Towards Designing Multi-Device Digital Self-Control Tools

Summary

Candidate:
Elia Bravo
Supervisors:
Luigi De Russis
Alberto Monge Roffarello

October 2020

Developers, tech industries and researchers are designing and creating software for achieving "digital wellbeing". Recent studies define "digital wellbeing" as a "degree to which users perceive their digital device usage to be well-aligned with personal, long-term goals", suggesting that the self-control of the user over their devices is central to this topic. The majority of Digital-Self Control Tools (DSCTs) are typically implemented for a single device, providing self-tracking statistics integrated with access blockers, timers, launches limits, goal reminders and other features. In the modern multi-device world, people typically own more than one device and they often use them in a concurrent way, or sequentially, performing the same task or for multi-tasking purposes. The lack of DSCTs that deal with our global technology usage points out the need of investigating digital wellbeing in a multi-device context. The goals of this thesis are:

- To define, through a literature analysis, which self-control strategies can be adopted in a multi-device context, with a focus on the digital habits.

- To develop a software tool to implement some of these strategies in a few dedicated multi-device settings.

- To evaluate the developed tool with an user study.

Digital habits and habit forming approach   Some studies point out the effectiveness of habit forming approaches like the Digital Behaviour Change Interventions (DBCIs) in the design of digital wellbeing tools. According to cognitive psychology theories, a "habit" is a human behaviour with a high frequency, a high level of automaticity and a consistent link with the individual and social context that triggers the behaviour. The habit formation phases can belong to non-conscious and implicit processes of our mind (impulses), or to deliberative, explicit and conscious processes (intentions). Most of the cited studies related to digital wellbeing identify the habit formation approaches as crucial for long-time behaviour change. The time and launches limits, the redirections of user activity, associated with a context, are the most effective features implemented in DSCTs with the aim to bridge the gap between intentions and impulses, scaffolding the formation of new habits. The previous definition of digital habits, as well as the features of DSCTs, look easily suitable for an adaptation to a multi-device world.

FeelHabits design   I tried to extend the concept of digital habits in a multi-device environment composed of the PC and the smartphone, in the design of FeelHabits, a first prototype of multi-device DSCT. To achieve this goal, I defined the "multi-device sessions" as usage sessions composed of the websites on PC browser or the apps on smartphone that are visited when the other device is active or was active in the last minute. Then, I introduced the concept of "multi-device app" as the pair composed of smartphone application and the analogous website (supposed to be visited through the PC browser). For instance: "WhatsApp" for smartphone, "web.whatsapp.com" on PC browser. Finally, a multi-device habit can belong to one of the three following categories:

- *Multi-device context habit*: it is a strong correlation between a contextual cue that involves itself the usage of a device, and a consequent interaction with a app/website of another device (in a common multi-device session). For instance: at work, in the morning, while using PC, the user frequently launches Instagram with the smartphone.

- *Multi-device app habit*: when a user habitually visits a multi-device app both with the smartphone and the PC browser, even if these two habits occur in different contexts. Together, they belong to a "multi-device app habit" category. For instance, a student during the day may be used to watching a TV series on Netflix with the smartphone, while performing another task (not necessarily technology related). At night, the same student may prefer to watch Netflix with the PC.

- *Multi-device app-context habits*: a hybrid form, where the usage of a specific app/website in a given context, with a given device, spurs the usage of a second app/website (even not related) with a different device (in a common multi-device session). For example: the usage of web.whatsapp.com with PC browser, in the morning, during working days, is frequently followed by a visit of Facebook with the PC.

To implement the habit forming features, the user can select among 3 intention categories:

- *Multi-device apps.* It is the option for the users who want to mitigate a habit that consist of visiting too often or for too long a multi-device app.

- *Smartphone at PC.* This intention aims to mitigate habits that involve a excessive usage of a smartphone app while using PC. (Multi-device context Habit)

- *Screen time.* To form the good habit to make a break after a long multi-device session, and to control the overall daily screen time.

These intention are associated with a daily temporal context, where the possible options are: working days and/or holidays, morning/afternoon/night.

FeelHabits   FeelHabits is the resulting prototype of multi-device Digital-Self Control Tool, composed of a Chrome Extension, smartphone Android app and a PC desktop app that work synchronously, communicating with one another through a Cloud database (Figure 1(a)). The user can define the previously mentioned context-related intentions by applying to them time limits (for all the intention categories), or limits of launches (for the "multi-device apps" and "smartphone at PC" categories). Then, the user can choose the severity of the system intervention in case of reach of a limit: it can be a simple notification, or a blocker. In case of blocker (Figure 1(b)), the user can accept the restriction of refuse it for the current day.

   Moreover, the FeelHabits system collects data about multi-device sessions for statistical purposes.
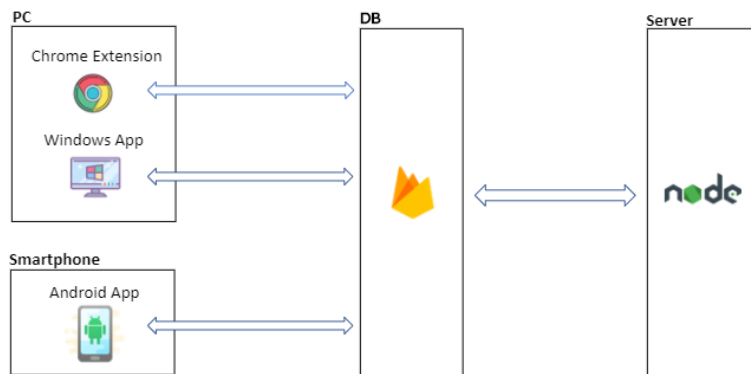
(a) Architecture
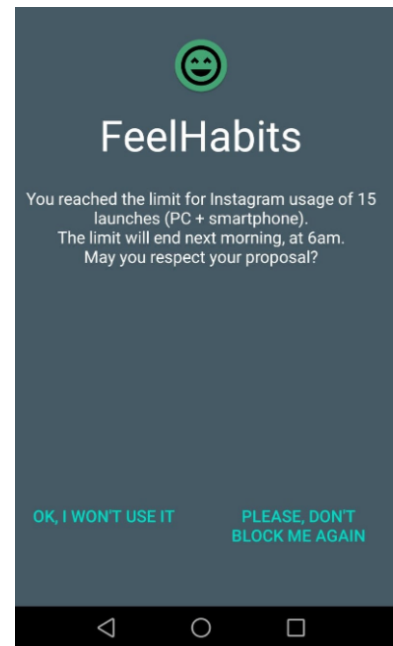
(b) Smartphone block example

Figure 1: FeelHabits

Evaluation   FeelHabits has been used in a two weeks test study performed with 7 participants with the aim of discovering the users behaviour towards the defined intentions, exploring the users multi-device habits, and evaluating the effectiveness of the implemented features. Users had a preference for the intentions at app-level: just 2 of them defined a non-stop session usage limit. The most common category for app choice is social networks (Instagram and Facebook) followed by communication (WhatsApp and Telegram), and video (Twitch, Prime Video, Netflix, YouTube). Users behaviours are significantly varied. Among them, 2 users tended to reach the limits almost everyday, with a opposite reaction towards blocker: one of them tried always to respect the limit, the other one always refused it. Other users defined less restrictive limits of usage time, reaching them few times. Generally, users deleted intentions to substitute them with new ones, when they realized that the associated limits were too strict, re-defining their personal goals. In general, the FeelHabits app received positive feedback for the effectiveness in reducing some app-related digital interactions.

Analysing the multi-device session data, the findings suggest that the users are not fully aware of their digital usage, and sometimes the limits look inconsistent with the actual interaction. With regard to multi-device context habits, I deeply explored the smartphone apps usage in front of the PC: the "smartphone at PC" intention looks as the most effective and universal one. In fact, in this context both the "messaging" and "social network" categories belong to the top 3 launched apps for all the users. About multi-device digital habits, not all the users showed a habitual interaction with multi-device apps. Differently, the extracted data about multi-device app-context habits reveal some context-related correlations that include the apps targeted as source of bad habits. This observation suggests a potentiality for the automatic modeling of this category of multi-device habits.

Conclusions   The results of this work provide a further proof for the need to evaluate digital wellbeing on the basis of the multi-device ownership. In my opinion, the road for future work should begin from a improvement in the features for the PC, followed by the involvement of other devices (smartwatch, tablet, smart TV).