Towards Understanding the Dark Patterns That Steal Our Attention

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ABSTRACT

Contemporary digital services often adopt mechanisms, e.g., recommendations and infinite scrolling, that exploit users' psychological vulnerabilities to maximize time spent and daily visits. While these attention-capture dark patterns might contribute to technology overuse and problematic behaviors, they are relatively underexplored in the literature. In this paper, we first provide a definition of what are attention-capture dark patterns based on a review of recent works on digital wellbeing and dark patterns. Then, we describe a set 5 of attention-capture dark patterns extracted from a 1-week-long auto-ethnography during which we self-monitored our mobile and web interactions with Facebook and YouTube. Finally, we report on an initial study ($N = 7$) that explores whether and how a widespread mechanism, i.e., social investment, influence usage and users' perception of the Facebook website. We discuss the implications that our work may have on the design of technologies that better align with users' digital wellbeing.

CCS CONCEPTS

• **Human-centered computing** → **HCI theory, concepts and models**; **Empirical studies in HCI**; Collaborative and social computing design and evaluation methods; • **Information systems** → *Web interfaces.*

KEYWORDS

digital wellbeing, dark patterns, technology overuse

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1 INTRODUCTION

In the contemporary attention economy [13], tech companies adopt mechanisms that exploit users' psychological vulnerabilities [7] to grab users' attention and maximize the time spent by people on their digital platforms, e.g., to increase advertisements revenue. Such a controversial business has several, measurable consequences on individuals' sense of agency [5, 21] and it often results in users' lack of control over technology use [10]. This has led public media and researchers in different areas, from philosophy [8] to HCI [9, 28], to focus on a people's *digital wellbeing*, which can be defined as *"the impact of digital technologies on what it means to live a life that is good for a human being in an information society"* [8]. The rising attention on the digital wellbeing topic has fostered, both in the academia and in the industry, the emergence of Digital Self-Control Tools (DSCTs) [23], i.e., a variety of mobile applications and web browser extensions that adopt interventions like timers and lock-out mechanisms to allows users to self-regulate their technology use. While these interventions can be considered as *external mechanisms* that apply universally to many different apps and websites [21], e.g., by allowing users to track and limit the usage of different services at the same time, they strongly rely on users' self-regulation strategies and capabilities, and their efficacy decreases in the long-term [28]. A promising (and hopefully more efficient) alternative to timers and lock-out mechanisms is to focus on the *internal mechanisms* adopted by digital services, such as YouTube's autoplay, that are likely to contribute to excessive technology usage and problematic behaviors [21]. The main idea behind such an approach is to redesign such mechanisms with the aim of removing problematic aspects from an app or website while still retaining its benefit. Despite a few notable exceptions [19, 21], the space of DSCTs targeting internal mechanisms is relatively underexplored. Furthermore, it is still unclear how to motivate key stakeholders to rethink their design procedures and objectives to better align with users' digital wellbeing and limit these manipulative mechanisms from the beginning.

As suggested by Lukoff et al. [21], a first, necessary step to close these gaps and convince designers and tech companies to find alternatives to the contemporary attention economy is to develop "a common language of *attention-capture dark patterns*." Moving in this direction, we first reviewed the recent literature on digital wellbeing and dark patterns to provide a definition for malicious mechanisms that lead to attentional harms and digital wellbeing problems. By exploiting such a definition, we then extracted and characterized a set of 5 attention-capture dark patterns, from *recommendations* to *pull-to-refresh*, through a 1-week-long auto-ethnography during which we self-monitored our own interactions with 2 popular digital services, i.e., Facebook and YouTube, and their mobile/web interfaces. Differently from the "traditional" dark patterns originally disclosed by Harry Brignull [6], attention-capture mechanisms go beyond the manipulation of user interfaces, as they also include system functionality like *autoplay* and *pull-to-refresh*. Some of these patterns, e.g., *pull-to-refresh*, are inherently associated to specific devices, i.e., smartphones and tablets, as they are implemented in

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mobile apps, only. Others, instead, are common both in mobile apps and websites, and can therefore be experienced while using different kinds of devices. For example, all the interfaces of today's social networks, both on mobile apps and on the corresponding websites, adopt a mechanism of *infinite scrolling*: as the user scrolls down a page, more content automatically and continuously loads at the bottom. In some cases, cross-device dark patterns may depend on the underlying digital service, and may target different contents. In video-sharing services like YouTube, for instance, *autoplay* characterizes the "next video" that is automatically reproduced to keep the user watching other contents, while the same pattern on Facebook is associated to stories and videos in the news feed.

We then report on the result of a preliminary study ($N = 7$) that we conducted to explore the impact of a widespread attention-capture dark pattern adopted by social networks, i.e., *social investment*, on the Facebook website. The study procedure is generalizable to different attention-capture dark patterns, and can be exploited to evaluate their impact and inform design choices. In the study, we monitored users while they normally interacted with Facebook through data-logging and periodical questionnaires. By using a dedicated web-browser extension, however, we progressively (and silently) reduced *social investment* from the website until it were completely removed. Results show that the targeted dark pattern may influence different aspects of Facebook use and people's digital wellbeing in different ways. Hiding "social" metrics, e.g., views and number of likes, or, more drastically, removing all the comments and reactions, significantly decreased the number of daily access to the service. Furthermore, it led participants to slightly decrease daily usage and passive sessions, e.g., with less scrolling, and it significantly decreased the users' perception on Facebook intensity use.

All in all, our preliminary findings open the way to new design processes that carefully analyze and take into account the impact of attention-capture dark patterns on technology use and users' digital wellbeing. We discuss such a novel and, in our opinion, important opportunity in the last section of this paper.

2 DEFINING AND CHARACTERIZING ATTENTION-CAPTURE DARK PATTERNS

Dark patterns have been defined as user interfaces that intentionally manipulate users into performing actions that go against their best interests [17]. Such a concept has gained interest after the disclosure of a set of dark patterns, mainly related to privacy and financial behaviors, operated by Harry Brignull and his popular *darkpatterns.org* website [6]. To start looking into dark patterns that "grab" users' attention and create "addictive" digital platforms, we performed a review of the recent literature on digital wellbeing and dark patterns. To this end, we exploited the electronic database of the Association for Computing Machinery (ACM) Guide to the Computing Literature[1], by using search terms adopted by previous reviews in the dark pattern [26] and digital wellbeing [23] contexts, respectively.

Recently, Lukoff et al. [21] coined the term "attention-capture dark patters" to explore the YouTube's internal mechanisms that undermine users' sense of agency. More generally, we can define an attention-capture dark pattern as:

> *a design or a system functionality that exploit people's psychological vulnerabilities to maximize **time spent**, **daily visits**, and/or **interactions** on a digital service **against the person's will**.*

Attention-capture dark patterns, in particular, have the following characteristics:

- they *distract* from a goal that a person has in a specific moment, thus undermining the individual's autonomy [26];
- they make a person experience a *lost sense of time and control* [21];
- they make a person experience a *sense of regret* in hindsight about the time spent on the service [11].

Differently from traditional dark patterns, attention-capture mechanisms go beyond the manipulation of user interfaces, as they also include system functionality like *autoplay* and *pull-to-refresh*. They can be related to the concept of "negative nudges [12]." According to the original definition [32], nudging refers to any (subtle) changes in the "choice architecture" of a system that can alter people's behaviors in predictable ways. Traditionally, nudging envisions that our knowledge about the users' systematic biases in decision making can be leveraged to support people in making optimal decisions. It is nowadays clear, however, that the same mechanisms and psychological vulnerabilities can be exploited against users [7].

Stemming from the reported overview, we then conducted a 1 week auto-ethnography during which we self-monitored our own interactions with Facebook and YouTube, i.e., two digital services that have been included several times in studies on technology overuse [18, 21, 24, 25], and their mobile/web interfaces. Auto-ethnography is a longitudinal first-person research method through which researchers describe and systematically analyze their personal experiences to underpin cultural meanings of technology use [14]. Specifically, we collected information, e.g., videos and screenshots, about those mechanisms that we perceived as "attention-capture," by applying the definition extracted from our review. Overall, we extracted a set of 5 attention-capture dark patterns:

Recommendations. Recommender systems are undoubtedly a tool that can improve the overall user's experience with a service that is designed to maximise a user's utility [7]. However, when there are misalignments between the goals of the platform and any of the user's utility, e.g., in terms of digital wellbeing, recommendations can easily become an instrument to "trap" the user into the system, especially when suggestions are endlessly delivered during the current user's interaction [21]: as the YouTube's product chief said in a recent Consumer Electronics Show (CES), more than 70% of YouTube watchtime is driven by artificial intelligence and recommendations [3].

Autoplay. A mechanism that is similar to recommendations and that can easily become an attention-capture dark pattern is *autoplay*, i.e., when new contents like videos or stories are sequentially and automatically played without the need of any user's interaction. Such a mechanism removes the need

[1] https://libraries.acm.org/digital-library/acm-guide-to-computing-literature, last visited on December 21, 2021.

for autonomous decision-making [7]. As for recommendations, this can be a useful feature in some circumstances, e.g., to listen to YouTube's music videos while working, but detrimental in others: Lukoff et al. [21], for example, found that autoplay often make users feel less in control by undermining their sense of agency, as suggestions of new videos are "*hard to decline*."

Pull-to-refresh. Through the *pull-to-refresh* interaction technique, users can "pull" an interface, e.g., by swiping down on a mobile app, to manually reload the status of the system and see if there is new content, e.g., a new friend's post on the Facebook newsfeed. As warned by tech-insiders [1] and researchers [7, 29], such a technique offers a *variable reward* to its users, i.e., it may or may not reveal a new content. In other words, it exploits the same user's psychological vulnerabilities that are targeted in gambling addictions, e.g., in slot-machines.

Infinite scrolling. Passively and mindlessly scrolling the newsfeed of a social network is an aspect of technology use that negatively influence users' digital wellbeing [20, 33]. According to Mildner and Savino [27], one of the mechanisms that promote such a behavior is the *infinite scrolling*, the mechanism through which, as the user scrolls down a page, more content automatically and continuously loads at the bottom. As the *pull-to-refresh*, also infinite scrolling can be related to the the concept of variable reward [31], since it creates the illusion that new interesting contents will "flow" forever, while the "quality" of the next visualized items cannot be predicted.

Social Investment. Social metrics like number of reactions, comments, followers, and views can "bind" users to the underlying platform, giving rise to an attention-capture dark pattern that we called *social investment*. Such a mechanism influences users by instilling the idea that they should continue to use the platform to avoid loosing the achieved progresses [15]. Furthermore, despite reactions and comments can be considered as one of the building block of contemporary social networks, researchers highlight that they are sometimes designed "*to structure rewards in a way that is likely to encourage use* [29]," e.g., the notification of a Facebook's like can be delayed to maximize its reward [2]. Receiving likes and comments, moreover, can also be seen as a partial reinforcement process, as only some (non predictable) interactions are rewarded.

Table 1 shows how the identified attention-capture dark patterns apply to Facebook and YouTube on mobile apps[2] and desktop websites, respectively. The table demonstrates that attention-capture dark patterns apply to mobile apps and websites in different ways. The *pull-to-refresh* pattern, for example, is inherently associated to a specific device, since it is typically implemented on touch screen interfaces: it is therefore not surprising that we only found it on the mobile apps of Facebook and YouTube. On Facebook, in particular, users can pull the interface to reload posts, e.g., in newsfeed and marketplaces, as well as notifications. On YouTube, instead, users can manually reload the main window to get new recommended videos. The others attention-capture dark patterns are instead present in both the two services and interfaces. Facebook and YouTube implement an infinite scrolling pattern both on their mobile apps and websites, e.g., to browse newsfeeds (Facebook) and recommended videos (YouTube). The *social investment* pattern is by its nature tied to social networks, but we found it in YouTube, also, as the service offers the possibility of liking and commenting videos, and spur creators to continuously increment views and subscribers. *Recommendations* and *autoplay* are instead more strongly linked to the underlying service, and target different contents: recommendations on Facebook, for example, range from sponsored pages to new friends to follow, while recommendations on YouTube are more specific, i.e., videos. Finally, YouTube *autoplay* characterizes the next video that is automatically reproduced when the previously played content ends. Facebook, instead, can automatically play stories and videos in the newsfeeds.

3 QUANTIFYING THE IMPACT OF ATTENTION-CAPTURE DARK PATTERNS

As reported in Section 2, attention-capture dark patterns apply in different ways to different digital services. An attention-capture dark pattern, in particular, may be more influential on some kinds of services and/or interfaces, thus requiring stronger mitigation methods, while it could be totally tolerable on other services and/or interfaces. Being able to *quantify* the impact of attention-capture dark patterns, e.g., on people's digital wellbeing and usage patterns, is therefore an import step to allow designers and tech companies to develop better technology. In this section, we describe how we are starting to pursue such a goal by reporting on the results of a preliminary study (N=7) that investigates the influence of an attention-capture dark pattern typically adopted by social networks, i.e., *social investment*, on the Facebook website. To design the study, we followed all the ethical guidelines of our university for studies involving human subjects. The adopted methodology can be generalized to different attention-capture dark patterns, digital services, and interfaces.

3.1 Methodology and Recruiting

To conduct the experiment, we developed a dedicated web browser extension, named `facebook-investment`, by exploiting the Web Extensions APIs[3]. In this way, the extension was compatible with the majority of the contemporary browsers, from Google Chrome to Firefox and Microsoft Edge. The experiment started with an initial demographic survey, and was composed of three 1-week long phases, during which the developed extension progressively (and silently) reduced the presence of *social investment* from the Facebook website until the pattern was completely removed. Figure 1 shows the three phases implemented by the `facebook-investment` extension. In the first week (***baseline phase***), participants could interact with an unmodifiedversion of Facebook. In the second

[2]Tested on an Android-based smartphone on March 2021.

[3]https://developer.chrome.com/docs/extensions/reference/, last visit on December 5, 2021.

Table 1: How the 5 identified attention-capture dark patterns apply to the 2 analyzed services, i.e., Facebook and YouTube, on the corresponding mobile app (left columns) and desktop website (right columns).

Pattern	Facebook 📱	YouTube 📱	Facebook 💻	YouTube 💻
Recommendations	Feed, Watch, Marketplace, Groups, Friends	Videos, Next video	Feed, Watch, Marketplace, Groups, Friends	Videos, Next video
Autoplay	Feed, Watch, Stories	Next video	Feed, Watch, Stories	Next video
Pull-to-refresh	Feed, Watch, Marketplace,Groups, Notifications	Home	✗	✗
Infinite scrolling	Feed, Watch, Marketplace, Groups	Home, Suggestions, Video lists	Feed, Watch, Marketplace,Groups	Home, Suggestions, Video lists
Social Investment	Views, Reactions, Comments, Friends	Views, Reactions, Comments	Views, Reactions, Comments, Friends	Views, Reactions, Comments

week (***mitigation phase***), participants interacted with a Facebook website in which the presence of *social investment* was reduced (Figure 1(c)). To this end, the extension started to remove all the Facebook's social metrics, including the number of reactions, comments, and shares under each post, but also number of likes, followers, and members for pages and groups. Finally, in the third week (***removal phase***), besides hiding all the social metrics, the extension removed the possibility of reacting to and commenting posts (Figure 1(c)). During the three weeks, the extension anonymously logged all the user's sessions on the Facebook websites, without storing any identifying information about the actual content engaged with by the participants. For each session, in particular, we collected the initial timestamp, the duration, the number of scrolls, and the number of keystrokes performed by the user. At the end of each phase, the extension prompted participants to fill in a weekly questionnaire to evaluate their past week of browsing. These surveys included a space to insert any open comments and two state-of-the-art psychological scales, i.e., Passive and Active Facebook Use Measure (PAUM) [16] and Multidimensional Facebook Intensity Scale (MFIS) [30].

We recruited participants interested in joining our preliminary study by sending emails to university students enrolled in different programs. In the recruiting message, we asked users a) what was the browser they use most often on their PC/laptop, and b) how often they used Facebook on their browser (*never*, *rarely*, *2/3 times a week*, *every day*). We received a total of 49 answers, from which we excluded participants who selected a browser that was not compatible with the developed extension, e.g., Safari, as well as participants that answered *never* or *rarely* to the question on Facebook usage. Overall, 25 participants qualified for the study. We sent to them an email that included an informed consent form to participate in the study, and a step-by-step guide to install the `facebook-investment` extension on the browser selected in the first recruiting message. Overall, 13 users installed the extension, with 7 of them that successfully completed the study by leaving the extension installed for 3 weeks.

3.2 Results

3.2.1 Demographic. Participants (2 females, 5 males) were on average 25.42 years old (SD = 3.15). Three of them were undergraduate students in psychology, 1 was a master's degree students in computer engineering, while the remaining 3 participants were Ph.D students in computer engineering. All the participants stated that they had started using Facebook more than 5 years ago. While participants declared to regularly use Facebook on their PCs/laptops, they also declared to regularly use mobile browsers (4) or the dedicated mobile app (3) to access Facebook on their smartphones. None of the participants had never used digital self-control tools or web browser extensions targeting Facebook.

3.2.2 Overall Facebook Use. We found that acting on *social investment* resulted in a slightly reduction of the daily time spent on the website in the *removal* phase. Specifically, the median of participants' average amount of daily time spent on Facebook was 7m 13s in the *baseline* phase (min = 38s, max = 24m 01s), 8m 33s in the *mitigation* phase (min = 0s, max = 1h 22m 28s), and 2m 18s in the *removal* phase (min = 38s, max = 26m 32s). Similar reductions characterized the average number of daily sessions (roughly 12 on average in the *baseline* phase and 8 in the *removal* phase) and the average length of each session (roughly 2 minutes on average in the *baseline* phase and 1 m 13 s in the *removal* phase).

3.2.3 Specific Usage Patterns. Not surprisingly, hiding social metrics from Facebook, as well as removing the possibility of reacting to and commenting posts, influenced participants' usage patterns. In particular, we found that the average daily number of mouse scrolls on Facebook decreased from the *mitigation* phase (median = 1595.85, min = 0, max = 9198.57) to the *removal* phase (median = 442.71, min = 110.28, max = 5288.28), while the number of keystrokes remained roughly the same across all the three weeks of the study. As scrolling is typically associated to a passive usage of Facebook [22], our findings may suggest that mitigating *social investment* promoted a more active usage of the Facebook website.

3.2.4 Users' Perceptions and Digital Wellbeing. The same participants recognized that their Facebook use turned to be more active and less intense after the *mitigation* and *removal* phases. According to the responses to the PAUM scale in the periodical questionnaires,

(a) - Baseline (b) - Mitigation (c) - Removal

Figure 1: The three different interfaces that participants experienced in our preliminary study. With respect to the *baseline* phase, in the *mitigation* phase we removed all the Facebook's social metrics, e.g., number of reactions, comments, shares, and followers (Figure 1(b)). In the *removal* phase, instead, we completely removed the possibility of reacting to and commenting posts (Figure 1(c)).

in particular, the average passive use decreased from 11.33 in the *baseline* phase (SD = 1.53) to 8.33 in the *mitigation* phase (SD = 3.05) and 9.33 in the *removal* phase (SD = 0.58). Active social use, instead, increased from the *baseline* phase (M = 6.00, SD = 1.00) to the *mitigation* phase (M = 8.33, SD = 1.15), and then slightly decreased in the removal phase (M = 7.00, SD = 2.00), probably due to the complete absence of likes and comments. Average scores of the MFIS scale, instead, decreased from the *baseline* phase (M = 28.67, SD = 4.62) to the *removal* phase (M = 21.67, SD = 8.02). While the perception of the participants on their Facebook use changed during the study, only 2 participants noticed some changes in the Facebook interface, at least according to the open comments in the weekly questionnaires. One participant, in particular, noticed that "*likes and comments counts have disappeared*" in the *mitigation* phase, and that comments and likes were unavailable in the *removal* phase. Similarly, another user commented that "*like, comment and share buttons disappeared this week.*" None of the participants, however, described browsing the updated Facebook website as a problematic or negative experience.

4 DISCUSSION

The HCI community have started to consider dark patterns only recently [17, 27]. As pointed out by Gray et al. [17], the original definition of dark patterns, i.e., deceptive functionality that exploits people's psychological vulnerabilities to promote choices that are not in the user's best interest, is very generic, and it leaves many unanswered questions, e.g., "*what is the user being 'tricked' into doing, and with what motivation*" (p. 3). Despite the generic definition, however, dark patterns have been traditionally applied to specific privacy and financial-oriented users' behaviors that can be influenced by a deceptive UX design: the "Privacy Zuckering" mechanism, for example, describes a user interface that tricks users into (unintentionally) sharing private information, while the "Sneak into Basket" pattern describes malicious e-commerce websites that sneak additional items into the basket.

Our work started to shed light on a new category of manipulative designs that contribute to the contemporary "attention economy," the *attention-capture dark patterns* [21]. These deceptive mechanisms share the common goal of "tricking" users to stay on a platform by exploiting their psychological vulnerabilities, to "capture" their attention and maximize advertisement revenue. Patterns like *autoplay*, for example, aim at diminishing individual's physical or mental effort to stay on the platform, while deceptive mechanisms like *pull-to-refresh* mislead the user by raising false expectations, e.g., for new messages, to promote a continuous usage of the platform. Besides exploiting different users' psychological vulnerabilities, attention-capture dark patterns differ from traditional dark patterns a) in the exploited methods, and b) in how they influence human-technology interaction. Regarding the exploited methods, traditional dark patterns describe situations in which user's choices are typically manipulated through the usage of deceptive UX design. Attention-capture dark patterns, instead, can also exploit ***system functionality*** that are independent form the underlying UX design, e.g., *autoplay* and *pull-to-refresh*. With respect to the influence on human-technology interaction, instead, traditional dark patterns negatively influence the interaction between people and their devices and services, and can prevent users from achieving their interaction goals. On the contrary, the attention-capture dark patterns described in Section 2 do not necessarily influence the user's interaction per se. Paradoxically, some of them aim at improving usability and simplifying the interaction. The dark side of this coin, however, is that such improvements and simplifications are sometimes a deliberate choice to promote a frequent and continuous use of technology, to the point of undermining users' sense of agency [21]. As demonstrated by our preliminar study of Facebook's *social investment* (Section 3), this negatively influence users' digital wellbeing: the collected scores on the Multidimensional Facebook Intensity Scale, for instance, significantly decreased as long as the presence of *social investment* was reduced, thus suggesting that users felt more in control without this kind of functionality.

We are confident that our work can promote the development of new design processes that consider users' digital wellbeing as one of the most important design goals. The HCI community and tech providers could work together to find alternative business models that do not necessarily target users' attention and engagement: designing for users' digital wellbeing, e.g., by targeting meaningful interactions [22] and microplanning [21], may initially result in a lower user engagement, thus resulting in a lower business profitability in the short term, but it could increase user loyalty in the long term. Our preliminary findings (Section 3), for example, suggest that mitigating Facebook's *social investment* may promote a more active usage of the platform. In particular, we claim that experiments like the one described in Section 3 should become one of the fundamental parts of the technology design processes adopted by researchers and practitioners. Varying the intensity of attention-capture dark patterns, as well as collecting usage data and responses to psychological state-of-the-art scales, could be a viable way to explore *when* a given mechanism is appropriate and *when it is not*, e.g., because it would promote compulsive usage. Designers could conduct A/B experiments on a large scale, to detect the presence of possible attention-capture dark patterns in their platforms and mitigate their negative influence on users' digital wellbeing. Finally, a standardized definition of attention-capture dark patterns could also be useful at a regulatory level [21, 34], since it could facilitate the development of new policies and regulations to limit mechanisms that lead to attentional harms. Some states in the U.S., for example, have recently approved regulations against UX dark patterns that threaten user's privacy [4].

4.1 Limitations and Future Works

The experiment reported in Section 3 can only be considered as an exploratory investigation, as it was conducted with a small sample of 7 students with the same cultural and geographical background, and it lasted 3 weeks, only. Furthermore, we only explored the effects of a single attention-capture dark pattern over a single website, i.e., Facebook, and we could not control the usage of other devices, i.e., participants may have accessed Facebook through mobile apps or other browsers. In our future works, we are planning to expand the set of 5 attention-capture dark patterns discussed in this paper by creating a comprehensive taxonomy of these manipulative mechanisms. At the same time, we will conduct longer experiments with larger and varied populations, e.g., to investigate the long-term impacts of attention-capture dark patterns on different digital platforms.

5 CONCLUSIONS

As the attention economy incentivizes continuous and frequent technology use, there is the need of better understanding what are the mechanisms that "steal" our attention on digital services. In this work, we have started to define and evaluate the impact of attention-capture dark patterns, with the aim of promoting the development of tools for digital self-control able to rebuild problematic designs and/or functionality, or, better, to convince designers and practitioners to mitigate this kind of manipulative mechanisms from the beginning of their design processes and find alternative business models that consider users' digital wellbeing as one of the most important selling points. While our work exemplified only a subset of attention-capture dark patterns, future works could focus on producing more complete taxonomies that encapsulate several if not all of the mechanisms that may lead to attentional harms. Furthermore, we hope that our preliminar study on Facebook's *social investment* can open the way to larger scale between-subject experiments that will allow us to better understand this particular category of dark patterns.

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