Supporting Temporary Non-Use of Smartphones

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ABSTRACT
Smartphones permeate everyday life, and its ownership is considered to be a norm especially among young generation. However, a majority of users are experiencing negative aspects of smartphone use which ranged from conflicts with daily lives (e.g., social interactions, work/study, and sleep disturbance) to health problems (e.g., techno-stress, and attention deficits). To deal with these concerns, users often attempt to regulate smartphone use by actively managing its use under various situations. In some cases, they even decided to become a non-user, by downgrading to feature phones. In this work, we report our survey results on the current practices of smartphone non-use and discuss HCI-related research issues on the interaction design for supporting smartphone non-use.

Author Keywords
Temporary non-use; non-use interaction design

INTRODUCTION
As smartphones have rapidly penetrated into the society, we observe negative aspects of smartphone use as well. People feel stressed with smartphone use due to social expectation of prompt responses. In some cases, its overuse may lead to conflicts in daily lives (e.g., social interactions, work/study, and sleep disturbance) and may cause health problems (e.g., techno-stress and attention deficits).

To deal with those concerns, some users decide to actively engage in temporary non-use. This coping strategy can be considered as one form of technology non-use, i.e., active resistance [8]. While this term is largely construed as an ideological protest for technology non-use, it also includes the cases where technologies are avoided in particular moments due to their influence on people's lives (e.g., study/work, life changing events).

Compared to other non-use cases, smartphone non-use is more challenging. People can delete their account for SNS non-use [3]; Internet non-use can be achieved by intentionally staying away from PCs [5]. However, smartphones are always carried by users and typically serve as gateways for numerous services ready at hand (e.g., information seeking, navigation, social networking). Discarding smartphones can be done at the huge expensive of losing in-situ digital assistance and instant social connectivity. Given that it is very hard to strictly practice non-use, people tend to choose to regulate its use via temporary non-use.

This position paper aims at deepening our understandings of temporary non-use of smartphones. To this end, we collect user stories on smartphone use and non-use from self-reported surveys and summarize our findings about commonly practiced non-use strategies and their effectiveness. From these findings we discuss HCI-related research issues on the design for supporting smartphone non-use.

RELATED WORKS
Several recent studies examined smartphone use and its implications. In an observational study of smartphone usage on the Stanford campus, Ames [1] showed that the students exhibited techno-social balancing behavior (between online and physical social interactions) and techno-resistance behavior (limiting smartphone use). Harmon and Mazmanian [4] identified two themes of smartphone use that are reflected in commercials, where one theme recommends the deep integration of smartphones in daily life, and the other urges people toward disintegration. Oulasvirta et al. [8] reported that the use of mobile devices may lead to the development of a checking habit that involves brief and frequent content consumption. In our exploratory analysis [6], we identified various problematic usage behaviors related to smartphone overuse such as mobile instant messaging initiated usage behavior and less regulated content consumption behavior. While these studies helped us to gain insights into related to smartphone usage and related concerns, they did not survey various non-use strategies, and their context and effectiveness.

SURVEY ANALYSIS

Methods
We conducted a preliminary online survey as follows. We asked the participants to describe their experiences about the conflicts and fatigues associated with instant Messaging (IM), SNS, Game, and Web using smartphones. We then asked them to report the non-use strategies and their

effectiveness. In addition, demographic questions were asked (e.g. age, gender, occupation, and years of using a smartphone). We posted the survey request to popular online community sites for a few days in January, 2014 and received 68 responses in total. The majority of participants are males (male: 60 and female: 8) and in their twenties (Mean: 28.8, SD: 5.91). Their occupations were diverse, ranging from college students to teachers and office workers. The self-report smartphone usage time was given as 4.47 hours on average (SD: 2.09).

Conflicts and Fatigues of Smartphone Use

Our results show that smartphones cause various kinds of conflicts on daily activities (e.g., sleep, work/study, and social interactions).

Instant messaging: We found three themes, i.e., frequent distraction due to notifications, long chat time, and constant attention requirement. Instant messages disrupted various daily activities: "*I was not able to focus on the meeting because group chat alarms blew off frequently*." "*I was about to sleep, but new messages woke me up!*" The participants reported that they tended to spend more time than they expected; "*I tended to chat much longer than I expected*." Due to social expectation of constant connectivity, the participants paid considerable attention to message exchanges: i.e., checking whether new messages have arrived, or whether the recipients have checked the senders' messages; "*I kept checking whether my message was read*."

SNS: Similar themes were found in the case of SNS. As in instant messaging, frequent push notifications about content updates distracted daily activities: "*When I received Facebook updates messages in the class, I couldn't focus on the lecture*." Due to frequent updates, the participants reported that they spent a significant amount of time for consuming the content: "*I just wanted to check a bit before I start my work, but in the end, I often realized that I spent a lot of time on it*." In some cases, content itself makes people feel less comfortable, e.g., political statements and personal complaints. In addition, there were concerns related to user privacy; "*In some cases, I found that privacy infringing information can be spread through Facebook*."

Mobile Games: Most of the complaints about mobile game usage are related with frequent and long use of mobile games. Our participant commented, "*I just wanted to play a bit before going to bed, but in the end, I spent more than two hours*."; "*I was on a bus, but I forgot to get off my home station because I was so immersed into the game*." Social features (e.g., inviting friends, showing ranking) are often used as game mechanics that lead to several problems. Frequent invitation messages disrupted daily activities, but more severe problems were related with intense competition among friends: "*I didn't study much because I wanted to increase my ranking*." For that purpose, one participant even spent money to buy game characters.

Web Browsing: One dominant theme appeared is its overuse as one participant commented, "*I spent most of my time at web portals where I read news articles, and express my opinions therein*." The online portal sites have abundant dynamic content (e.g., trending news, web search, links to webtoons, online communities), and users may spend a considerable amount of time for consuming such content.

Non-Use Strategies and Their Effectiveness

In our survey, 58.8% of the participants had experiences of various forms of non-use to cope with the negative aspects of smartphone use. The rest of participants commented that they think that smartphones did not feel such needs. In Table 1, we report the major themes for non-use strategies.

Methods	Examples
Altering smartphone settings	*"I put it into the airplane mode." "I turn off all the notifications." "I just turn it off." "I uninstall apps." "I sometimes do factory resetting."*
Intervention software	*"I used a study app that blocks app usage based on my schedule."*
Physical separation	*"I left my phone at home." "I put my phone out of reach of my hands." "I put my phone in my bag."*
Mental efforts	*"I just set my goal and try to use based on that goal"*
Downgrading	*"I changed my data plans from unlimited to smaller data size." "I downgraded my smartphone to a feature phone.*

Table 1. Popular non-use strategies

Our participants mostly used the methods of altering smartphone setting, e.g., putting phones to airplane/silent modes, turning off notification alerts, and removing overused apps. Several participants used intervention software that allowed them to perform fine-grained setting (e.g., blocking phone usage for a specific time duration). Along with this setting control, physical separations were often used as coping strategies; e.g., leaving phones at home, and placing phones out of reach of their hands. A number of participants commented that they set the usage goals and tried to use their phones only needed. Several participants employed stronger coping strategies; e.g., changing their data plans (from unlimited to fixed size) and downgrading to feature phones.

We then asked the effectiveness of such coping strategies. Our participants were somewhat successful for regulating usage behavior, but a majority of participants stated that they failed to continue their efforts for various reasons.

Participants turned off their phones, but they often felt inconvenience (e.g., missing incoming calls), which made them to do so less frequently. Turning off notifications and alarms worked well in the first few days, but the participants felt that their usage tended to come back to its previous levels. Due to similar reasons, physical separation

worked only for a short period of time. Uninstalling apps were effective for some users, but most users complained about this approach: "*I uninstalled an excessively played game, but I downloaded some other games later*." It takes only a few steps to download and install apps, and it is difficult for the users to continue abstinence.

Those who used intervention software showed varying degrees of effectiveness. One participant said, "*I was able to reduce game play and chatting time.*" Other participants commented that its usefulness is very limited: "*I didn't pay much attention on this app*."; "*I only used this app before going to bed*. At least it helps me not to disturb my sleep."

Our participants stated that downgrading strategies did not lead to considerable changes: "*It was effective for some time, but I felt really confined, and I had to switch back to the original plans*."; "*It was effective initially, but it didn't take much time for me to switch back to smartphones*."

Interestingly, those participants who used mental strategies of setting the usage contexts/goals were quite successful managing their use: "*After this, I don't have any instances of engaging in long use of 30 minutes to 1 hour. I was able to reduce 2-3 hours of usage to less than 30 minutes a day*."

LOSS AVERSION AND LACK OF SELF-REGULATION

Our survey results showed that various coping strategies led to failure. We hypothesize that such failures may be related to people's tendency of avoiding losses due to non-use [7], and lack of self-regulation [2].

We asked the participants of what fraction of smartphone usage is considered to be useful (e.g., interpersonal functions, information seeking, and entertainment). The fraction ranged from 10% to 100%, and its average was about 50%. What makes non-use difficult is that useful cases are intertwined with conflicting cases. According to decision theory, when people evaluate an outcome of their behavior, they tend to show risk aversion behavior of avoiding loss. After experiencing a utility loss in the mist of non-use (e.g., missing an important call), a user will show risk aversion behavior of avoiding such loss due to non-use.

This human behavior highlights us to model the cost of non-use. There could be at least three dimensions to consider: physical, temporal, and utility costs. Physical cost is bodily actuation cost to use smartphones. Temporal cost is the time required to regain service access. Utility cost is related with loss of smartphone-supported services and is dependent on services (e.g., voice, instant messaging), contexts (e.g., studying, waiting), and delay sensitivity. The cost of temporary non-use strategies can be evaluated using this model. For examples, the airplane mode has low physical cost, low delay cost for switching, and very high utility loss (no access at all). In the case of turning off smartphones, the temporal cost would be much higher (time to boot up a phone). If a user leaves a phone out of reach of her hands, we expect that it has some degree of physical and temporal costs, but its utility cost would vary widely depending on where the phone is located (high cost if it is left at home, and small cost if it is a few steps away or is located in a bag).

Another important aspect is related with a user's self-regulation. According to Bandura [2], self-regulation consists of three sub-processes, i.e., self-monitoring, judgment, and self-reaction. In other words, a user observes usage behavior, judges its outcomes based on personal, social, and collective norms, and adjusts usage behavior to maintain compliance with norms. Our survey results showed that typical temporal non-use strategies often lack systematic methods for self-monitoring. Moreover, social and collective norms are less salient because non-use contexts are mostly personal (e.g., while studying/working, before sleeping). According to our results, those who used metal strategies of setting their goals (i.e., personal norms on usage behavior) were able to successful maintain non-use strategies.

SYSTEMATIC SUPPORT FOR TEMPORARY NON-USE

We propose several design guidelines to systematically support temporary non-use of smartphones: i.e., fine-grained utility management, contextual interaction modes, self-regulation enhancement methods, and inconvenient interaction design.

Fine-grained utility management: Utility of smartphones vary widely depending on the types of apps installed. Nonetheless the current system only supports very crude non-use strategies such as turning off and airplane modes (although there were not designed for that purpose). Alarming modes are also very crude as it only supports three cases, i.e., vibration, sound, and none, regardless of apps and contexts. Mobile operating systems can support systematic tools for fine-grained utility management; e.g., what kinds of notifications will be alarmed under what contexts; and enabling/disabling specific apps.

Contextual interaction modes: Due to its wide range of utility functions of smartphones, in some cases complete non-use may not be feasible. For example, while studying a foreign language, a user needs to refer to an online dictionary using her smartphone. Similar to the drive safe modes that limit some of the features (e.g., text messaging), we can design various interaction modes to facilitate non-use under various contexts. For example, we can turn our smartphones to language learning modes by enabling audio payback, and online dictionary apps.

Self-regulation enhancement methods: The key aspects of self-regulation are self-monitoring and personal judgment based personal, social, and collective norms. Mobile platforms can incorporate software tools that allow users to self-monitor their usage behavior. Moreover, smartphones can understand various social contexts by sensing places and social interactions. Similar to battery charge warning, we can alert users of non-use warning under particular contexts; e.g., warning to stay focused on the current social

interactions. It is possible to encourage social and collective norms by designing social support features (e.g., sharing non-use experiences among friends).

Inconvenience interaction design: So far we discussed various assistive tool design that allows for fine-grained usage setting. Alternative design would be making smartphone interactions less convenient. As we illustrated earlier, we can build costs models for smartphone usage; e.g., temporal, cognitive, and physical costs. The current design allows immediate, effortless user interactions; i.e., less than a few touches, with very low cognitive and physical loads. If we build a complex cost model (possibly personalized), we can intentionally provide varying degrees of inconveniences. For example, Tsujita and Rekimoto [10] demonstrated that enforcing users to smile to grant their access to home appliances greatly improved their happiness. We believe that as long as there are long-term benefits of smartphone non-use, inconvenience design would help users to maintain non-use behaviors. Oulasvirta et al. [8] showed that instant access may lead to a habitual checking behavior. If varying degrees of interaction load (temporal, cognitive, and physical) are levied based on the level of gratifications, we can easily guide users to maintain non-use behavior, and habitual behaviors could be avoided.

CONCLUSION

We considered temporary non-use of smartphones as coping mechanisms for overuse and its related problems. Our preliminary survey results showed that our participants raised various concerns related to the representative services such as instant messaging, SNS, mobile games, and web browsing. We identified popular temporary non-use methods such as phone setting alteration (e.g., airplane modes, turning off, removing apps, and factory resetting), intervention software use, physical separation (e.g., leaving a phone at home, and putting it in a bag), metal efforts (e.g., setting detailed non-use goals), and downgrading (e.g., changing data plans or falling back to feature phones). However, the participants often failed to maintain non-use strategies. We hypothesized that such failures may be due to people's tendency of avoiding utility losses, and lacking self-regulation. Considering these potential reasons, we systematically explored possible interaction issues for supporting temporary non-use, including fine-grained utility management, contextual interaction modes, self-regulation enhancement methods, and inconvenient interaction design.

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