

# Reconfiguring the Smartphone to Support Intentional Use

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## ABSTRACT

This paper explores how the smartphone's form could be designed to help users establish more intentional usage patterns. A research through design approach that was based in design fiction principles resulted in three design proposals and scenarios, the Planning Phone, the Parasite Phone, and the Placeful Phone. These were evaluated in a focus group and analysed to develop a deeper understanding of how design researchers and developers can use ideas of authorship, barriers and norms to support intentional smartphone use.

## CCS CONCEPTS

• **Human-centered computing** → Interaction design.

## KEYWORDS

Smartphone, Intentional use, Design Research, Interaction Design

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## 1 INTRODUCTION

For many application developers, news sites, social media, video streaming and the similar services, success depends on capturing attention from new as well as existing customers. An increased amount of time spent on their individual applications or in their ecosystem of products can result in direct benefits for the company, for example through income generated from advertisements, increased amount of data about product use, or a stronger relation to their brand [20]. This sometimes is referred to as the attention economy [14]—the treatment of human attention as a scarce resource. However, the smartphone as the gateway to applications like these can result in excessive, automated, or unaware use [5, 38]. This is increasingly recognized as a key research and development problem by health researchers, HCI researchers and the IT industry alike.

Studies related to what sometimes is called ‘Problematic Smartphone Use’, or PSU [6], found that automatic interactions with the smartphone can lead to screen time being twice as much as

user estimates [30], while excessive use can lead to addiction, anxiety, irritation, frustration, or impatience [52]. Separation from the smartphone can provoke fear, unofficially called *nomofobia* [21] or even a sense of the self being lessened [43]. In social situations, the phone can disrupt face-to-face interactions and conversations or reduce attention to surroundings [52]. Social media can make teenagers in particular spend more time on their smartphone [24], which can be linked to increasing levels of unhappiness, loneliness, sleep disturbance, and even depression [20, 39].

Of course, the functionality offered by the smartphone, such as communication, connectedness, entertainment, wayfinding, and facilitating productivity has made the smartphone an essential aspect of navigating everyday life. It is in this tension between increasing time spent on screens and possibly negative emotional effects where we see a role for HCI and design. The screen time management applications that have recently become standardized features of operating systems [37] can for example contribute to an awareness of use over time, while recent applications (described below) aim to give users more control over their use by restricting use or access to different platforms. At the same time, we see that most of these efforts operate on a software level. As design researchers who are interested in understanding the role of physical product design in the shaping of human-product relations, we are interested in exploring the physical form of the smartphone to support more intentional use. By ‘intentional use’ we mean that users establish a more mindful relationship with the smartphone, and develop more purposeful usage patterns [44].

This paper begins with a background related to emerging issues around problematic smartphone use, and recent HCI and design research efforts in that space. We then describe how we developed three alternative smartphone proposals, which were evaluated in a focus group session with interaction design experts who have experience in design and design research. Based on the results from this session, and a theoretical framework that presents research themes for intentional smartphone use specifically, we draw connections between our design proposals, feedback from the focus group, and the framework themes to discuss how smartphone technology could be designed to support intentional use.

## 2 BACKGROUND

In only two decades, mobile communication has come to be an integral part of everyday life, as mobile and smartphones have become one of the most rapidly disseminated technology in human history [3]. They have entered all kinds of domains, like managing finances, watching movies, finding our way around, controlling our smart environment, even managing and tracking the spread of COVID-19 [27] and supporting a variety of health practices [12]. Smartphones have contributed to both socio-economical and socio-technical developments [24], and are “increasingly a part of the

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construction of identities and collectivities” [19]—but of course, not everything is positive when new technologies become embedded in systemic ways.

## 2.1 Issues around smartphone use

One negative effect of the prevalence of smartphones is that they can lead to addictive behaviour. The apps and social connections developed by being constantly connected create dependence based on specific design strategies. Ali, Arden-Close, and McAlaney [2] describe one of these as *scarcity*, where a snapchat or social media status is available for only a brief period, encouraging you to get online more often. *Social proof* is what they call the rhetorical weight of popularity, meaning that 20,000 users retweeting an article implies that it must be important or essential. *Personalisation* refers to how your feeds are customized to present news based on your interests. Finally, *reciprocity* describes the network effect inherent to the social networks that make it harder to leave them once a critical mass is already present. These incentive structures can lead to negative side effects—problematic smartphone use. PSU can be characterized by sleeping disorders [46], anxiety and depression [53], damaging social interactions [23], executive dysfunction [44, 52], attention problems [35, 43], and many others.

Oulasvirta et al. found that frequent checking for updates via the smartphone can increase the risk of disease and associated personal and social problems [38]. These negative effects are driven by different factors, such as personal habits and loneliness, and the typically those who experience PSU feel uncomfortable and irritated when the smartphone is not available [39]. The World Health Organization (WHO) puts a particular focus on the problematic use of mobile technologies by children, teenagers, and young adults [30]. Their concerns are that smartphone use might replace healthy behaviours and habits such as physical activity and sleep, and possibly lead to harmful habits such as reduced sleep, day-night reversal, malnutrition, headaches, neck pain, or even gambling disorders [23, 30].

## 2.2 Efforts to address issues around smartphone use

Efforts to address problematic issues around smartphone use have taken place in both commercial contexts as well as HCI and design research. Commercially, numerous applications have been developed that intervene in smartphone usage, such as *AppDetox* (<https://appdetox.github.io/about/>), *PostBox* (<https://www.postbox-inc.com/>), or the *Unlock Clock* (<https://experiments.withgoogle.com/unlock-clock>). *AppDetox* allows users to decide how much they prefer to use an app or simply block it; *PostBox* delivers notifications in batches and at a time that users indicate; and the *Unlock Clock* is a live wallpaper that counts the number of times the phone is unlocked in a day. Other efforts to make smartphone use more intentional focus on a particular situation like the classroom or studying, such as *FOCUS* (<https://meaningful-things.com/focus>) or family time, such as *FamiLynk* (<https://families.google.com/intl/it/familylink/>). The main design principle in the applications above is to restrict or limit use based on the perceived needs of those situations. The Google platform *Digital Wellbeing* (<https://wellbeing.google/>) takes a different approach, asking its users

to evaluate their attachment to technology through a questionnaire and to provide relevant advice through guidelines and toolkits.

Problematic smartphone use has historically been studied by researchers in addiction studies [39], though it has also made its entrance to HCI and design research over the past decade [23, 28]. As part of such research, experimental applications have been developed to explore new approaches. For example, *Lock n' lol* is an application developed by researchers at KAIST to help users focus on their group activities by allowing group members to limit their smartphone usage together [31]. Building on the idea of social regulation, *NUGU* is a group-based intervention app for limiting smartphone use collaboratively [32].

This paper builds on these themes from beyond a purely software perspective in order to imagine new ways to consider intentional smartphone usage. As design researchers with an interest in interaction with physical products, we explore how the physical and temporal form factors [51] combined can influence smartphone use. What follows in the next section is an account of the methods we used as part of this design research process.

## 3 METHODS

Our research aims to explore how interaction design research can affect the physical and temporal form factors of the smartphone to support more intentional use. This question was explored as part of a larger project that aimed to draw relations between behaviour change and design futuring practices in speculative and critical design (or SCD) [47]. To begin our exploration, we organized a survey to develop an understanding of current smartphone use and perceived problems that people had with their phones. The results of this survey launched a research through design process that developed three design proposals to prompt more intentional smartphone use. These proposals were evaluated using a focus group, and finally reflected on to generate design insights using Kühn et al's themes for mindful technology use [34].

### 3.1 Survey

The survey [41] was meant to generate broader general knowledge about smartphone use and any associated problems through a set of multiple-choice questions. These considered basic demographics, experience with technology, usage patterns, and perceived problematic instances of using the phone. In addition to this, we were also interested in gathering a collection of anecdotes that could inspire subsequent design work. To that end, the survey asked the following open-ended questions to elicit stories about smartphone use and related emotions: *Do you sometimes feel guilty while using your phone? Do you have any rituals or routines with your phone? Can you tell us a story about your favourite way to use your phone?* These questions formed the basis of our design process, situating our inquiry into real-world need and practices.

### 3.2 Research through Design

As a form of design research, research through design (RtD) mobilizes methods and objects of design as a means of inquiry into a topic of design [22, 54]. One way that RtD works is by developing design proposals that deliberately take the form of consumer products—often in an evocative or provocative way—as an invitation to reflect

on the values embodied by its design [17, 18]. Some examples of the plethora of methods that were developed in design research and adjacent communities that borrow from this idea include critical artefacts [10], diegetic prototypes [29], discursive design [50], speculative design [4], adversarial design [15] or provotypes [8] as modes of inquiry driven by material form.

This project was inspired by SCD to propose alternative physical designs for the smartphone to investigate how smartphone use can be made more intentional. SCD offers a design mode that critiques the current forms and practices that surround the smartphone. This work foregrounds—through design—that smartphone use can become problematic, leading to overuse, addiction, or inappropriate use for a particular context. On the other hand, following Auger, we speculate how the application of emerging technology can lead to design concepts that articulate social issues [4]. These took the form of design fictions [7, 48, 49] that told stories about how the form and practices of mobile technology might change, and with those changes support associated behaviour changes. By using SCD, we aim to use the design to prompt discussion about contemporary concerns inherent to smartphone technology [15], while inviting for reflection on how novel technologies could be employed to affect these concerns [45]. Our RTD process consisted of a series of design workshops [42] with the authors where ideas were generated and concepts were developed, supported by inspirational imagery and scenarios [11] to develop refined design fiction stories and subsequently design concepts.

### 3.3 Focus Group

The proposals that were generated as part of the design process were discussed in a focus group session [40]. The participants that were selected for the focus group took part in the initial survey and indicated that they were interested in staying involved in the project. The session was conducted online and took one and a half hours. The participants were firstly introduced to the design research project, followed by a presentation and discussion of each idea, and concluded with summarizing reflections.

### 3.4 Analysis

Finally, we analysed the design ideas based on feedback from the focus group and Kühn et al as a guide [34]. Kühn et al offers a set of design research themes for mindful technologies that both offer us a framework to interpret the results of the focus group as well as a vocabulary for articulating the kind of intentional behaviour that our concepts support.

## 4 DESIGN PROCESS

To begin the design process, we recruited N=125 respondents via social networks (Facebook, LinkedIn, and Instagram) and university email lists (46% female, 53% male, 1% other/prefer not to say). 50% of the respondents were between 25 and 35 years old, 22% between 35-45, 15% between 18-25, and 9% between 45-55, leaving 4 percent of respondents over 55 years old. 47% considered themselves skilled with technology use, our highest rating, while 38% marked themselves as comfortable and 14% average. Our sample skews young and generally considers themselves to be proficient with smartphone use. When asked what they use their smartphones for,

almost all use it for messaging (98%), closely followed by social networking and internet searching/news (84% each), as well as maps and navigation (83%). Respondents felt most tempted to use their smartphone when they are on public transport (71%), when they are annoyed (58%), when they were alone (55%), and when they want to relax (50%). This temptation often felt habitual (72%), but participants also didn't want to miss notifications (39%), wanted to be updated on their friends' activity (26%), and let them feel closer to other people (22%) and places (13%).

As an object, our respondents said that the smartphone drew their attention as it was easily accessible, leading to checking it often (72%); it would buzz, flash, make sound, or otherwise take focus (50%), that they found the content engaging (37%); and that it fit their hands or pocket well (25%). 21% said that their phone felt like a part of them.

When asked about negative effects, 69% felt anxiety from being connected all the time, and thus always reachable; 56% mentioned that they felt distracted by the phone, or that they couldn't concentrate. 15% mentioned fear of missing out on something if they didn't have access to their phones.

In terms of their affective relation to their phones, 60% said that they felt guilty using their phones sometimes, 51% expressed a desire to be less attached to their phones, 49% wanted to use the phone less often, and 36% wanted to use the phone more intentionally. Combined with the longer form, open-ended questions, the survey gave us a pastiche of how people understand and consider their phone use, what they wanted to get from using their smartphones, and what kinds of troubles their smartphones might lead to.

### 4.1 Concept generation

We used the survey data as a prompt to begin our design process. As above, this process was derived from a series of design workshops to develop provocative futures for smartphones that could inspire more intentional use. Initially, the scale and scope of the design space was larger, with any number of possible directions to follow. Over time, and inspired by survey data and our own experiences [33], the design space narrowed into different cases and accessories for a phone concept based in the current day that could shift usage practices.

## 5 DESIGN PROPOSALS

The design process above led to three design proposals: the *planning phone*, the *parasite phone*, and the *placeful phone*. These concepts were intentionally slightly cartoonish to leave space for our focus group to interpret it as they will—rather than being fully fledged design concepts, these were meant to identify possible strategies for designing for intentional use that could be taken up in the future.

### 5.1 The Planning Phone

In response to the survey question about feelings of guilt when using the smartphone, several responses indicated that the activity that is engaged with on the smartphone is not perceived as useful, for example, *I can do more useful things like read a book; ending up on social media by accident; or being outside on my phone missing out on nature*. This notion of planning activities alongside the smartphone use associated with those activities inspired a design direction.

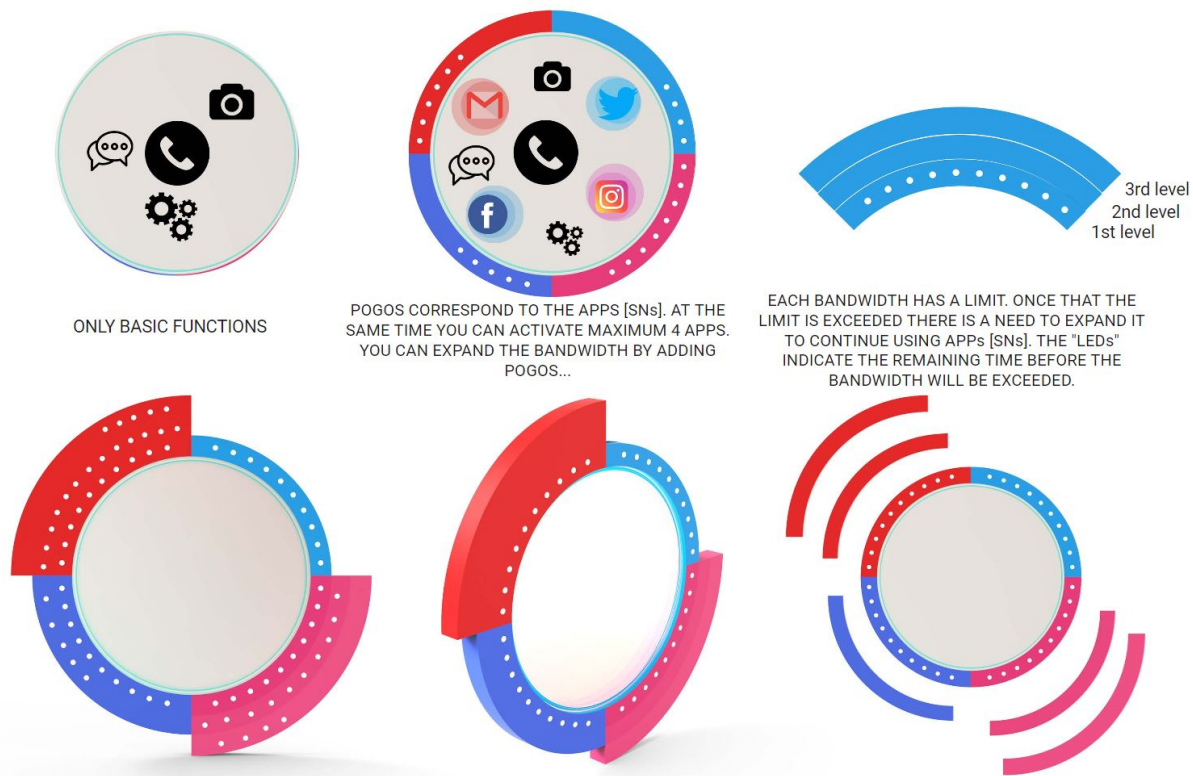


Figure 1: The Planning Phone

We were particularly motivated by the idea of planning which applications would be needed and for how long a user wanted to use them that day.

The Planning Phone (Figure 1) is a type of modular phone, akin to the FairPhone (<https://www.fairphone.com/en/>) or PhoneBlocs (<https://www.onearmy.earth//project/phonebloks>) but motivated by intentional use rather than reducing e-waste. The Planning phone is a circular phone that on its own only offers applications for calling, messaging, and taking photos. Additional applications such as Instagram, Facebook, Twitter, and so on can be added by placing segments onto the sides of the phone, though this is restricted to a maximum of four applications at a time—one application per quadrant. These segments also use lights to indicate how much time can be spent on the application. Users can add up to three segments of one application on top of each other, to increase the amount of time they can spend on the application. In that sense, increasing the time available for application use on the Planning Phone makes it more challenging to physically handle the phone.

For this study, the details of the Planning Phone were intentionally left ambiguous in terms of manufacturability or exactly how much time each segment represents. Instead, the main qualities of planned and restricted use (both physically and over time) were embodied by its design.

## 5.2 The Parasite Phone

The survey pointed out that almost half of the participants expressed a desire to be less attached to their phones. Additionally, some expressed feeling guilty by spending too much time on the phone or finding it difficult to disengage, as illustrated by the quote *I feel guilty because I am lazy/it's difficult for me to stop using the phone and start doing something else*. These results inspired a design direction that aimed to gradually intervene in use by making the phone increasingly less usable over time.

The Parasite Phone (Figure 2) is a regular phone that lives in a parasitic case. The more the phone is used, the bigger the case will inflate and grow, and consequently the harder it becomes to use the phone. To be able to use the phone again, it needs to deflate, which can only happen when it is ignored. The material appearance of the phone was inspired by performative objects and soft and social robots [9, 36].

## 5.3 The Placeful Phone

In terms of rituals and routines of using the smartphone, several survey responses revealed that there were situations that led to the use of particular applications. For example, some responses indicated that email and news were read first thing in the morning, one respondent read their horoscope every morning, and another checked their social media such as Instagram and TikTok. The

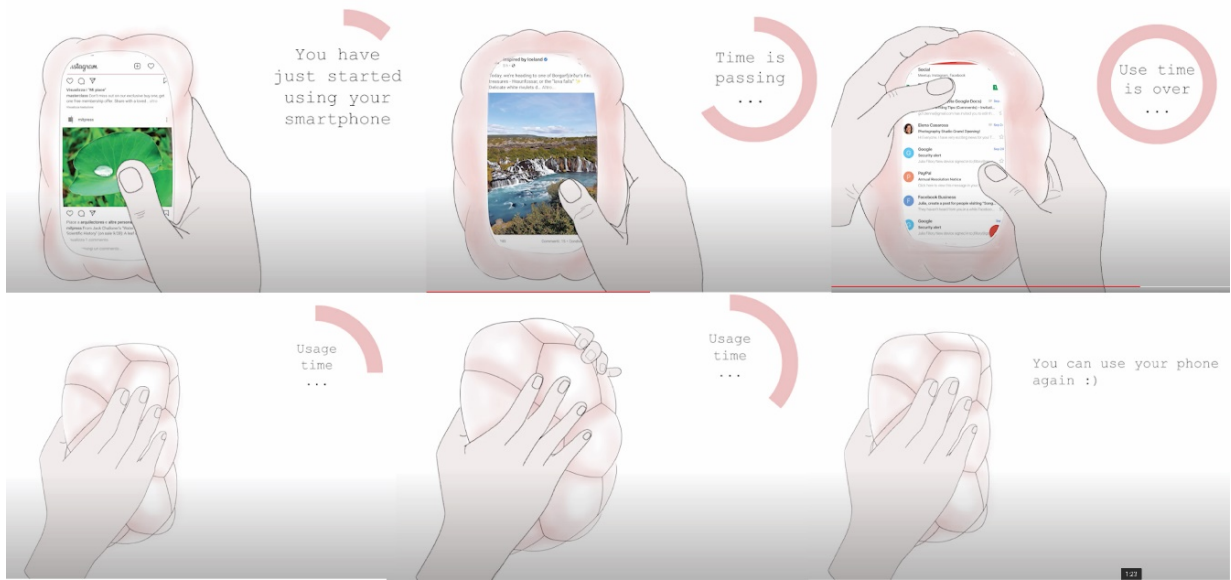


Figure 2: Storyboard for the Parasite Phone



Figure 3: Storyboard for the Placeful Phone

Placeful Phone (Figure 3) explores how the smartphone is used in contexts such as these. It consists of a smartphone that has no basic functionality on its own, and a set of cards that indicate which functionality should be enabled. These cards are roughly divided into two categories: a first set that is related to the spatial or virtual environment, such as “work”, “restaurant”, “gym”, “shopping”, “nature”, or “travel”; and a second set that is related to activities, such as “family time”, “pet time”, “romantic”, “holiday”, “party”, or “zen time”. The cards are personalized so that there is some autonomy

over which card allows what functionality, while cards from the first and second category can also be combined. Overall, this proposal asks its user to consider what is and what isn’t appropriate behaviour in context to avoid antisocial behaviours.

## 6 FOCUS GROUP EVALUATION

The three proposals were discussed in a focus group with six participants who have worked in interaction design as a researcher, student, manager, or company owner. The participants were asked

to explain the perceived benefits and possible frustrations of proposals, including what could and what couldn't possibly support intentional use.

### 6.1 Planning Phone

At the start of the discussion, the participants recognized why the authorship offered by the Planning Phone would make their use more intentional. This was mainly expressed in terms of 'awareness': *Interacting with content modules and seeing the LED dots indicating usage time would make me become more aware of the time I spend on the smartphone*, or *Having categorized applications would make me become more aware of what I am using the smartphone for*. Despite understanding the main goals of the prototype, questions arose around several aspects.

Firstly, the idea that 'use' can be planned was critically questioned, as it was seen to add a cognitive load that would make it more challenging to stick to the intended use for the day. Participants felt that they would have to always think about their current and future use. Further, our participants agreed that it is hard to anticipate and predict your own behaviour, as applications can be used in multiple contexts and across different activities. They felt that, instead of making you feel more in charge of your use, this would make you feel stressed or anxious (*If I forget some module I would be anxious about whether I have received some important notification or message*).

Secondly, the form factor was questioned. The circular form seemed particularly alien, as it would create scrolling issues that might make use less comfortable. When it came to the segments, and adding new segments, the physical form was seen to reflect your anticipated use in a social setting, and in turn, self-image and projecting what you consider to be an appropriate use for that app. Having every section added so highly visible was uncomfortable and undesirable to our participants, as the amount of smartphone use was regarded as something in the individual and private realm: *Making the usage time so evident would make me embarrassed in public space, I don't want let others know about my habits*. The very act of attaching and detaching segments was found annoying and time-consuming. In sum, it was challenging for the focus group to be able to plan for the Planning Phone, as the use of the phone is dynamic and hard to anticipate. Further, when they could imagine taking on that role, the form of the concept didn't represent how they wanted to present themselves publicly.

### 6.2 Parasite Phone

The barriers in use that were presented in the Parasite Phone had a strong visceral response by more than half of the participants: *I find this artefact odd and ugly; it would be difficult to integrate it in my everyday life*. Nonetheless, the potential benefit of this proposal was recognized at the same time: *Initially, it may be annoying and frustrating, yet it would make me become more aware of how much time I spend on the phone* or *This barrier could prevent me from often using my phone because it is embarrassing when it inflates*. Like the Planning Phone, the appearance of the Parasite Phone was thus not just disabling usability, it also was seen to have an impact on their social environment. As opposed to the notion of a beautiful user experience, the participants jokingly talked about ugliness in

use as a mechanism to reduce the time spent on the phone. As a playful way to address usage time, it was suggested that a product like this could have educational value for children who are using a phone for one dedicated activity, helping them learn intentional habits.

This proposal mainly evoked discussions about what constitutes meaningful and mindless use of the smartphone. For example, what if you are using your phone to navigate opposed to playing a game; or what if you are calling with someone opposed to managing your finances? The quantity of use does not always reflect the quality of use. Especially unforeseen situations would be troublesome for ideas like this: *It would worry me if I need my smartphone for an emergency, and I couldn't activate it because it needs to deflate*. In sum, the Parasite Phone's changing shape was too decontextualized from what the phone was used for. This also highlights a conundrum for design—as the phone is also a primary emergency tool, physically inhibiting use as a strategy to make use more intentional may always be seen as a non-starter, even as emergencies are very rare. Still, this concept pointed to the potential of ugliness in use as a tactic to address mindless use of the smartphone.

### 6.3 Placeful Phone

The Placeful Phone was discussed last and received overall positive comments. The flexible selection of cards was appreciated as—unlike the other two proposals—they acknowledged the situation of use: *I found this proposal very pragmatic in terms of interaction and its application in the real world/life situations*, followed by *it is a sort of declaration I make to myself: Now I do this, and I do not need anything else that may distract my attention*. The commitment that came from the limitation of selecting only two cards, was seen to support behaving more intentionally with the smartphone: *Even though the possibility to combine only two cards is limiting, it could actually make me learn how to act more intentionally with this technology*.

The idea that the cards are personalized would require a level of self-awareness of how the phone is already used. Our participants questioned how well we can know ourselves in this respect and how well computation can support this process. For example, the card that is about 'Work' can relate to many different situations and require different applications depending on who would be asked. And, over time, these applications are likely to be changing as well. Besides this, the physicality of this proposal was questioned, as one participant said: *I would lose half of them or forget them at home*. Even though the use of the cards is an act of intentional use, this participant would prefer a software solution, akin to the Flight Mode functionality and recent contexts like focus, driving, sleep, and so on already present on smartphones. In sum, the Placeful Phone was received relatively positively, albeit with concerns about what a card about the environment or activity would include, and whether the "cards" should be a hardware or software solution.

### 6.4 Synthesis and possible future directions for study

In a closing discussion, the focus group participants indicated that the session addressed a problem that our participants had not reflected on before, while each proposal provoked a different set of



questions. The agenda to make smartphone use more intentional was positively received, as it could decrease levels of stress and support a more reflective stance towards smartphone use (*it can help you zoom out*). The discussion also pointed to relevant avenues for further exploration.

Firstly, the technical functionality (which application), the social environment (in which situation), and the dynamics over time (short as well as long term) were seen as factors that are interdependent and intertwined in solutions to address problematic smartphone use. The three proposals were seen to not take this complexity into account, by focusing the design mainly on the kind of application that is selected for use (Planning Phone, Placeful Phone) or their use over time (Parasite Phone). The proposals were therefore, directly put by one of the participants, *provocative, but not interesting*.

Secondly, it was discussed who is to be held responsible for the problematic use of the smartphone. Is it application developers, smartphone producers, policy makers, or the end-user? Each of these were mentioned as playing a role in combating the potential negative consequences of problematic smartphone use or stimulating intentional use of the smartphone. Taking on these different perspectives as part of the design process and involving a bigger picture approach to the issue of problematic smartphone use would help to position and accurately situate the potential contribution that design research can make in this domain.

Thirdly, the notion of data consumption was mentioned as a response to the focus on applications in the design proposals. What content is being consumed on the smartphone, when, and why? What does which content do to our attention and when? Reframing design efforts into the direction of data and content could result in new ways to consider “intentional” smartphone use that are less bounded to app usage directly.

## 7 DISCUSSION

To analyse and reflect on the design ideas and take the feedback from the focus group into account, we use the theoretical framework from Kühn et al as a guide [34]. This study of ‘mindful’ interaction offers a set of themes for design research. Inspired by Tristan Harris’ strategies to develop a more mindful relationship for the phone [25], such as changing the screen to grayscale, turning off notifications, or putting all applications into one folder, their study participants used a custom-built phone interface over two weeks. Based on their experience, the authors extracted five design research themes were identified that serve as starting points or components of design artefacts to develop more intentional use of interactive technology. These are:

- *Barriers*, or ways to intentionally prevent progress in interaction and creating a pause for conscious reflection. This theme relates to detours [1] or micro-boundaries [13] that prevent circular, compulsive, or automatic use.
- *Authorship*, or ways to feel more empowered or active in using a system. This theme relates to personalization, but to improve intentionality rather than usability or desirability.
- *Balance* refers to a paradox of technology: that the development of technologies produces desires that the technologies

themselves create. This theme invites reflection on the balance between these parts, and whether technology is taking too active a role in creating user desires.

- *Contrast*, or stimulating reflection on when which functionalities of the smartphone are meaningful to use.
- *Norms* refer to the developing of healthy standards for technology by actively negotiating desired behaviour in context and shaping technology in culturally meaningful ways.

The Planning Phone primarily explores Kühn et al’s theme of *authorship*. The material properties and interactions embedded in this proposal give the user a possibility to decide what kind of content to use. These intentions are made visible in the physical form factors of the phone. The Parasite Phone primarily explores *barriers*. By making it difficult or nearly impossible to use the phone, this barrier creates a moment of conscious reflection on use, stimulating meaningful content rather than the more compulsive and automatic impulses that our respondents sought to avoid such as repetitive checking, scrolling, and other automatic usage patterns. The Placeful Phone primarily exploits *norms* to develop more intentional smartphone use. As with the Planning Phone, the Placeful Phone is based on anticipating how the smartphone will need to be used by stressing the social and spatial context as well as the behaviour that is expected in that context.

The connections between Kühn et al’s research themes [34] and the design research proposals serve as a rough framework for understanding how these design concepts relate to intentionality. The three proposals reflect how the themes could be used to support more mindful use of technology. Of course, this is not meant to be a one-to-one mapping, and all the concepts reflect aspects of many themes: the Placeful and Planning phones certainly involves ideas of contrast as well as authorship, and the Parasite Phone could easily prompt reflections on contrast. Rather, they are starting points for reflection which elements or strategies could be provocative or desirable for future inquiry. For this project, the design concepts seem to most clearly relate to ideas of *authorship*, *barriers*, and *norms*. The following section breaks down how these have worked in these cases, and is followed by broader reflections for design research in this area.

### 7.1 Interpreting themes for intentional design

*Authorship*, or inviting smartphone users to modify their interface to stimulate intentional use, was primarily visible in the Planning Phone, and to a smaller degree in the Placeful Phone. Authorship in this case seems to be tightly connected to concepts of anticipation, planning, and self-image. That is, it requires anticipating what a day will be like, and planning what that implies in terms of required smartphone functionality in a way that is in line with an image of self that is believed to be socially acceptable. To be an “author” implies taking responsibility over what was created—in our case, the way in which the smartphone is used, how long, and for which purposes. This proved to be a kind of responsibility that requires flexibility: the Placeful Phone was less restrictive than the Planning Phone and received more positively. Authorship to support intentional smartphone use is thus about making decisions about acceptable self-imposed limitations that are flexible enough to not end in anxiety or stress.

*Barriers*, or intentionally preventing progress in interaction, were visible in all the concepts. In the Parasite Phone and the Planning Phone, barriers placed restrictions on the time applications could be used and physically less convenient form factors. In the Placeful Phone, the barrier limited the applications that could be used. As a mechanism to support intentional use, and perhaps due to the deliberately cartoonish character of the proposals, these barriers were perceived as too constraining. The barriers created by the Placeful Phone, however, operated more like a microboundary [13], in the sense that it offered a lower barrier to use that could more easily be overcome by using a different card in the smartphone. This notion—to not disable use completely but instead offer ways to continue using the smartphone after a reflective break—seemed more palatable to our focus group participants. Of course, this does not mean that they would necessarily lead to less problematic smartphone use overall! However, barriers to support intentional smartphone use seem like they could become a potent mechanism for driving more intentional smartphone use, if the right balance is struck.

*Norms*, or asking to negotiate what “appropriate” use of the smartphone is in context, was primarily visible in the Placeful Phone, but also mentioned in the discussions of the Planning Phone and Parasite Phone, albeit restricted to how their physical form might be frowned upon in a social setting. As a mechanism to support intentional use, the notion of norms evoked reflections on “space” vs “place” [26]. That is, one set of cards mainly talked about “space” (e.g. ‘the gym’ or ‘work’), or the structure of the world in which events occur, while another set of cards covered ideas of “place,” referring to a space that is invested with an understanding of appropriate behaviour (e.g. ‘pet time’). Norms are relevant for a particular place, not for spaces. Using norms as a mechanism to support intentional use showed to be powerful, as it refers to social enforcement opposed to technological enforcement. For example, despite the Planning Phone and the Parasite Phone being presented as a technological interventions, they still operated in social worlds and contexts that affect how the design ideas were understood [16], negatively affecting how our participants understood them. Simply inviting users to reduce their screen time in such a physical and quantitative fashion does not seem promising on its own to motivate more intentional use. Rather, working with particular goals that are situated in particular places could go a long way towards helping people to choose to use their devices more intentionally.

## 8 CONCLUSION

By using our design concepts as our prompts in conversations with the focus group, our reflections of the research themes *authorship*, *barriers*, and *norms* are of course limited to how they were illustrated in the designs. Even though they were not regarded as “interesting” as such, the designs were regarded as provocative invitations for reflection on an issue that would have otherwise not received very much attention from the participants.

From their responses, we argue that future design and development of the smartphone should not treat technical, social and temporal factors individually, but rather seek a meaningful integration of these in supporting intentional use. This study has developed three interlinking goals can support intentional smartphone use.

First, developing contextually-relevant barriers can stop negative use patterns. Second, offering opportunities for authorship that help to respect individuals’ privacy. Third, making sure that these interventions are based in contextually-meaningful social norms. Taken together, these offer strategies for developing more intentional technology use that can be relevant and appropriate to users over time. Future research building on these results could produce mappings of how interaction modes based on these goals can support or inhibit different kinds of behaviours, or examine existing products for examples of how these themes operate, or put the themes to the test with real users in real-world situations.

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