Acquisti. 2016. Follow my recommendations: A personalized privacy assistant for mobile app permissions. In *Twelfth symposium on usable privacy and security (SOUPS 2016)*. 27–41.

[34] Danielle Lottridge, Eli Marschner, Ellen Wang, Maria Romanovsky, and Clifford Nass. 2012. Browser Design Impacts Multitasking. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting* 56, 1 (Sept. 2012), 1957–1961. https://doi.org/10.1177/1071181312561289

[35] Yuwen Lu, Chao Zhang, Yuewen Yang, Yaxing Yao, and Toby Jia-Jun Li. 2023. From Awareness to Action: Exploring End-User Empowerment Interventions for Dark Patterns in UX. http://arxiv.org/abs/2310.17846 arXiv:2310.17846 [cs].

[36] Kai Lukoff, Ulrik Lyngs, Karina Shirokova, Raveena Rao, Larry Tian, Himanshu Zade, Sean A. Munson, and Alexis Hiniker. 2023. SwitchTube: A Proof-of-Concept System Introducing "Adaptable Commitment Interfaces" as a Tool for Digital Wellbeing. In *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems*. ACM, Hamburg Germany, 1–22. https://doi.org/10.1145/3544548.3580703

[37] Kai Lukoff, Ulrik Lyngs, Himanshu Zade, J. Vera Liao, James Choi, Kaiyue Fan, Sean A. Munson, and Alexis Hiniker. 2021. How the design of youtube influences user sense of agency. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems*. 1–17.

[38] Ulrik Lyngs, Kai Lukoff, Laura Csuka, Petr Slovák, Max Van Kleek, and Nigel Shadbolt. 2022. The Goldilocks level of support: Using user reviews, ratings, and installation numbers to investigate digital self-control tools. *International Journal of Human-Computer Studies* 166 (Oct. 2022), 102869. https://doi.org/10.1016/j.ijhcs.2022.102869

[39] Ulrik Lyngs, Kai Lukoff, Petr Slovak, Reuben Binns, Adam Slack, Michael Inzlicht, Max Van Kleek, and Nigel Shadbolt. 2019. Self-Control in Cyberspace: Applying Dual Systems Theory to a Review of Digital Self-Control Tools. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems*. ACM, Glasgow Scotland Uk, 1–18. https://doi.org/10.1145/3290605.3300361

[40] Ulrik Lyngs, Kai Lukoff, Petr Slovak, William Seymour, Helena Webb, Marina Jirotka, Jun Zhao, Max Van Kleek, and Nigel Shadbolt. 2020. 'I Just Want to Hack Myself to Not Get Distracted': Evaluating Design Interventions for Self-Control on Facebook. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*. ACM, Honolulu HI USA, 1–15. https://doi.org/10.1145/3313831.3376672

[41] Gloria Mark, Mary Czerwinski, and Shamsi T. Iqbal. 2018. Effects of Individual Differences in Blocking Workplace Distractions. In *CHI*. ACM. https://dl.acm.org/doi/pdf/10.1145/3173574.3173666

[42] Arunesh Mathur, Gunes Acar, Michael J Friedman, Eli Lucherini, Jonathan Mayer, Marshini Chetty, and Arvind Narayanan. 2019. Dark patterns at scale: Findings from a crawl of 11K shopping websites. *Proceedings of the ACM on Human-Computer Interaction* 3, CSCW (2019), 1–32.

[43] Arunesh Mathur, Mihir Kshirsagar, and Jonathan Mayer. 2021. What Makes a Dark Pattern... Dark?: Design Attributes, Normative Considerations, and Measurement Methods. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems*. ACM, Yokohama Japan, 1–18. https://doi.org/10.1145/3411764.3445610

[44] Abhinav Mehrotra, Veljko Pejovic, Jo Vermeulen, Robert Hendley, and Mirco Musolesi. 2016. My Phone and Me: Understanding People's Receptivity to Mobile Notifications. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems*. ACM, San Jose California USA, 1021–1032. https://doi.org/10.1145/2858036.2858566

[45] Thomas Mildner and Gian-Luca Savino. 2021. Ethical user interfaces: Exploring the effects of dark patterns on facebook. In *Extended Abstracts of the 2021 CHI Conference on Human Factors in Computing Systems*. 1–7.

[46] Thomas Mildner, Gian-Luca Savino, Philip R. Doyle, Benjamin R. Cowan, and Rainer Malaka. 2023. About Engaging and Governing Strategies: A Thematic Analysis of Dark Patterns in Social Networking Services. https://doi.org/10.1145/3544548.3580695 arXiv:2303.00476 [cs].

[47] Alberto Monge Roffarello, Kai Lukoff, and Luigi De Russis. 2023. Defining and Identifying Attention Capture Deceptive Designs in Digital Interfaces. In *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems*. ACM, Hamburg Germany, 1–19. https://doi.org/10.1145/3544548.3580729

[48] Cal Newport. 2019. *Digital minimalism: Choosing a focused life in a noisy world*. Penguin.

[49] Shuo Niu, Ava Bartolome, Cat Mai, and Nguyen Binh Ha. 2021. # StayHome# WithMe: how do YouTubers help with COVID-19 loneliness?. In *Proceedings of the 2021 CHI conference on human factors in computing systems*. 1–15.

[50] Fabian Okeke, Michael Sobolev, Nicola Dell, and Deborah Estrin. 2018. Good vibrations: can a digital nudge reduce digital overload?. In *Proceedings of the 20th International Conference on Human-Computer Interaction with Mobile Devices and Services*. ACM, Barcelona Spain, 1–12. https://doi.org/10.1145/3229434.3229463

[51] Jan Ole Rixen, Luca-Maxim Meinhardt, Michael Glöckler, Marius-Lukas Ziegenbein, Anna Schlothauer, Mark Colley, Enrico Rukzio, and Jan Gugenheimer. 2023. The Loop and Reasons to Break It: Investigating Infinite Scrolling Behaviour in Social Media Applications and Reasons to Stop. *Proceedings of the ACM on Human-Computer Interaction* 7, MHCI (Sept. 2023), 1–22. https://doi.org/10.1145/3604275

[52] Brennan Schaffner, Antonia Stefanescu, Olivia Campili, and Marshini Chetty. 2023. Don't Let Netflix Drive the Bus: User's Sense of Agency Over Time and Content Choice on Netflix. *Proceedings of the ACM on Human-Computer Interaction* 7, CSCW1 (2023), 1–32.

[53] Abigail J. Sellen, Rachel Murphy, and Kate L. Shaw. 2002. How Knowledge Workers Use the Web. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (Minneapolis, Minnesota, USA) *(CHI '02)*. Association for Computing Machinery, New York, NY, USA, 227–234. https://doi.org/10.1145/503376.503418

[54] Teun Siebers, Ine Beyens, J. Loes Pouwels, and Patti M. Valkenburg. 2022. Social Media and Distraction: An Experience Sampling Study among Adolescents. *Media Psychology* 25, 3 (May 2022), 343–366. https://doi.org/10.1080/15213269.2021.1959350 Publisher: Routledge _eprint: https://doi.org/10.1080/15213269.2021.1959350.

[55] Xiaoyuan Su and Taghi M. Khoshgoftaar. 2009. A Survey of Collaborative Filtering Techniques. *Advances in Artificial Intelligence* 2009 (Oct. 2009), 421425. https://doi.org/10.1155/2009/421425 Publisher: Hindawi Publishing Corporation.

[56] Jonathan A. Tran, Katie S. Yang, Katie Davis, and Alexis Hiniker. 2019. Modeling the Engagement-Disengagement Cycle of Compulsive Phone Use. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems*. ACM, Glasgow Scotland Uk, 1–14. https://doi.org/10.1145/3290605.3300542

[57] Christine Utz, Martin Degeling, Sascha Fahl, Florian Schaub, and Thorsten Holz. 2019. (Un)informed Consent: Studying GDPR Consent Notices in the Field. In *Proceedings of the 2019 ACM SIGSAC Conference on Computer and Communications Security*. ACM, London United Kingdom, 973–990. https://doi.org/10.1145/3319535.3354212

[58] Aku Visuri, Niels Van Berkel, Chu Luo, Jorge Goncalves, Denzil Ferreira, and Vassilis Kostakos. 2017. Predicting interruptibility for manual data collection: a cluster-based user model. In *Proceedings of the 19th International Conference on Human-Computer Interaction with Mobile Devices and Services*. ACM, Vienna Austria, 1–14. https://doi.org/10.1145/3098279.3098532

[59] Jason Watson, Heather Richter Lipford, and Andrew Besmer. 2015. Mapping User Preference to Privacy Default Settings. *ACM Transactions on Computer-Human Interaction* 22, 6 (Dec. 2015), 1–20. https://doi.org/10.1145/2811257

[60] Jason Wu, Siyan Wang, Siman Shen, Yi-Hao Peng, Jeffrey Nichols, and Jeffrey P Bigham. 2023. WebUI: A Dataset for Enhancing Visual UI Understanding with Web Semantics. In *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems*. ACM, Hamburg Germany, 1–14. https://doi.org/10.1145/3544548.3581158

[61] Yuxi Wu, Sydney Bice, W. Keith Edwards, and Sauvik Das. 2023. The Slow Violence of Surveillance Capitalism: How Online Behavioral Advertising Harms People. In *Proceedings of the 2023 ACM Conference on Fairness, Accountability, and Transparency*. 1826–1837.

[62] Yuxi Wu, W. Keith Edwards, and Sauvik Das. 2022. "A Reasonable Thing to Ask For": Towards a Unified Voice in Privacy Collective Action. In *Proceedings of the 2022 CHI Conference on Human Factors in Computing Systems (CHI '22)*. Association for Computing Machinery, New York, NY, USA, 1–17. https://doi.org/10.1145/3491102.3517467

[63] Xuhai Xu, Tianyuan Zou, Han Xiao, Yanzhang Li, Ruolin Wang, Tianyi Yuan, Yuntao Wang, Yuanchun Shi, Jennifer Mankoff, and Anind K Dey. 2022. TypeOut: Leveraging Just-in-Time Self-Affirmation for Smartphone Overuse Reduction. In *CHI Conference on Human Factors in Computing Systems*. ACM, New Orleans LA USA, 1–17. https://doi.org/10.1145/3491102.3517476

[64] Mingrui Ray Zhang, Kai Lukoff, Raveena Rao, Amanda Baughan, and Alexis Hiniker. 2022. Monitoring Screen Time or Redesigning It?: Two Approaches to Supporting Intentional Social Media Use. In *CHI Conference on Human Factors in Computing Systems*. ACM, New Orleans LA USA, 1–19. https://doi.org/10.1145/3491102.3517722

[65] Zhiping Zhang, Michelle Jia, Hao-Ping (Hank) Lee, Bingsheng Yao, Sauvik Das, Ada Lerner, Dakuo Wang, and Tianshi Li. 2023. " It's a Fair Game", or Is It? Examining How Users Navigate Disclosure Risks and Benefits When Using LLM-Based Conversational Agents. *arXiv preprint arXiv:2309.11653* (2023).

[66] Shoshana Zuboff. 2023. The age of surveillance capitalism. In *Social theory re-wired*. Routledge, 203–213.

A APPENDIX

Table 6. General participant demographics.

#	*Age*	*Gender*	*Education*	*Occupation*
P1	29	Man	Master's degree	Student
P2	30	Woman	Master's degree	Student
P3	23	Man	Master's degree	Student
P4	25	Woman	Bachelor's degree	Student
P5	23	Man	Some college	Business, management, or financial (e.g., manager, accountant, banker)
P6	22	Woman	Bachelor's degree	Student
P7	27	Man	Master's degree	Computer engineer or IT professional (e.g., systems administrator, programmer, IT consultant)
P8	26	Woman	Master's degree	Computer engineer or IT professional (e.g., systems administrator, programmer, IT consultant)
P9	25	Woman	Master's degree	UX researcher
P10	27	Man	Master's degree	Computer engineer or IT professional (e.g., systems administrator, programmer, IT consultant)
P11	33	Man	Doctorate	Scientist (e.g., researcher, professor)
P12	32	Man	Master's degree	Student
P13	21	Man	Bachelor's degree	Student
P14	24	Man	Master's degree	Student
P15	27	Man	Master's degree	Computer engineer or IT professional (e.g., systems administrator, programmer, IT consultant)
P16	44	Woman	High school	Landscaping and general contracting worker
P17	21	Woman	Some college	Student
P18	41	Man	Bachelor's degree	Art, writing, or journalism (e.g., author, reporter)
P19	29	Man	Bachelor's degree	Computer engineer or IT professional (e.g., systems administrator, programmer, IT consultant)
P20	32	Man	Associate's degree	Computer engineer or IT professional (e.g., systems administrator, programmer, IT consultant)
P21	33	Man	Doctorate	Scientist (e.g., researcher, professor)
P22	55	Woman	Bachelor's degree	Service (e.g., retail clerks, server)
P23	25	Woman	Master's degree	Engineer in other fields (e.g., civil engineer, bio-engineer)
P25	38	Woman	Master's degree	Education (e.g., teacher)
P26	23	Man	Bachelor's degree	Student
P27	22	Non-binary	Bachelor's degree	Administrative support (e.g., secretary, assistant)
P28	32	Non-binary	Master's degree	Administrative support (e.g., secretary, assistant)
P29	24	Woman	Bachelor's degree	Medical (e.g., doctor, nurse, dentist)
P30	27	Woman	Bachelor's degree	Scientist (e.g., researcher, professor)

Table 7. Codebook for qualitative analysis.

Why do users get distracted when browsing social media websites? (RQ1)	
Why user is distracted	
Distracting elements on social media websites	**Why users is not distracted**
- cluttered layout	Habituation & indifference toward distracting elements
- notifications	A social media site provides an expected experience
- real-time updates	*- webpage content fed was aligned with their current intents or interests*
- infinite scroll	*- self-curated webpage content*
- feed recommendations	*- internal functionality supporting distraction-free experience*
- autoplay videos	Task at hand was less prone to distractions
- short videos	No specific purpose when browsing
Browsing intention alignment	
- webpage content deviated from users' expectations	
- webpage prioritized displaying irrelevant content	
- webpage showed inaccurate search results	

How does Purpose Mode affect people's use and experience on social media websites? (RQ2)	
Purpose Mode is helpful	
Mitigate discussions	**Purpose Mode is not helpful / unhelpful**
Less time spent	User was not distracted in the first place
- resolve choice overload/paralysis	User already took action to resolve distractions
Enhance mental states	Decrease website utility
- make the interface less overwhelming	Increase task load
- help focus	
Increase sense of control	

Table 8. The average hours that our participants spent on each social media website, including both the first and the second week of the field study, and the percent of time that participants spent on the given sites. Columns five to nine add up to 100%.

			% of the total online time spent on...					
PID	Total online (hr/day)	Social media (hr/day)	**Social media overall**	**FB**	**LI**	**X**	**YT**	**Other**
P01	11.5	6.3	54.6	0.3	1.0	0.1	53.2	45.4
P02	1.3	0.4	33.7	8.9	8.9	13.1	2.8	66.3
P03	4.6	0.2	4.4	0.1	0.2	0.9	3.3	95.6
P04	2.2	0.1	5.1	1.4	0.3	3.3	0.0	94.9
P05	2.1	1.1	53.7	2.5	3.0	0.0	48.2	46.3
P06	3.8	0.2	5.1	1.2	0.8	0.0	3.1	94.9
P07	1.5	0.4	23.7	19.3	1.1	0.0	3.2	76.3
P08	1.0	0.6	61.3	4.7	0.8	0.1	55.6	38.7
P09	0.7	0.2	29.3	11.0	3.0	6.3	9.0	70.7
P09^{w}	1.8	0.6	31.9	0.3	10.2	7.7	13.7	68.1
P10	0.3	0.2	73.7	67.1	0.0	0.0	6.6	26.3
P10*	23.7	23.7	100.0	0.0	0.0	0.0	100	0.0
P11	1.7	1.0	60.4	0.9	0.3	0.8	58.4	39.6
P12	6.1	1.6	26.8	1.0	23.3	0.0	2.5	73.2
P13	2.9	0.5	18.3	0.8	8.0	2.0	7.5	81.7
P14	2.8	0.4	13.3	0.6	1.4	0.7	10.6	86.7
P15	3.1	1.8	58.2	5.6	0.3	0.4	51.9	41.8
P16	13.9	0.4	3.2	0.4	0.1	0.2	2.5	96.8
P17	3.8	0.5	12.0	0.6	0.6	0.1	10.7	88.0
P18	5.9	5.0	84.8	6.0	1.2	18.9	58.7	15.2
P19	2.0	0.4	18.3	0.0	1.8	3.9	12.6	81.7
P20	4.5	2.0	45.9	2.6	0.1	0.0	43.2	54.1
P21	2.8	1.7	60.2	2.7	13.1	0.0	44.4	39.8
P22	9.9	2.7	26.9	2.7	0.8	0.0	23.4	73.1
P23	2.9	1.0	34.7	4.5	0.0	0.0	30.2	65.3
P23^{w}	0.3	<0.1	2.5	0.0	2.5	0.0	0.0	97.5
P25	0.2	0.1	81.8	9.9	20.6	18.7	32.6	18.2
P26	0.4	0.2	56.9	0.4	0.1	0.0	56.5	43.1
P26^{w}	8.6	0.5	5.2	1.4	0.6	0.1	3.0	94.8
P27	1.9	0.6	30.4	2.4	2.5	2.1	23.4	69.6
P28	5.5	0.9	16.7	1.2	0.3	1.1	14.1	83.3
P29	1.7	1.4	80.6	0.4	0.4	0.3	79.5	19.4
P30	0.3	<0.1	7.5	5.2	1.7	0.0	0.6	92.5
P30^{w}	0.2	<0.1	11.2	4.7	4.5	0.0	2.1	88.8

^{w}: a work-related device/browser profile; *: a second device that the participant kept on all the time only for YouTube

Table 9. The number of hours participants spent on each website (i.e., for those they spent at least ten minutes in total) and the percentage of the time each participant spent on that website with a given feature enabled — e.g., P22 spent 2.3 hours on Facebook and had Compact Layout enabled for 17% of these 2.3 hours.

PID	**Facebook (h)**	Autoplay (%)	Compact (%)	Desaturate (%)	Feed (%)	Infinite (%)	Notif (%)	**LinkedIn (h)**	Autoplay (%)	Compact (%)	Desaturate (%)	Feed (%)	Infinite (%)	Notif (%)	**X/Twitter (h)**	Autoplay (%)	Compact (%)	Desaturate (%)	Feed (%)	Infinite (%)	Notif (%)	**YouTube (h)**	Autoplay (%)	Compact (%)	Desaturate (%)	Feed (%)	Infinite (%)	Notif (%)
P01	<0.2	–	–	–	–	–	–	0.9	96	3	5	5	5	5	<0.2	–	–	–	–	–	–	40.8	100	0	0	0	0	0
P02	0.7	97	88	0	3	90	3	0.6	96	94	0	4	94	4	1.5	96	95	0	8	95	8	<0.2	–	–	–	–	–	–
P03	<0.2	–	–	–	–	–	–	<0.2	–	–	–	–	–	–	0.6	91	96	6	5	93	94	2.2	97	98	22	21	99	99
P04	0.2	86	86	92	2	80	92	<0.2	–	–	–	–	–	–	0.4	91	95	95	4	95	84	–	–	–	–	–	–	–
P05	<0.2	–	–	–	–	–	–	0.5	90	96	96	12	95	96	–	–	–	–	–	–	–	17.3	100	26	100	2	100	100
P06	0.2	78	55	55	55	55	55	0.2	81	97	90	64	78	90	–	–	–	–	–	–	–	0.5	93	97	26	97	97	97
P07	1.8	98	97	1	1	16	97	<0.2	–	–	–	–	–	–	–	–	–	–	–	–	–	0.4	94	44	0	0	0	43
P08	0.2	66	92	2	10	40	34	<0.2	–	–	–	–	–	–	<0.2	–	–	–	–	–	–	1.8	98	99	2	2	99	2
P09	0.2	86	77	23	77	94	77	<0.2	–	–	–	–	–	–	<0.2	–	–	–	–	–	–	–	–	–	–	–	–	–
P09[w]	<0.2	–	–	–	–	–	–	0.7	97	100	19	0	0	97	0.6	83	86	23	0	88	82	0.5	94	98	59	5	98	98
P10	0.9	95	98	6	1	12	93	–	–	–	–	–	–	–	–	–	–	–	–	–	–	<0.2	–	–	–	–	–	–
P10[*]	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	157.8	100	0	0	0	100	100
P11	<0.2	–	–	–	–	–	–	<0.2	–	–	–	–	–	–	<0.2	–	–	–	–	–	–	6.8	99	99	51	1	99	99
P12	0.2	92	99	92	79	74	92	3.4	96	44	43	96	96	44	–	–	–	–	–	–	–	0.2	95	95	95	95	95	95
P13	<0.2	–	–	–	–	–	–	0.7	96	98	50	1	6	98	<0.2	–	–	–	–	–	–	0.9	91	57	5	5	96	96
P14	<0.2	–	–	–	–	–	–	0.2	86	98	9	9	91	29	<0.2	–	–	–	–	–	–	0.6	96	4	4	4	98	98
P15	1.3	98	39	10	8	36	38	<0.2	–	–	–	–	–	–	<0.2	–	–	–	–	–	–	10.5	100	63	1	0	63	63
P16	0.3	75	71	54	44	47	71	<0.2	–	–	–	–	–	–	<0.2	–	–	–	–	–	–	1.2	97	62	7	85	58	58
P17	<0.2	–	–	–	–	–	–	<0.2	–	–	–	–	–	–	<0.2	–	–	–	–	–	–	1.5	97	88	6	39	41	99
P18	2.0	98	99	98	2	2	99	0.4	93	97	97	14	97	97	4.1	99	99	1	0	2	1	17.3	100	100	1	1	100	100
P19	–	–	–	–	–	–	–	<0.2	–	–	–	–	–	–	0.4	81	94	90	23	87	94	0.4	92	99	92	88	95	95
P20	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	13.6	100	0	0	0	100	100
P21	0.3	93	43	96	8	88	96	3.5	99	1	82	24	99	99	<0.2	–	–	–	–	–	–	7.4	100	100	4	3	100	99
P22	2.3	99	17	3	96	96	96	0.7	93	89	1	87	87	87	–	–	–	–	–	–	–	12.1	99	0	0	0	99	100
P23	1.3	97	7	5	4	61	96	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.7	96	83	3	10	23	96
P23[w]	–	–	–	–	–	–	–	<0.2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
P25	0.2	81	100	21	16	21	66	0.5	97	97	2	0	95	22	0.3	87	96	10	0	84	92	0.8	96	98	4	0	98	98
P26	<0.2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	<0.2	–	–	–	–	–	–
P26 [w]	0.6	93	100	96	90	90	97	0.8	96	45	45	39	41	45	<0.2	–	–	–	–	–	–	4.3	99	2	0	1	1	2
P27	<0.2	–	–	–	–	–	–	0.4	92	91	4	9	90	93	0.5	89	95	7	0	95	95	5.7	99	2	0	0	99	100
P28	0.5	83	94	83	80	80	82	0.2	60	67	67	60	60	67	0.5	93	99	93	91	91	96	6.9	99	100	0	99	99	99
P29	<0.2	–	–	–	–	–	–	<0.2	–	–	–	–	–	–	<0.2	–	–	–	–	–	–	25.8	100	100	3	0	100	100
P30	<0.2	–	–	–	–	–	–	<0.2	–	–	–	–	–	–	–	–	–	–	–	–	–	<0.2	–	–	–	–	–	–
P30[w]	<0.2	–	–	–	–	–	–	<0.2	–	–	–	–	–	–	–	–	–	–	–	–	–	<0.2	–	–	–	–	–	–

[w]: a work-related device/browser profile; [*]: a second device that the participant kept on all the time only for YouTube

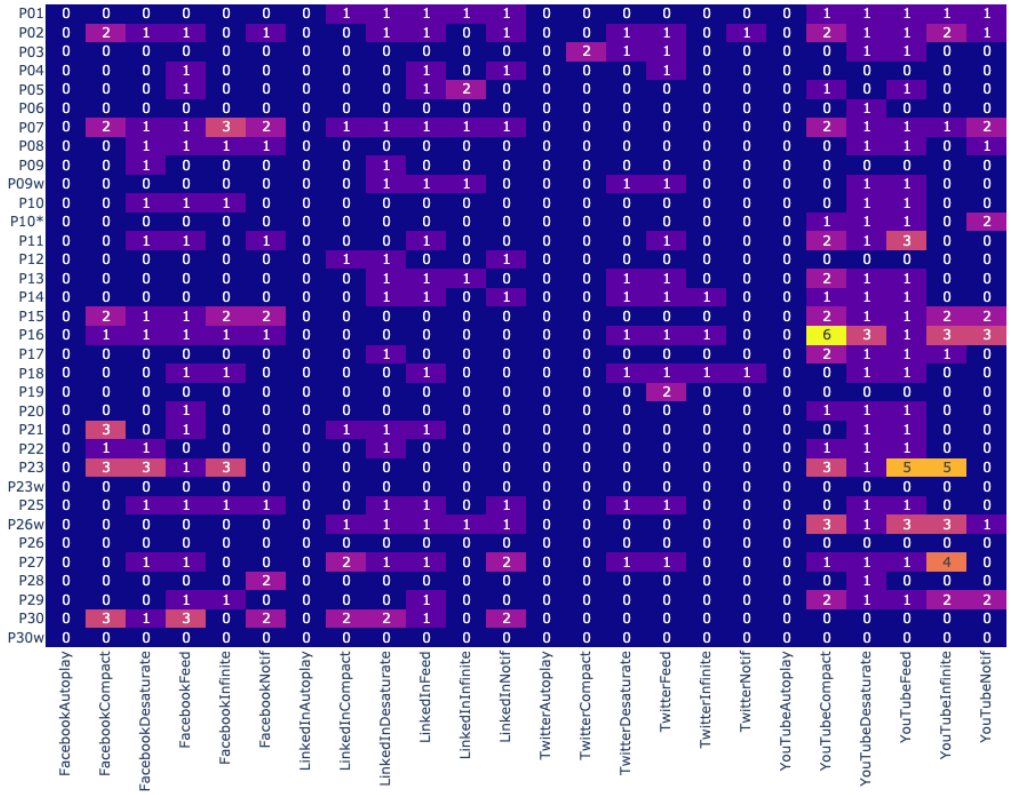

Fig. 7. A heat map illustrating the number of times that each participant toggled a given feature. Some participants did not use a given site, resulting in zero toggles.

Table 10. The differences in the averaged time-spent-on-site between the first and the second week of the field study. The times are in HH:MM format. A negative time means that a participant, on average, spent less time on a site during the second week of the study (i.e., having access to Purpose Mode) compared to the first week of the study.

(hr/day)	Total online	Social media	FB	LI	X	YT	Other
P01	3:40	1:16	-0:02	0:03	–	1:15	2:23
P02	-0:09	-0:14	-0:03	-0:07	<0:01	-0:03	0:05
P03	3:05	-0:07	–	–	-0:01	-0:06	3:12
P04	0:11	-0:01	<0:01	–	-0:02	–	0:13
P05	-0:56	0:16	-0:08	-0:05	–	0:30	-1:12
P06	0:18	-0:08	-0:01	<-0:01	–	-0:05	0:26
P07	0:11	-0:04	-0:04	-0:01	–	0:01	0:15
P08	-0:18	-0:31	-0:01	–	–	-0:29	0:13
P09	-1:02	-0:21	-0:06	-0:02	-0:05	-0:07	-0:41
P09^{w}	-2:04	-0:38	–	-0:10	-0:07	-0:21	-1:25
P10	-0:04	-0:04	-0:04	–	–	–	<-0:01
P10*	-0:24	-0:24	–	–	–	-0:24	–
P11	-0:21	<-0:01	<-0:01	–	–	<-0:01	-0:20
P12	-2:34	-2:07	-0:03	-1:48	–	-0:15	-0:27
P13	-3:53	-0:31	-0:01	-0:15	-0:04	-0:10	-3:21
P14	-0:17	-0:25	–	<-0:01	<-0:01	-0:25	0:07
P15	-0:48	0:18	0:01	–	–	0:18	-1:07
P16	-3:27	-0:38	-0:02	–	-0:01	-0:33	-2:48
P17	0:26	-0:23	<-0:01	<-0:01	–	-0:22	0:49
P18	-3:08	-2:47	-0:07	-0:01	-0:57	-1:41	-0:20
P19	-0:13	-0:29	–	-0:02	-0:03	-0:23	0:15
P20	-0:11	-0:09	-0:11	–	–	0:01	-0:02
P21	-0:13	-0:11	-0:03	0:15	–	-0:23	-0:02
P22	-4:15	-0:57	0:09	0:02	–	-1:09	-3:17
P23	0:40	-1:07	0:06	–	–	-1:13	1:47
P25	0:01	0:01	<0:01	<0:01	<-0:01	0:01	<-0:01
P26	-0:50	-0:34	–	–	–	-0:34	-0:15
P26^{w}	2:28	0:06	-0:10	0:01	–	0:14	2:22
P27	-0:35	-0:06	-0:05	-0:02	<0:01	<0:01	-0:28
P28	0:03	-0:11	-0:02	<0:01	<-0:01	-0:08	0:14
P29	0:55	0:56	–	–	–	0:56	<-0:01
P30	0:16	<-0:01	<-0:01	–	–	–	0:16

^{w}: a work-related device/browser profile; *: a second device that the participant kept on all the time only for YouTube