Attention is all they want, time is all you have: aligning time use with values to counteract dark patterns

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Abstract

Digital technologies designed to capture our attention also capture our time. These attention capture damaging patterns lead individuals to spend time in ways that do not align with their values. Many digital self-control tools enable tracking time spent using digital technologies (such as social media), but tend to be designed for those already seeking to improve their digital well-being and may not include the broader life context of the user. We present two case studies of self-tracking systems that support collecting comprehensive records of time use, annotating time use with abstract human values, and visualizing the alignment between time use and values. These systems prompted users to reflect on *why* they were engaging in activities of everyday life, helped many participants clarify their own values, and led some users to report being motivated to make lifestyle changes (such as spending less time on screens). We synthesize the case studies and discuss design implications for digital self-control tools, and for well-intentioned commercial organizations that wish to produce digital technologies that support human values.

Keywords

Dark patterns, digital well-being, digital self-control tools, self-tracking, time use, human values, personal informatics

1. Introduction

Time is all we have. Humans have always struggled to spend time in alignment with their values, and this challenge has become more difficult with the proliferation of digital technologies competing to capture our attention (and therefore time). Features such as algorithmic recommendation, combined with infinite scroll (IS), are an example of a type of *attention capture damaging (dark) pattern* (ACDP) [1]. Users of digital technologies containing ACDPs tend to use them more often than they would like, and use them in ways that are often not considered meaningful [2] (and therefore not in alignment with their values).

As a response to the struggle of disengaging with digital technologies containing ACDPs, researchers and commercial organizations have designed and built a variety of digital self-control tools (DSCTs) that help individuals track, monitor, and reduce the amount of time they spend using these technologies [3]. Many DSCTs support tracking screen time, which, while often useful, often fails to include the broader context of the users' lives such as time spent off-screen, or how the use of time aligns with their values. This broader context is critical for helping users have more "time well spent" [4], which is a fundamental goal of DSCTs. In addition, many DSCTs are designed for individuals who already wish to improve their digital well-being, and do not address those who are in the pre-contemplation stage of the transtheoretical model of behavior change [5].

We suggest that DSCTs can be designed to support comprehensive self-tracking of time use in order to motivate individuals to take action to improve their digital well-being. We present two case studies of self-tracking systems that support individuals in creating comprehensive records of time use, and annotating self-tracked activities with abstract needs, values, and self-aspects of identity. The systems

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also present aggregated visualizations of the self-tracked (and self-reported) data, helping individuals discover patterns in how their concrete use of time supports their abstract goals such as their values and needs. By supporting reflection on abstract values and connecting the abstract values to concrete activities (such as time spent on social media), individuals can recognize the extent to which using technology with ACDPs does (or does not) support their personal human values, helping motivate them to seek further interventions to improve digital well-being.

Overall, this workshop paper makes the following contributions:

- A presentation of two prior case studies that inform the design of DSCTs, which support reflection on abstract values in the context of concrete activities
- Design implications for DSCTs that seek to help individuals in the pre-contemplation stage of improving digital well-being
- Design implications for commercial organizations that create digital products and services

2. Background

In this section, we briefly present dark patterns, focusing specifically on those patterns that lead users to spend more time using digital technology than they otherwise would. We also introduce digital self-control tools (DSCTs) and their connection with self-tracking of time use.

2.1. Attention Capture Damaging Patterns

Dark patterns, also known as deceptive patterns or damaging patterns, are designs that deceptively lead users into behavior that is not in their best interest [6]. Attention capture damaging patterns (ACDPs) are a subclass of dark patterns that seek to capture users' attention, feel compelled to use the technology, and lead them to "lose their sense of time" [1]. ACDPs and other dark patterns take advantage of known biases or tendencies in human cognition, such as framing, decoy, or motivating uncertainty effects [7].

Infinite scroll (IS) is an ACDP in which, as the user scrolls down a page, more content is automatically refreshed and loaded [8]. By removing stopping points, IS creates an illusion of a never-ending stream of content [8, 1]. Users can be trapped in a state of "doom scrolling" while losing a sense of goals and time, or they leave the interaction feeling dissatisfied [1, 9]. Another ACDP is the content autoplay pattern, typically used with video platforms [1]. As a piece of content ends, another piece of content plays right away without requiring any user interaction [8, 1]. Through this process, the need for autonomous decision-making is removed which can lead to prolonged "binge-watching" sessions [1, 9].

In a survey of 61 students (ages 15-21) in Bangladesh, 45.2% reported spending 1-2 hours a day mindlessly scrolling on social media, while 30.6% reported spending more than three hours daily [10]. Users of systems with ACDPs have described their experience as "frustrating" and how it "doesn't really seem fair" [11]. This experience can motivate individuals to seek interventions to improve their digital well-being.

2.2. Digital Self-Control Tools, Digital Well-Being, and Time Use

To counteract these deceptive designs, researchers and technologists design and study digital self-control tools (DSCTs), a class of tools that are intended to help users track, monitor, manage, or self-regulate their use of digital technologies [8, 3]. DSCTs can take a variety of forms with different strategies for supporting digital well-being, such as blocking or removing apps, self-tracking time using technology, providing affordances for engaging with goals, or providing rewards (such as streak tracking) for certain behaviors [3]. For example, a study where users were informed about the emotional valence of webpages they were visiting was shown to promote more purposeful browsing, resulting in an improved mood for some [12]. A previous randomized controlled trial study showed that participants found that different types of DSCTs were reported to have different levels of usefulness in changing

behavior around digital technologies [13]. Some of the most highly useful intervention strategies were those that directly modified or removed exposure to the specific features that were "attention capturing" (such as removing an infinitely scrolling feed). However, these interventions generally work only on web browsers, limiting the scope of their use [13].

DSCTs focusing primarily on measuring screen time have become popular in commercial applications. Apple's Screen Time, for example, is a default application on the iPhone, and provides a day-by-day breakdown of how much time is spent using the phone, broken down by application and by category. While DSCTs can have positive effects on screentime use, they often rely on the internal will-power of users to adhere to continued use of the tool [14]. In addition, DSCTs tend to focus on the specific context in which the digital technology is used. DSCTs often support tracking screen time, for example, but not necessarily time spent with friends and family or time spent engaging in other activities. While DSCTs may help to reveal and manage problems at the scope of the digital technology, they generally do not include a broader context of the individual's life and what is most important to them (with an exception of tools that seek to remind users of goals).

In this direction, Socialize [15] and Aiki [16] encourage users to do something other than the addictive or undesired use of digital technology. Socialize helps structure "if-then" plans where if undesired use is detected, the system will trigger a suggestion for pre-defined alternative plans, such as "going for a walk" [15]. Aiki redirects users to a website focused on language learning [16].

We suggest that time-tracking DSCTs can be designed to incorporate the broader life context in which digital technology use is situated, and support individuals in reflecting on how their time use aligns with their values. While not directly targeting any specific digital technology, this sort of broad "life study" can help individuals to feel motivated to change.

3. Case Studies Informing DSCT Design: Aligning Time Use and Values

In this section, we present an overview of two *in situ* deployment studies that asked participants to gather comprehensive records of their time use and how their time use aligned with abstract goals such as needs, self-aspects, or values. We highlight how these studies show the potential for comprehensive self-reflection on time use to counteract the negative effects of attention capture damaging patterns.

3.1. Case Study 1: Measuring Time, Self, and Needs

The first study focused on the self-tracking of time use in relation to the satisfaction of basic human needs [17]. The authors designed a technology probe consisting of a shared spreadsheet (Google Sheets), and an educational PDF that explained two psychological theories (the Multiple Self-aspects Framework [18] and Max-Neef's Fundamental Human Needs [19, 20]. The spreadsheet included a row for every 15 minutes of the day, designed to mimic traditional time-use diaries [21]. Participants were instructed to complete a version of the Day Reconstruction Method (DRM) [22] where they recalled each "episode" (or activity) of the day, and recorded basic information such as the activity name, people co-present, and location. In addition to the basic activity information, participants were also prompted to reflect and record which of Max-Neef's fundamental needs were being satisfied (or hindered) by engaging in the activity, and which of their self-aspects were being activated.

10 participants collected a complete record of their time-use for a week, and then the researchers manually categorized their activities into bespoke interactive visualizations (see Fig 1) for an example. Participants then completed a closing interview where they saw the visualization for the first time (which was emailed to them as an HTML file). Participants could change the data that was visualized in order to find connections between their activities, needs, aspects of identity, relationships, and locations. Participants expressed a variety of positive outcomes from engaging in study, both in the act of reflecting on time-use itself, and while exploring the visualization. Participants discovered benefits to activities they did not realize (such as showering), and discovered needs that were not being met in their daily life ("I have no spirituality... at this time of my life") [17].

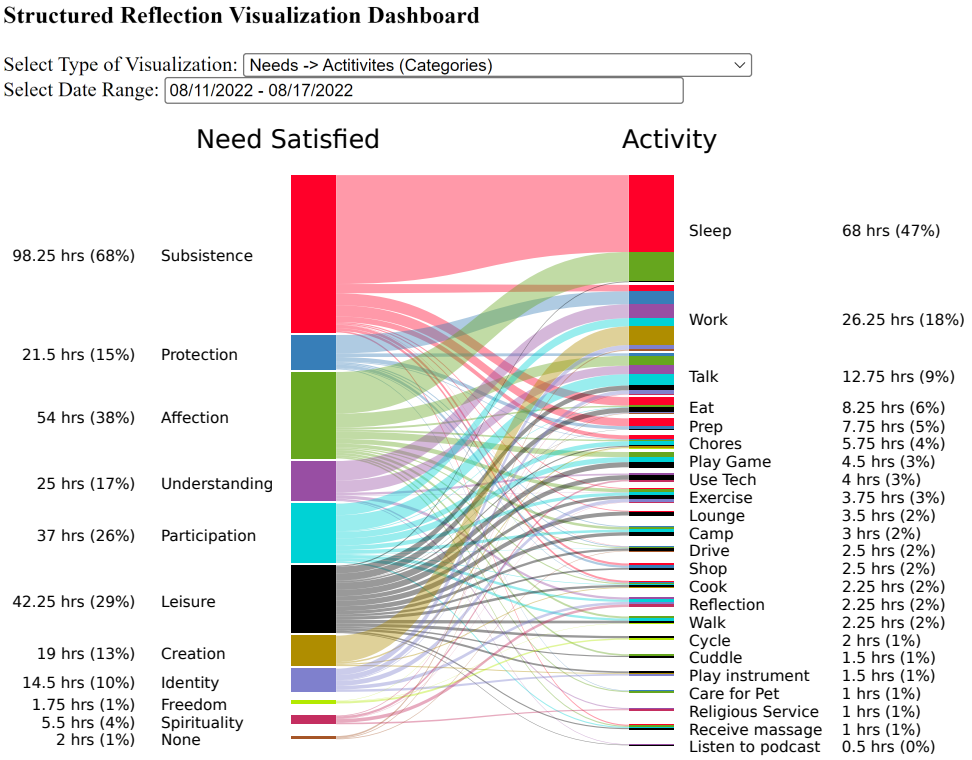

Figure 1: A custom interactive network visualization showing a week's worth of time-use data from the first case study [17] (used with permission). Categories of activities are connected to which basic needs those activities were self-reported to have helped satisfy. Participants can hover over individual nodes to filter the data to those activities connected to the node.

Perhaps the most transformative insights were those related to understanding motivations for engaging in activities. Participants were forced to confront their often automatic routines and assign needs and self-aspects to the activities of those routines. One participant said "Like why do I do this habit? I've been doing it for years or months or days but like *why* am I doing it?" [17]. Another participant said "This study has been quite a journey sometimes... I do stuff without even knowing it... I spend most of the time being alone, just working, watching TV" [17].

Engaging in this style of comprehensive time-tracking and reflection may help individuals to identify negative effects of dark patterns in their life, as this would likely be evident while reflecting on activities influenced by the deceptive designs (spending time scrolling on social media, for example), and also reflecting on aggregate visualizations (realizing the extent of time spent on screens that may not satisfy many needs).

3.2. Case Study 2: Tracking Time Use to Reflect on Values

A primary limitation of this first case study is that it required participants to connect their activities with a pre-determined set of needs (Max-Neef's), even though some participants did not resonate with all of the needs in the set. In addition, gathering data was time-intensive and cognitively demanding. The work presented in this second case study sought to address these issues by building a prototype personal informatics system that allows participants to record a spoken narrative of their day, which is then parsed into activities on a calendar interface [23]. Rather than structuring reflection around specific, predetermined theories of needs and self-aspects, participants could develop their own custom sets of values (or use sets from a pre-defined library of values drawn from major world religions and psychological theories).

15 participants first completed an opening interview where they set up the system for data collection, which included reflecting on their high-level values. Each participant created a custom set of values

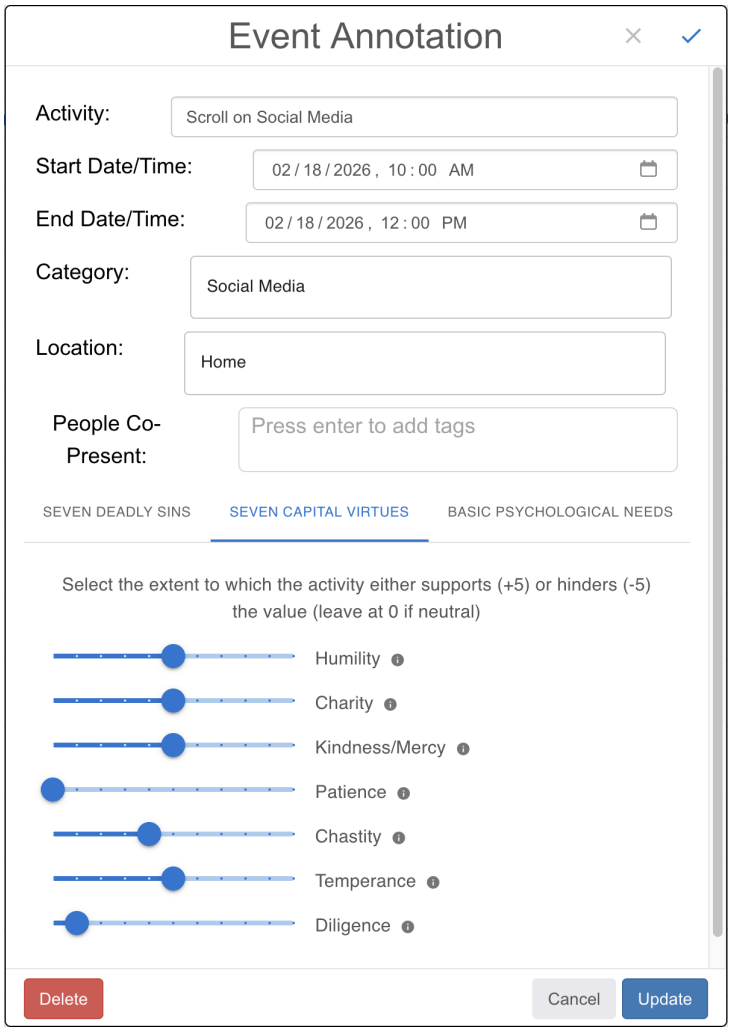

Figure 2: A screenshot from the eValuATE system, prompting the user to annotate an activity with values. Participants customized their abstract values, which were used to scaffold reflection on concrete activities of everyday life (including time spent using digital technology).

that was important to them, which was used to scaffold reflection on the specific activities (see the annotation modal in Fig 2 for example sets of values). Participants then used the online web application to track their time, and annotate their time use with values for up to a month. Throughout the study, participants could make changes to their tracked values. In contrast to the prior study, participants were able to view and interact with the visualization dashboard at any time, rather than solely at the end.

In the closing interview, participants expressed that using the system helped them to clarify their own values, discover time that did not support their values, and be motivated to make changes to how they spent their time. Some participants did not have a clear sense of their values or how their values related to their everyday activities before the study. Over time, P3 said the experience led them to realize "what do I actually value?" [23]. In general, participants felt more motivated to incorporate values into how they were living their everyday lives.

Having to annotate activities of everyday life with abstract values that they themselves selected forced participants to confront challenging internal questions as to why they engage in each activity. One participant said "If I noticed [an activity]... that I had to drag one of those, like, values [sliders] to the negative on, I think that would really make me pause, and [think] if I wanted to continue doing that" [23]. Simply having to assign an association between one's personal values and the specific activities of life resulted in an increased salience of possible discrepancies. About half of the participants

reported changing their behavior as a result of the study. P13 said, "**since I did this, I have been avoiding screens as much as possible**... I realized, like, that [expletive] was bumming me out" [23].

The authors generalized the design strategy used in eValuATE into a multi-level reflection model that encourages designers to support reflection across levels of abstraction. In this case, participants reflected on high-level, abstract values, and then connected those values to specific and concrete activities of everyday life.

4. Discussion

These case studies contribute to the discussion of dark patterns and the design of digital self-control tools to mitigate the effects of dark patterns. This work shows the importance of seeing an individual's time spent using technology *in context* with the rest of their life, which connects with the importance of seeing dark patterns in context of their use [24]. Both case studies focus on the design of tools that help individuals to gather a *comprehensive* record of their time use, and how each activity of time use either supports or hinders specific values. In what follows, we synthesize how DSCTs can help to incorporate an individual's broader life context and deeply held values to motivate improving digital well-being.

4.1. Design Implications for Digital Self-Control Tools

Many digital self-control tools are focused on addressing challenges of "lagging adoption," where individuals realize they want to change their technology use, but haven't done so yet [25]. These tools may include timers [26], lockout controls [27], or the tool may make modifications to the application or website itself [14]. Drawing on the transtheoretical model of behavior change [5], these interventions are targeted towards individuals at the later end of the behavior change stages, particularly the *preparation*, *action*, and *maintenance*. They know they want to change, but struggle to do so, and seek DSCTs for targeted interventions.

The two case studies present a reflection strategy that could be used to design DSCTs to help motivate those who are in the "pre-contemplation" stage, which is a traditionally difficult stage to design for [5]. In this stage, individuals do not intend to make changes, often because they are uninformed of the consequences of their choices [5]. The self-tracking tools in the case study led participants to **reflect first on their abstract values**, helping participants to clarify what was most important to them (without any specific behavior change intention). Next, participants were prompted to **explicitly connect these abstract values with each concrete activity of everyday life**, by dragging a slider to either a positive or negative value. This could lead an individual in the pre-contemplation stage to realize that activities influenced by ACDPs perhaps do not align with their values. As the system relied entirely on self-report (of values, activities, and their relationship), there is no intentional "nudging" the participant in a particular direction.

There may be self-reinforcing feedback loops between the amount of time "captured" by dark patterns, and overall feelings of purposelessness. While technology alone is not suitable for helping individuals develop a sense of purpose, DSCTs can include affordances that bring what matters most to the individual into context with which to contrast the effects of ACDPs. This could motivate individuals to move into a later stage of the transtheoretical model, and perhaps use a different type of DSCT, such as one that changes the internal structure of the digital technologies they are over-using.

4.2. Design Implications for Commercial Organizations

Well-intentioned commercial organizations should seek to design digital technologies that support (and not hinder), an individual living in alignment with their values. A common business aphorism is "know your customer." The case studies above suggest that well-intentioned companies can benefit both themselves and their customers by **seeking to understand how the use of their products aligns with customer values**. An important finding of the presented studies is that individuals can elicit meaningful numeric ratings of how well a specific activity either supports or hinders their

values. Commercial organizations can use this strategy to help measure how their products support user-reported value-alignment and make changes to better align their products and services with human values. This could be implemented through experience sampling [28] surveys asking individuals to reflect on their most recent time-segment of interaction with the company's product. While traditional value-sensitive design (VSD) approaches focus on bringing specific values into the design process early [29], having an *in situ* method for getting feedback on value-alignment would help reduce the chances of value drift over time.

Users may be more likely to pay money for digital technologies that result in them spending time in alignment with their values. Well-intentioned commercial organizations can **make salient the connections between the use of their product and the support of users' values**. If using a digital technology in a particular way does in fact support an individual's deeply held values, then it is reasonable for the company to make that connection explicit. By doing so, the user may be more motivated to continue using the technology (in a good way), and could increase motivation for the user to pay for the technology, which could support business models that do not rely on attention capture patterns for revenue. This approach generally relies on having users that are interested in living their values, knowledgable about their values, and aware of how their use of technology either supports or hinders their values. Therefore, we suspect that it may be first necessary to help individuals grow in awareness of how their time using technology supports (or hinders) their values before this becomes an effective intervention to reconcile differing business and user goals.

5. Future Work

The two case studies present proof-of-concept designs that help individuals reflect on concrete activities of daily life and abstract human values. Both studies had relatively low sample sizes (10 and 15) and did not include objective measures of pre/post time use. In addition, neither study measured objective screen time use. Future work can include larger-scale deployment studies that seek to determine the extent to which engaging in multi-level technology-supported reflection reduces the influence of attention capture damaging patterns on an individual's time use. In addition, future work can explore the "marketing" side of multi-level reflection tools such as those presented in this paper: what motivates individuals to engage in reflection on how their time use and technology use supports (or hinders) their values?

6. Conclusion

This paper presented two case studies where participants engaged in a comprehensive gathering of their time use, and reflected on how their time use supported (or hindered) abstract goals such as needs and values. This technology-supported reflection process of connecting abstract values with concrete activities can help to reveal misalignment between one's highest priorities for life and how daily life is lived. Reflecting on time-use and values can reveal the influence of dark patterns in both the act of gathering data (i.e., *which of my deeply held values did this hour of scrolling on social media support?*) as well as helping individuals to see the cumulative effect of using technology and how it relates to the context of the rest of their everyday activities. We discuss design considerations digital self-control tools that seek to include the broader context of individuals' everyday lives and values, and considerations for commercial organizations that wish to design technology that supports alignment between time use and values.

Declaration on Generative AI

During the preparation of this work, the authors used ChatGPT in order to: peer review simulation. After writing a complete draft without AI assistance, the source code for the paper was pasted into

ChatGPT to get feedback on the papers strengths and weaknesses. None of the text of the paper was generated by AI, and the authors take full responsibility for the content of the paper.

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