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Affordances of Digital Detox Applications: Exploring Gamification and Undesign as Design Principles

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ABSTRACT

While smartphones and mobile apps offer convenience and entertainment, they also contribute to distractions and experience of stress in users' lives. In response to these challenges, digital detox – the voluntary restriction of digital media use – has surged as a significant sociocultural phenomenon. To meet this growing demand, numerous products and services, particularly mobile applications with self-restricting features, have emerged. This study investigates the affordances of digital detox applications that incorporate gamified and self-inhibiting design to limit smartphone usage. Adopting the conceptual frameworks of gamification and undesign, we conducted an app walkthrough study analyzing four smartphone apps: Forest, Hold, Cleverest, and Freedom. Our analysis provides a systematic overview of how gamification and undesign elements are integrated into smartphone applications. Additionally, we explore the connection between these affordances and the monetization models of the apps, revealing the paradox of using technology to mitigate technology overuse. This study provides critical insights into implications of digital detox apps, contributing to the broader discourse on digital disconnection and well-being research.

KEYWORDS

Gamification; undesign; affordances; digital detox; smartphone apps; productivity; digital well-being

1. Introduction

Smartphones and mobile apps play a double-edged role in people's lives, providing convenient solutions and enjoyable content while also contributing to distractions and experience of stress. During the pandemic, smartphones and mobile apps became essential tools for breaking isolation, accessing information, and maintaining connections with others and the world (David & Roberts, 2021). However, the negative impact of digital technologies and the "always-on" culture, where "doomscrolling" became a phenomenon (Ytre-Arne & Moe, 2021), gradually gained more attention during and after the pandemic, prompting discussions on handling the challenges and adverse effects of intrusive technologies (Zhang et al., 2023). The omnipresence of smartphones and the constant flow of content create few limitations on usage, potentially conflicting with other obligations and raising concerns about excessive time consumption and productivity loss (Karlsen & Ytre-Arne, 2022; Ytre-Arne et al., 2020).

Prior to the pandemic, increasing attention was paid to digital detox, which refers to people voluntarily limiting their social or online media use or their digital involvement in general (Syvertsen & Enli, 2020). Since the early 2010s, digital detox has frequently appeared in popular media and self-help literature and has been researched as a sociocultural phenomenon (Syvertsen, 2020). While digital detox metaphorically links to the realm of health and wellness, academically it is part of the broader, emerging interdisciplinary field of digital disconnection research (Lomborg & Ytre-Arne, 2021), enriched by studies from various areas or disciplines such as media and communication, psychology, sociology, human-computer interaction (HCI), information systems (IS), and tourism (Ross et al., 2024).

One of the earliest studies on digital detox in relation to smartphones involved an experiment with the app AppDetox, launched on Google Play and tested on real users "in the wild" (Löchtefeld et al., 2013). This app allowed users to create rules for blocking access to certain apps, or the entire phone, for set periods. A decade later, these features are core components of digital well-being tools integrated into operating systems such as Google Digital Wellbeing for Android devices (Langheinrich, 2020), quickly followed by Apple and other platforms with similar features for monitoring and possibly limiting device use, especially screen time spent (Jorge et al., 2022).

In addition to operating-system-based or platform-based tools, third-party digital detox apps similar to AppDetox, primarily focused on productivity and well-being, are increasingly prevalent in the app market, representing a notable commercial trend in this context. Two powerful platforms – Google Play and Apple's App Store – currently boast an extensive selection of detox apps, illustrating how the need to distance oneself from smartphones has been manufactured into a technological commodity (Beattie,

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2020). Popular detox apps like Forest, Hold, Moment, Space, Quality Time, and OffTime, have been discussed in research for their effects on one's digital detox and well-being (Nguyen, 2022; Schmuck, 2020). Some of these apps adopt gamification to engage users, making the practice of limiting phone use more fun and complex (You, 2024). Gamification, defined as "the use of game design elements in non-game contexts" (Deterding et al., 2011, p. 9), invites engagement and stimulates action. However, when used in digital detox apps, it aims to encourage disengagement and block action, for instance by rewarding people for reducing their phone use (Lyngs et al., 2019).

The design of detox apps with game elements warrants in-depth exploration, as their affordances for limiting phone use and engaging users coexist and are expected to work together. While gamification can make apps more engaging or useful (Zichermann & Cunningham, 2011), it also has its limits and "dark side" (Nyström, 2021; Schöbel et al., 2021) raising concerns about negative outcomes, such as manipulation and even exploitation (Bogost, 2013; Marczewski, 2017). Digital detox apps raise critical questions about personalized gamification design and experience, as noted by Schöbel et al. (2021, p. 485): how can we avoid fighting fire with fire by employing gamification elements to reduce the negative effects of usage and achieve healthier information system usage behavior?

Exploring the potential and limits of gamification in digital detox requires examining what affordances enable and limit interactions between humans and smartphones. This study aims to provide new insights into the implications of digital detox and productivity apps through an analysis of their affordances. It also seeks to understand the affordances these apps counteract, shedding light on the underlying factors driving smartphone (non-)usage. By combining the concept of *undesign* (Pierce, 2012) with gamification studies, we build a framework to guide our analysis of app affordances. By showing the relationships between app affordances and monetization models, this study also highlights some core affordances of platform economy relevant to other applications and market segments. The guiding research questions of this study are:

RQ1: What gamification and undesign affordances are employed by digital detox apps?

RQ2: In what ways might the affordances motivate smartphone (non-)use?

RQ3: What are the monetization models of the apps and how are they related to the affordances?

In this study, we employ the app walkthrough method (Light et al., 2018), which allows researchers to directly engage with the apps and collect data. We do not analyze empirical users, and the answer to RQ2, therefore, is restricted by our analytical framework and systematic traversal of the apps. In the following section, we will present the literature, and our analytical framework, concerning gamification and undesign affordances as well as their potentials and limits in the context of digital detox. This is followed by a presentation of the method and analysis and, finally, a discussion of our findings and conclusion.

2. Towards gamification and undesign affordances of digital detox apps

In this section, we explore gamification and undesign affordances that potentially address people's need for digital detox, particularly in enhancing productivity. We draw on concepts and studies from gamification research, HCI, media and communication, and design research. The concept of affordance originated in ecological psychology (Gibson, 1977) and was later employed in design studies, defined as "a relationship between the properties of an object and the capabilities of the agent that determine just how the object could possibly be used" (Norman, 1988, p. 11). It has been further developed and operationalized across various disciplines (Bucher & Helmond, 2018). This study does not aim to unpack the complex conceptualization of affordance or its varied interpretations (Chouinard & Davis, 2016; Oliver, 2005). Instead, we focus on discussing gamification and undesign affordances in the context of digital detox apps, examining the range of functions and constraints they offer. In the following, we will describe the two key concepts of our analytical framework – gamification and undesign – in more depth.

2.1. Gamification affordances

Gamification is commonly defined as "the use of game design elements in non-gameful contexts" (Deterding et al., 2011, p. 9). This involves implementing game-like features in technology not intended primarily for gaming. Features commonly associated with gamification are achievements, badges, and leaderboards. From a game design perspective, these elements are often regarded as peripheral to the game experience. At the center is the aesthetic, rule-based environment ready to be explored by the user (Deterding, 2011; Huotari & Hamari, 2012; Juul, 2005). Games also include goals that might be elusive and conflicting, and lead to frustration and failure, just as much as a successful ending (Juul, 2013). From a marketing perspective, gamification has been defined as "a process of enhancing a service with affordances for gameful experiences in order to support user's overall value creation" (Huotari & Hamari, 2012, p. 19). Here, the aim is not the (game) experience itself, but to obtain an external "value." In other contexts, this can be related to health, education, or sustainability, to name a few (Schöbel et al., 2020).

When employing gamification as an analytical framework, one challenge is that the concept can be abstracted to different levels, ranging from concrete interface design elements, such as points and achievements, to more general game design patterns, models, and principles (Deterding et al., 2011). These abstractions can also draw on various sources, such as existing models, literature, and empirical studies (Schöbel et al., 2020). For instance, what has been discussed in studies on interface design may just represent

one aspect of design in studies of game design patterns or principles: concrete interface design elements such as points, badges, and leaderboards may be seen as "mechanics" in the MDA model (a framework developed to understand games and game design), which also includes the other two aspects of "dynamics" and "aesthetics" (Hunicke et al., 2004). Moreover, the same concept may be placed on different levels of abstraction. For example, a reward can be described as a concrete design element, or as a characteristic of a set of elements encompassing points, badges, and virtual goods (Thiebes et al., 2014).

Relevant to our study, gamified design elements may also be interpreted as motivational affordances. Hamari et al. (2014) identified ten categories of motivational affordances based on empirical studies of gamification. These are: points, leaderboards, achievements/badges, levels, story/theme, clear goals, feedback, rewards, progress, and challenge. The elements can also include friends/teams/groups, and reminders (Weiser et al., 2015). In this study, where the goal is to examine gamification affordances of digital detox apps at a micro level, we choose to focus on "motivational affordances" (Hamari et al., 2014) which resembles "game mechanics" (Hunicke et al., 2004), "interface elements" (Crumlish & Malone, 2009), and "construction elements" (Schöbel et al., 2020) in relevant typologies.

2.2. Undesign affordances

How to curb excessive or unwanted use of technology has been discussed within HCI and related fields. The design researcher Tony Fry (2005) launched the concept "elimination design" advocating the idea that *not* to design a service or tool may sometimes be a better solution than trying to make the best version of it. Building on this concept, James Pierce (2012) launched the term *undesign*, arguing that HCI research has a responsibility to engage more strongly with undesigning technology, or with negating technology by design. He outlines a spectrum of approaches ranging from the inhibition of technology use to the displacement of technology, and the total erasure of an existing technology or foreclosure of an emerging one. Of relevance to this study are undesign affordances categorized as *inhibiting* technology, in particular affordances that offer self-inhibiting options.

Pierce defines self-inhibiting technology as a specific type of undesign affordance centered around the individual. This may come in the form of "user-specified settings or other choices that individual users can freely select in order to later inhibit users or even prevent them altogether" (p. 961). The self-inhibiting options can be technologies that can be (re)configured to limit use (e.g., TV with cabinet doors), or the control features embedded in the technologies (e.g., parental control mode). In the context of the smartphone, this can generally be achieved in two ways: by applying design options in the proprietary operation system or through third-party applications or apps. Both options are relevant for the current analysis as the apps often promote or take advantage of affordances already embedded in the operating system.

Pierce does not detail the types of affordances that fall into the category of self-inhibiting technology, but other HCI researchers have described relevant affordances. One example is based on a critique of *frictionless design*, a design principle that was previously regarded as best practice, and a typical approach in the first wave of HCI. Cox et al. (2016) describe this principle as ambiguous, suggesting, rather, implementing design that slows down interaction in certain contexts, since "in many scenarios, designing friction into interactions through the introduction of *microboundaries*, can, in fact, have positive effects" (p. 1389) and may "disrupt 'mindless' automatic interactions, prompting moments of reflection and more 'mindful' interaction" (ibid). Similarly, Laschke and Hassenzahl (2011) propose a set of *aesthetics of frictions*, aiming at "creating friction (mainly through choice) to highlight and suggest behavioral alternatives to established routines" (unpaginated blog).

In the app context, the self-inhibiting options are also related to the features serving the design for self-control or digital well-being, such as tracking, blocking, removal, setting goals, setting time limits, and gamification mechanisms involving rewards and punishment (Lyngs et al., 2019; Monge Roffarello & De Russis, 2019; Widdicks, 2020; Widdicks et al., 2022). In this study, the undesign affordances refer to the "self-inhibiting options" from Pierce's undesign but are also informed by empirical studies providing more relevant examples in the app design.

2.3. Towards a combined framework of gamification and undesign

Digital detox has been understood and researched from various perspectives across disciplines (Ross et al., 2024) – seen as a sociocultural phenomenon (e.g., Syvertsen, 2020), a media practice (e.g., Nguyen, 2022), or a solution to technostress (e.g., Mirbabaie et al., 2022). Commercial digital detox products, such as devices that block internet access (Beattie, 2020) and digital detox camps (Karlsen, 2023; Syvertsen & Karlsen, 2024) have also received research attention. However, analyses of concrete design solutions in commercial detox products have received less focus. Since digital detox reflects a need for more control, understanding the extent to which these products contribute to agency or manipulation is vital. By analyzing digital detox apps within a framework that combines gamification and undesign, we can better understand their potential and limitations, contributing to nuanced discussions on digital detox and its implications for individuals in a broader context.

Research on productivity and digital well-being tools shows that strict inhibition can cause negative feelings like guilt, fear of missing out (FOMO), tension, and ambivalence (Purohit et al., 2023; Ribak & Rosenthal, 2015; Syvertsen, 2022; Ytre-Arne et al., 2020). Gamification, on the other hand, can enhance motivation and app performance, possibly making it more effective in designing engaging self-restricting technologies (e.g., Monge Roffarello & De Russis,

Table 1. Literature-based gamification and undesign affordances.

Gamification affordances	Points/credits, leaderboards, achievements/badges, levels, story/theme, goals/assignments/quests, rewards, progress, challenge, avatars, reminders, friends/teams/groups, etc.
Undesign affordances	Removal, blocking, setting time limits, punishment, etc.

Table 2. Basic information of four digital detox apps.

App	Forest: Focus for Productivity	Hold – make it happen	Cleverest: Focus Digital Detox	Freedom: Focused Screen Time
Creators	Seekrtech Co., Ltd. (2014)	Hold AS (2016)	Martian & Machine GmbH (2019)	Eighty Percent Solutions Corporation (2011)
Main features	Timer for blocking the phone and growing a tree	Timer for blocking the phone and collecting points	Timer for blocking the phone and making the avatar happy	Timer for blocking apps and websites
Other features	Rewards (coins, species, white noises; real trees), achievements, leaderboard, tags, statistics, app-allow lists, etc.	Rewards (coins; coupons, lucky draw), leaderboard, statistics, music playlists, etc.	Rewards (happy avatar), statistics, tags	Blocklists, schedules, audio tracks, lock mode, etc.
Release year (App Store)	2014	2015	2015	2018
Age rating (App Store)	4+	17+, Gambling, Frequent/ Intense Contests	4+	4+
Price (App Store)	49 NOK (3.99 USD), with in-app purchases	Free	Free	Free, with in-app purchases
Ratings, number of ratings (App Store)	4.8/5.0, 919	4.5/5.0, 3.1K	N/A	3.5/5, 30
Downloads, ratings, reviews (Google Play)	10M+, 4.6/5.0, 593K	100K+, 4.0/5.0, 3.2K	5K+, N/A, N/A	500K+, 4.4/5.0, 4.58K

2019; Widdicks et al., 2022). This may also paradoxically contribute to excessive use. Negative impacts of gamification, such as ethical issues and user manipulation have also been discussed in prior research (Bogost, 2013; Marczewski, 2017; Schöbel et al., 2021).

In our study, incorporating Pierce's undesign perspective provides a balanced view of detox app affordances and their intended use environments. It helps raise critical questions about current design practices and their implications, influenced by critical and speculative design values (Dunne, 2008; Dunne & Raby, 2013). Moreover, in conjunction with the design approach of persuasive design, the concept of undesign also opens up a design space for designing "inaction" in the case of self-inhibition, leading to innovative outcomes (Pierce, 2012).

As discussed earlier, different ways exist to define gamification and undesign affordances. In this study, we approach gamification and undesign affordances at the micro level in smartphone apps. We build our analytical framework mainly on Hamari et al.'s (2014) typology of motivational affordances and Pierce's (2012) notion of self-inhibiting options. They provide the most relevant and valuable insights concerning motivational and inhibiting affordances relevant to our study of digital detox and productivity apps. We also draw on the literature reviewed earlier and include affordances and design elements not mentioned by Pierce and Hamari et al. The list of affordances established from our literature review is as follows (see Table 1). This will be revised and expanded as the analysis progresses.

3. Method and data

In this section, we present the walkthrough method, sampling, and empirical data, and briefly introduce the four apps of our study. The basis for selecting apps was an initial mapping of digital detox and productivity apps on Apple's App Store and Google Play in Norway. The apps were found by searching for terms related to digital disconnection and productivity including "digital detox," "digital disconnection," "digital break," "non-use," "unplug," "Pomodoro," "phone addiction," and "screen time." In addition, Google was used to search for reviews and recommendations of apps around the world. The final strategic selection of apps was done to provide a diverse sample of affordances based on app features, product descriptions, and reviews.

As we wanted a broad representation of gamification and undesign affordances, we strategically chose a variety of apps. More specifically, we chose one app dominated by gamification affordances (Forest) and one app dominated by undesign affordances (Freedom) to represent the ends of a gamification-undesign spectrum. To create a more nuanced picture we chose two other apps, Hold and Cleverest, which could be placed between the two ends. Table 2 provides a summary of the basic information of the four apps, drawn from their official websites and app stores in Norway.

The main methodological guideline for this study is the app walkthrough approach (Light et al. 2018) where researchers systematically track and document their own use of the app or technology from the onboarding process through daily use until the use is ended and, if applicable, the subscription or a profile is terminated. It allows researchers to engage with the app interface, buttons, menus, and so on, and experience different features and functionalities systematically and analytically. Inspired by science and technology studies (STS) and culture studies, the app walkthrough method can help researchers understand what and how technological mechanisms and cultural values are embedded in, and conveyed by, the app.

Figure 1. Notes from a walkthrough of the home interface of the Forest app.

Moreover, examining the app's vision, operating model, and governance enables the researchers to understand the app's context and expectations for ideal app use formed by app designers or developers. This method can help researchers understand what and how technological mechanisms and cultural values are embedded in and conveyed by the app.

The main empirical data is the in-app data, including the interface, features, functions, and the documented flows of activities. We documented our walkthrough by taking screenshots, videos, and notes, and identified gamification and undesign affordances according to the table and our own experiences (see an example in Figure 1). Information from the app creators' websites, profiles on social media, descriptions and reviews on app stores, news articles, and reports, were used to provide contextual information about the apps' vision and business models.

We employed both deductive and inductive approaches to analyze the primary data (Rivas, 2012). Our initial table of gamification and undesign affordances (see Table 1) was expanded and revised based on the inductive coding of the app data. For instance, in terms of rewards, not only virtual goods but physical goods like free treats were found and added to the table (Table 3). Moreover, a few undesign affordances were found intertwined with gamification affordances serving punishment, such as avatar withering and missing rewards. These affordances were added to the table of undesign affordances (Table 4) to be further explained in the analysis. Based on contextual information about the apps' business models (e.g., price on app stores) and further validated by the interface walkthrough (e.g., in-app purchase), a table of monetization models (Table 5) was generated to show how the affordances connect with the app business model.

We documented our use of both the free and paid versions. The second author conducted the initial walkthrough in two weeks during the fall of 2020, on an iPhone 12 (iOS 14) to gain insights about different features and experiences of the four apps. The first author conducted a three-day-walkthrough on the updated version of the apps in December 2022, using an iPhone 12 Pro (iOS 16) and reviewed contextual information about the four apps, to double-check the identified affordances and get an overview of the apps and their contexts. Finally, during the spring of 2023, the two authors discussed the affordances and updated them into new tables, by tailoring existing elements and adding new ones. The updates of the main features and functions of the apps were tracked until November 2023, in case there were big changes in the app's functionality or availability. The latest tracked versions are Forest (4.71.0), Hold (52.0.0), Cleverest (2.2.0), and Freedom (6.8).

4. Analysis

In this section, we first present the identified gamification and undesign affordances of the four apps, and how they might motivate smartphone use and non-use. We have placed gamification and undesign affordances into two separate tables (Tables 3 and 4), but they are not always mutually exclusive. As the gamification affordances turn out to be richer and make the app functionality more complex than the undesign affordances, more light will be cast on the former. Second, we

introduce the monetization models of the apps and analyze how they relate to the affordances and the implications.

4.1. Gamification affordances and detox app use

Table 3 contains a list of gamification affordances of the four apps. Some are typical gamification affordances, such as virtual and physical rewards, points/coins, leaderboards, achievements or badges, progress/levels, challenge, friends/communities, and avatars. Other affordances, such as reminders and statistics, are not necessarily aiming to make the user experience more gameful, but we categorize them as gamification affordances in this context, as they support the overall aim of the apps to monitor and guide user habits, leveraging the overall gamefulness of the app use.

Gamification affordances are typically used to enhance engagement and motivation, providing a sense of accomplishment, growth, community, and competition. For instance, the different virtual plants the user can grow function as virtual goods, rewarding the user when a detox session is accomplished (see Figure 2(a)). Both Forest and Hold provide physical goods that people can "redeem" in real life. In Forest, for instance, the app producers cooperate with a company that plants trees in Africa when the users spend virtual coins they earn after finishing detox sessions. In Hold, users spend points getting coupons for purchasing study commodities or access to gyms, or chances for winning a draw for a scholarship or festival tickets (see Figure 2(b)). In addition, affordances involving social features such as leaderboards and friends/communities encourage social interaction by allowing players to compare their performance with others or collaborate with others in groups to reach a common goal, fostering a sense of competition or belonging.

In addition to virtual and physical goods, points or currencies like coins are a common form of in-game scoring or currency system, quantifying and rewarding users' efforts to not use their smartphones. Together with achievements and badges, they are awarded to users for completing missions (e.g., completing a detoxing session), achieving challenges (e.g., reaching the top 10 in the global leaderboard in Forest, see Figure 2(c)), or reaching significant milestones (e.g., focusing 4 hours/3 days/7 days/30 days in a roll in Forest).

Achievements or badges are often tracked and displayed in the apps to encourage users to devote themselves to detoxing. Recognizable from loyalty programs and computer game design, the first achievement or badge comes quickly and demands little effort, stimulating the user to return to the app or the game, and gradually increasing loyalty (Hwang & Choi, 2020). In terms of the non-typical gamification affordances, the timer or stopwatch (see Figure 3) is a core element shared by all four apps, allowing users to choose or customize the length of their detoxing. Once the timer (or stopwatch) is set, a count-down (or count-up) display is initiated, showing the remaining (or completed) detoxing time to the user. This is often visualized in the form of a clock, in some cases with an avatar or a progress bar that vividly depicts time passing (see Figure 3(a–c)).

The reminder or motivating quotes are the other affordances shared by all four apps. Reminders or motivating quotes are prompts that remind users to start the detox sessions, adhere to their goals, and give feedback on their performance. In Forest and Hold, which have the largest number of gamification affordances, motivating quotes are used to celebrate the completion, comfort failed players, mock their failure, and ask for self-reflections on their failure. For example, in Hold, if users finish an abstention session they will be met with enthusiastic messages like "You made it!" and a celebrating gif inside the timer. If they fail, they will receive messages like "Not approved" or "What's stopped you?" with critical or ironic memes.

Statistics provide users with information about their detox activities, progress, and patterns. It is noted that the three apps that feature statistics do not provide any complex analysis based on the collected data or give any suggestions like advanced health or wellness apps do. Rather, they provide users an overview of their app use, primarily related to time, such as total focused time, focused time during user-selected periods, number of completed/failed sessions, and types of tasks they tagged. This kind of summary or report is designed to help users reflect on their journey, track their long-term progress, and identify areas for improvement. In some apps like Forest and Hold, there is also a simple comparison between the latest and previous data, such as "Today compared with same time yesterday, and the day before yesterday" in Forest to show the overall trend in usage, or "Best weekday" or "Best time of day" in Hold to help identify the peak performance and usage patterns over time.

Tagging is a feature that allows users to categorize and label what types of activities they engage in during the detox sessions, ranging from "study," "work," "relax" or "entertainment," "social," to "exercise" and "rest." There are pre-set tags in apps while some apps also allow users to label their own activities or purposes. For example, Cleverest only includes the three labels "work," "relax," and "social." Forest has "work," "study," "social," "entertainment," "rest," and "other," and the user can create new tags based on individual needs. Tags in the case not only show the app designers' ideas about when and where they expect people to be distracted by their phones but also allow users to mobilize their detox activities on different occasions beyond the pre-assumed settings.

The "Music/sound" affordance in Table 3 refers to the ambient music and white noises embedded in apps to

Table 3. Gamification affordances of four digital detox apps.

	Forest	Hold	Cleverest	Freedom
Virtual goods	x	–	–	–
Physical goods	x	x	–	–
Points/currencies	x	x	–	–
Leaderboard	x	x	–	–
Achievement/badges	x	x	–	–
Progress/levels	x	x	–	–
Challenge	x	x	–	–
Friends/communities	x	x	–	–
Avatars	x	–	x	–
Music/sound	x	x	–	x
Tags (themes)	x	x	x	–
Statistics (history)	x	x	x	–
Reminders/quotes	x	x	x	x
Timers/stopwatches (goals)	x	x	x	x

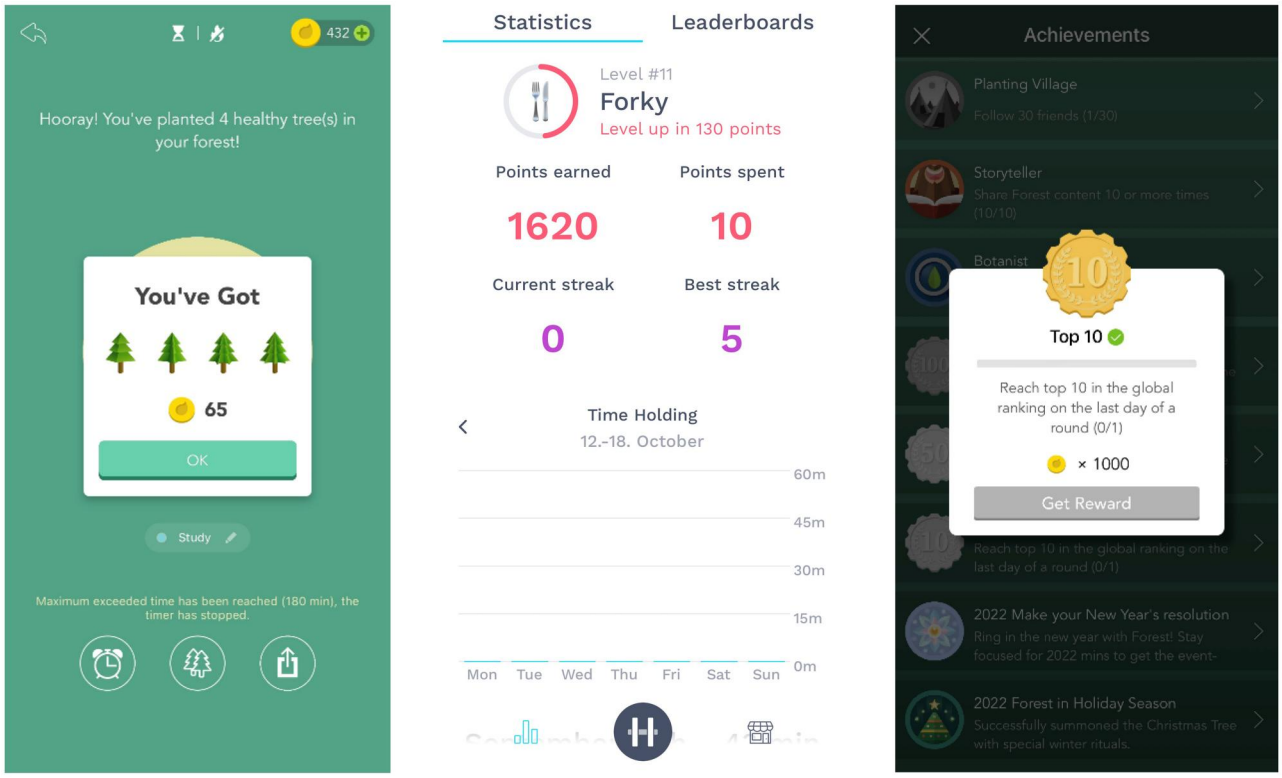

Figure 2. (a) Virtual trees for completing a 180-min-session in Forest. (b) Points collected in Hold. (c) A Top 10 badge and 1,000 coins.

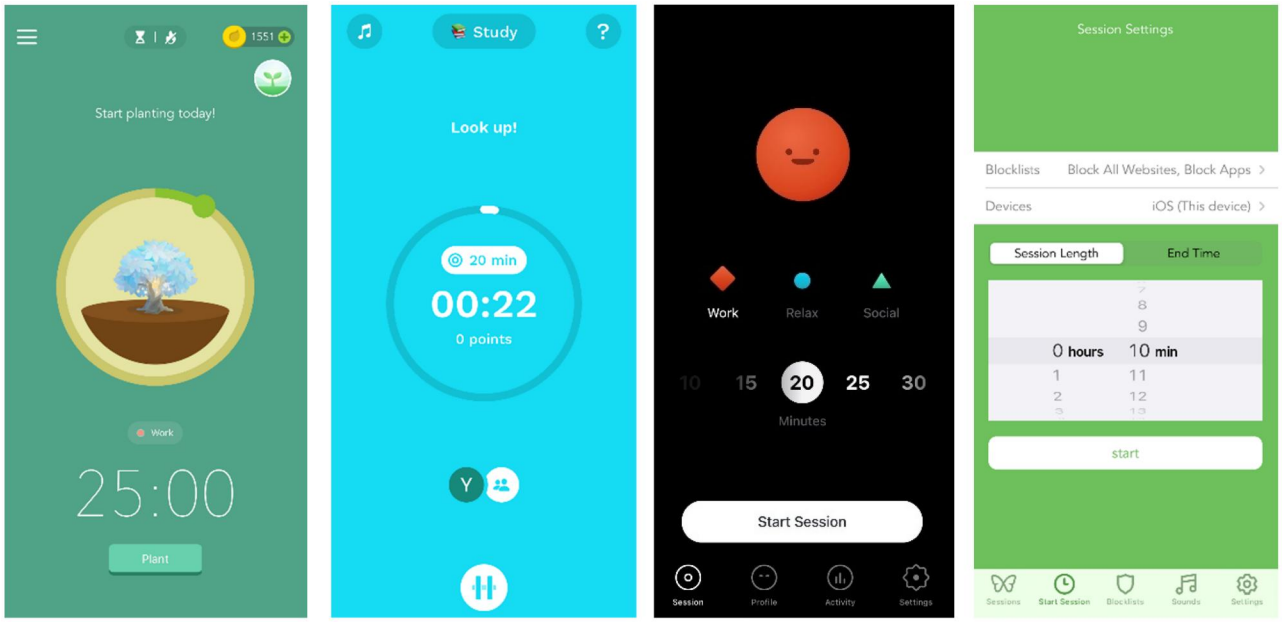

Figure 3. (a) Timer in Forest. (b) Stopwatch in Hold. (c) Timer in Cleverest. (d) Timer in Freedom.

help create a soothing and focused atmosphere. For example, there are different "Focus Sounds" in Freedom that are expected to give users an assortment of music, café, office, and nature sounds to help users stay focused and productive. In Hold, there are free Spotify and Apple Music playlists for focus and study. Moreover, music or sounds can also work as a type of reward that requires people's effort to unlock, as in Forest there is only one free sound, and coins are required to unlock other sounds.

4.2. Undesign affordances and smartphone non-use

Table 4 includes undesign affordances that help limit one's smartphone use directly or indirectly. Compared to gamification affordances, undesign affordances are fewer in terms of quantity and variety. They mainly motivate people's smartphone non-use in two ways: blocking and punishing (see Figure 4).

On the one hand, blocking includes restricting access to the whole phone or specific websites, or to apps shared by

all detox apps. It explicitly denotes the detoxing function based on the time-limiting function of such apps. During the time-based detox session, users are not allowed to interact with their phone screen or have limited access to certain websites, apps or the internet. While Hold and Cleverest simply provide users with phone-blocking services, Forest and Freedom allow users to customize their block lists based on their preferences. For example, in Freedom, people can choose to block one specific app like Facebook, the app category of "Social" which contains a few social media and messaging apps, all the apps, or the whole phone (see Figure 4(a)). Likewise, in Forest users can turn off the Deep Focus Mode through which the whole phone is blocked, and customize their app-allow lists, to get access to the selected apps or app categories (see Figure 4(b)).

On the other hand, there are undesign affordances that function as a negative outcome should the users fail a session, in the same (or rather the opposite) way as to gamification affordances when the session is finished as planned. These affordances aim to dissuade users from excessive or unwanted smartphone use. For example, a failure (e.g., suspending the detox sessions) will be recorded by the app and communicated visually. The failure can be represented by quotes with animations such as a sentence of "Oops! You can do better next time" with a withered plant in Forest (see Figure 4(c)), or an "Oh nooo!" with a sad face in Cleverest (see Figure 4(d)). If users fail the session, they also lose the rewards or achievements that should be collected or reached. They also risk losing current rankings if they are top users on the leaderboards. In this case, not only the representations of failure but also the risk of losing something that you "deserve" or should receive is embedded in the undesign mechanism. As coined in relevant studies of motivational design patterns of casual games, not only the attempt to win but also the possibility of loss (avoiding punishment) can be drivers that motivate users to follow the rules (Lewis et al., 2012).

Table 4. Undesign affordances of four digital detox apps.

	Forest	Hold	Cleverest	Freedom
Setting time limits	x	x	x	x
Blocking smartphones/screen	x	x	x	x
Blocking apps	x	–	–	x
Blocking websites	–	–	–	x
Blocking the Internet	–	–	–	x
Records of failure	x	x	x	–
Avatar withering	x	–	x	–
Losing rewards or achievements	x	x	–	–
Dropped ranking	x	x	–	–
Mocking quotes and memes	–	x	–	–

4.3. Monetization models and relations to affordances

It may seem like a paradox how widely gamification affordances are used in our sample of detox apps, but from a monetization perspective, it makes perfect sense. By revealing how the access to different app features is ruled by the revenue models, our analysis shows the different weighting of gamification and undesign affordances in the four apps. Table 5 shows the monetization models of apps, based on data from Apple's App Store and the apps' official websites.

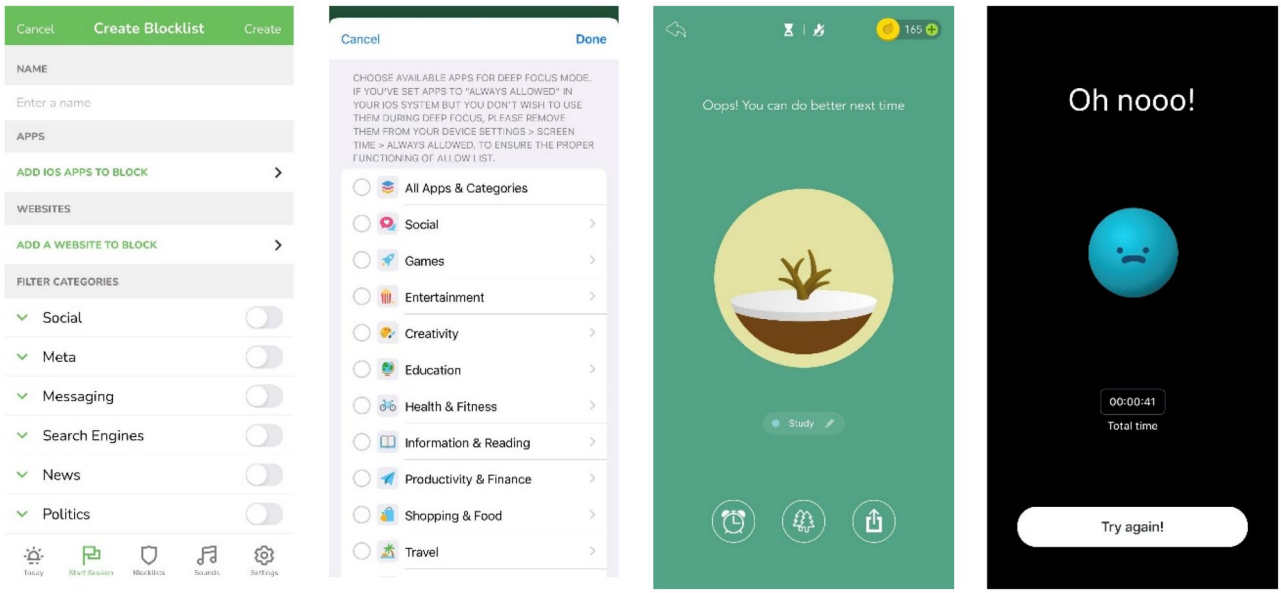

Figure 4. (a) Blocklist setting in Freedom. (b) Blocklist setting in Forest. (c) Withered tree in Forest. (d) Sad avatar in Cleverest.

Table 5. Monetization models of four digital detox apps.

	Forest	Hold	Cleverest	Freedom
Free	–	Free to use	Free to use	–
Freemium	–	–	–	Free to try
Premium	Pay to access	–	–	–
Subscription	–	–	–	Pay to access
In-app purchase	Pay to "win"	–	–	–
Partnership	Partner with an NGO	Partner with companies	–	–

Apart from Cleverest, which is free, there are several monetization models employed and combined by the four apps (see Table 5). Different from free of charge, "freemium" is a model where the basic functionalities are offered for free and where the user can pay for extra content through various types of micro-transactions or upgrades (Feijoo et al., 2012; Nieborg, 2016). One example is Freedom, which allows users to have 5 free trials of their blocking sessions without paying. If people want unlimited sessions and access to other advanced settings, the app offers monthly (8.99 USD) or yearly (39.9 USD) subscriptions, or a one-time purchase (99.5 USD).

Premium is a monetization model where the user pays for downloading and using the app. In our sample, only Forest employs this model. Forest also offers in-app purchases such as "Sunshine Elixir" or "Crystal" used to buy virtual plants, bypassing the need to save up gold to do so. Impatient users might use this option to buy themselves out of the waiting time, in effect circumventing the reward system that was supposed to drive use in the first place. In game design, this monetization model is called "pay-to-win" and is often frowned upon by players and designers since games with competitive features will offer paying players advantages over those only spending time and effort to advance in the game (Alha et al., 2014). Since Forest is not primarily a competitive arena, the possibility of reducing waiting time for generating gold will probably appeal only to smaller numbers of users.

Hold has a partnership with external organizations such as 7-Eleven, the bookstore Akademia, and the retail chain Elon, where users can use points earned in the app (see Figure 2(b)) to get discounts on goods or services. To earn a profit and be attractive for these companies, Hold is dependent on a high retention rate and users generating a large number of points, substituting the need for payment with high user engagement. In this context, the abundance of gamification affordances is directly linked to the companies' need for activity and income and not only to the user's need for detox functions.

The analysis shows that the monetization models of these digital detox apps are intricately linked with their gamification and undesign affordances. The gamified elements not only enhance user engagement but also create opportunities for monetization by offering users incentives to make purchases or subscribe to premium features. For highly gamified apps like Forest and Hold, their monetization models mirror those applied to mobile game apps, where both positive and negative feedback carry a "price." Virtual currencies – earned through successful detox sessions or purchased – unlock rewards, achievements, music, and advanced features, incentivizing users to engage more with the app and avoid penalties. Undesign affordances, while primarily serving the detoxing purpose, indirectly or only partially contribute to user engagement and retention. They are critical for the success of monetization strategies of less gamified detox apps like Freedom, where only premium subscribers get unlimited access to sessions and advanced features like scheduling, lock mode, and device synchronization.

5. Discussion

Our analysis and findings show the relevance of employing gamification and undesign as an analytical framework in the context of digital detox apps. By integrating gamification and undesign, our analysis reveals how these seemingly contrasting approaches are expected to influence use behavior synergistically. Ideally, gamification can motivate users to engage more with the detox apps through positive reinforcement and goal setting. At the same time, undesign distances people from digital interfaces and promotes a less intrusive user experience.

Though both gamification and undesign affordances appear in the apps, they are used differently depending on the focus of each app and their monetization models. The utilization of gamification affordances, such as virtual and physical rewards, and achievement, is prevalent in the apps. However, the incorporation of more rigorous undesign affordances, like blocking the smartphone, is comparatively limited in terms of quantity and variety. Some affordances like timers and reminders can also be placed in both groups of affordances, and many of the undesign affordances, such as setting time limits, are also intertwined with gamification affordances. This indicates that the boundary between gamification and undesign affordances in the context of detox apps is blurred.

Forest and Hold, which have the highest number of gamification affordances, may resemble ordinary casual smartphone games in terms of the types of affordances used to drive engagement. Examples include farming games like Hay Day (Supercell, 2012), idle games like Cookie Clicker (Dashnet, 2013), collecting games like Pokémon Go (Niantic Inc., 2016), and nursing/hatching games like Tamagotchi (Bandai, 1996). For instance, Forest employs goals and affordances similar to HayDay, where the user grows crops and develops the farm by investing virtual currency in new types of plants (Karlsen, 2019). In addition to affordances, these apps employ the same monetization models, such as in-app purchase, which may enhance engagement in the apps and, by extension, the smartphone.

Ironically, the extensive use of gamification design in digital detox apps may inadvertently draw more attention to the smartphone. To earn points or other virtual items necessary for avatar upgrades or other in-app developments, users are compelled to frequently return to their smartphones, for example by logging on, planting, and harvesting. Users are encouraged to start new sessions frequently through reminders and promises of rewards, with the ideal result that they integrate them into their daily routines. This resembles the "play-by-appointment" affordance in game design, which encourages the development of routines according to the temporal logic of the game rather than the player's preferences (Zagal et al., 2013). In the context of digital detox apps, users may start sessions even in moments when their attention would otherwise be on something else or when sessions are not needed, for example, while sleeping or relaxing.

While excessive use of gamification design may appear economically reasonable in a market perspective, it

underscores the inherent paradox of attempting to "beat technology with technology" (Syvertsen, 2020). Similar concerns have also been expressed in gamification research, as researchers need to consider how to avoid "fighting fire with fire," such as user manipulation driven by gamification or gamified nudges (Schöbel et al., 2021). This paradoxical situation raises questions about the effectiveness of relying on gamification to curtail excessive smartphone usage and the necessity for alternative approaches that address the underlying issues more directly, whether these concern productivity, digital well-being, or other topics. The underlying principles in undesign also call for tech companies and regulatory bodies to consider alternatives to technological solutions (Pierce, 2012) as these might create a more sustainable interactions between people and technology (Widdicks et al., 2022).

This study provides insights into the affordances of gamified apps serving digital detox and their monetization models. However, we acknowledge the limitations of the method and the general lack of methodological and data triangulation. The app walkthrough method revolves around the apps and their content, and while we have explored the apps over time and in everyday situations, the analysis does not necessarily reveal how the apps are experienced by ordinary users in everyday life. Users might have different motivations for using the apps and react differently to interface or content than we as researchers do. Furthermore, our observation and interpretation of the data were conducted within a limited time frame and may not cover all affordances that require longer time use, or grasp differences in design due to different app versions, operating systems, app stores, or devices. Further in-depth and longitudinal studies on user experience and app performance would shed more light on the effectiveness of such app use and the long-term implications. Investigating the accessibility and use of these apps across diverse demographics and cultural contexts would also provide valuable insights into their applicability and efficacy.

6. Conclusion

In this study, we build an analytical framework to explore the gamification and undesign affordances of digital detox apps, how smartphone use and non-use are motivated, and how the affordances are connected with the monetization models. We find that various gamification and undesign affordances are adopted by app designers to make their apps help people carry out digital detox – for instance, limiting screen time and reducing smartphone distractions – while at the same time, the apps are carefully designed to encourage users to develop new routines and cultivate their loyalty to specific detox apps, ironically on the smartphones.

By shedding light on the affordances as well as their relationships with the monetization models in the app market, this study not only shows the concrete mechanisms that motivate people's (dis)engagement with smartphones, but also discusses the affordances that are monetized and what degree gamification and undesign contribute to the monetization models. This study contributes to bridging the concepts of gamification and undesign which are seemingly two opposite extremes in the spectrum of designing engagement and disengagement. It also enriches the discussion about the potential and limits of mobile apps in assisting people's digital detox. We offer nuanced insights into the intricate interplay between design principles, app functionality, and commercial imperatives within the realm of digital detox apps on app stores.

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