
Work-Life Balance through Tangibles and the Internet of Things

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Abstract

When busy juggling career, family and social demands, it is all too easy to lose sight of the importance of maintaining health and wellbeing through taking breaks from and recovering after work. Given the abundance of attention-grabbing smart devices that notify us at inopportune moments, another mobile app that tells us to stop checking our phones and focus on non-work activities seems counterintuitive. Instead, a separate system such as a tangible user interface (TUI) that acts in the periphery of our attention without aggravating the information overload we are exposed to, could be the way forward. A number of TUI interventions have been designed but there is a woeful lack of evaluative research investigating the efficacy and user experience of such concepts.

Author Keywords

Wellbeing; peripheral interaction; work-life balance; tangibles; Internet of Things.

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION

Over the course of a day, people switch between multiple roles (e.g. parent, co-worker, friend, etc.). The

use of communication technology has increased our ability to be constantly connected with each of these roles. Throughout the day we get notified about work emails, personal messages, social media updates, etc. While on one side there is the benefit of gained flexibility in terms of when and where to work [14], these new ways of switching between work and non-work are also associated with more work-life conflict, which in turn is correlated with stress [21]. Often these notifications can be a distraction if they conflict with the role we are conducting at that given time: for example, when we get a work email in the evening, or a Facebook update whilst in the office.

Drawing from boundary theory and relevant HCI work, we highlight how mobile apps may not be the best solution to such boundary challenges, as they do not distance the user from the source of distractions, i.e. the smartphone. We therefore encourage future work in HCI to explore the possibility of relying on tangibles and Internet of Things (IoT) as a viable alternative to digital health apps when promoting wellbeing. We have used the word *tangible* here to broadly define a physical product that distinguishes itself at various degrees from a non-palpable mobile application. TUIs and IoT have the advantage of being both online and offline, offering even more flexibility when travelling and moving around. Mobile tech has allowed us to be physically in one place, but digitally in another. Having a tangible representation of this could help us be more focused and have more mindful interactions [12].

To support our argument, we present a series of examples and proof-of-concepts, drawing from both academia and industry, on how TUIs and IoT can be used to promote work-life balance and wellbeing. We

then point out the pressing need to evaluate the user experience of these designs in order to inform the next generation of TUIs.

Peripheral Interaction

Everyday we are bombarded with information coming from the physical and digital environment surrounding us. Our attention to this information can shift: when an object is in the periphery of our attention it can quickly come to the front of our attention if the user so wishes, or it becomes relevant [3]. Bakker et al. expand on Weiser & Brown's [27] original notion of peripheral displays, whereby the information not only is perceived in the periphery of attention, but users "physically interact with the digital world in their periphery" ([4], p.240). Guldenpfenning et al. [16] report on a series of peripheral displays that are not screen-based but rather give unobtrusive ambient feedback, such as sounds or light. The notion of unobtrusive feedback or notifications has already been proven successful and users enjoy them when experiencing them on a smartwatch [7].

We propose that tangibles that promote wellbeing, such as the ones presented in this paper, should act in the periphery of our attention to counteract the abundance of distractions we already experience and provide unobtrusive ambient feedback/notifications. They should also be designed to consider how peripheral interaction might come about.

Work-Life Balance and its Issues

The expression *work-life balance* has been in vogue for several years now, and refers to the ability to manage and be in control of one's several life roles and each of their demands. When management and control are

lacking, people report feeling stressed and burned out [1,15,22]. Much work on work-life balance comes from occupational and health psychology and is often referred to as boundary theory [2].

People have different work-life boundary management strategies [21] and use technology accordingly, for example deciding whether to synch work email on their personal phone. However, very little work has sought to uncover these practices around technology [8]. Even the work that does exist focuses on use of smartphones and other devices, but highlights how current technology is not designed to support work-life balance and users' preferences. Cecchinato et al. [8] found that as a result, people create workarounds, or micro-boundaries, to counteract their devices' distracting nature that interrupts both work and personal domains. Role conflict and interruptions are two of the causes of imbalance pinpointed in the literature [6].

Chong et al. [10] were interested in monitoring work-life balance and discuss benefits and drawbacks of different methodologies to do so. They compared video diaries followed by interviews, with a more tangible 'squeeze' diary method: a tactile ball interface that records pressure levels when squeezed and physical location and a companion app. They found that while video diaries provided a rich qualitative dataset, using the tactile ball was a quicker and easier way for participants to record whenever they experienced a work-life conflicting situation. The app was used to reflect upon one's experience at a later stage, when not distracted [9].

The challenge for the next generation of ubiquitous technology is to be customizable enough to support

users' boundary strategy preferences. We argue that it is imperative to go beyond mobile applications that try to promote wellbeing. While it is certainly a cheap and quick way to reach many people (who already own a smartphone), mobile apps add to the information overload we are exposed to. Contrarily, tangibles and IoT can offer new opportunities to be connected and remind us of the importance of balance and mental wellbeing.

In the following section we will present a series of examples that, although do not all fit in the realm of tangibles, can be used as a provocative springboard to think about future directions.

PROPOSED SOLUTIONS

While some of the following examples come from academic research [28], the majority have been created by industrial designers, some of which are unfinished products. We have categorised the examples into three groups based on the aims of the proposed solution: better segmenting work-personal time by cutting out distractions at work; making others aware of one's availability; and help recover from daily demands.

Better Segmentation of Work-Personal Time

In this section we present five examples designed to help users increase their productivity when needed, in order to be work-free in personal time.

The *Durr*¹ is a wrist-worn device developed to investigate the perception of five minutes and increase self-awareness of how differently we can perceive time,

¹ <http://skreksto.re/products/durr>



Fig.1 Prototype of Durr [19]



Fig.2 Bossy [24]



Fig.3 CanFocus [29]



Fig.4 Saent [31]



Fig.5 Daily Stack [20]

yet the designers do not report on the insight gained. As a result an independent academic study was conducted on a prototype version of the Durr that vibrates every five minutes [19] (Figure 1). Harrison and Cecchinato [19] found that wearing a personal and subtle reminder of time slipping-by maximized the use of their productivity, for example making them less prone to overrun meetings.

Three of the designs in this category have been made to resemble a physical button. *Bossy* [24] is a desktop-based button, designed with flexible workers in mind, and it is intentionally not a mobile app, but rather a TUI shaped as a big button with a disguised screen (Figure 2). It acts as both an input and output device: after connecting to one's productivity tools (calendars, to-do lists, etc.) and wearables, it displays top three priorities. Users can then complete, snooze or order them by tapping on the surface. In addition, it has built-in health and wellbeing reminders to create better habits, such as standing up and drinking more water. *CanFocus* [29] and *Saent* [31] are two similar buttons that sit on the physical desktop and connect with one's devices to mute notifications and distractions (Figure 3 & 4). They also act as subtle reminders for the user and those around, to not be disturbed depending on which colour light is on.

The last example is a physical representation of the now virtual 'stack of work'. As we have moved to a digital and cloud-based workspace, piles of paper, notes and books are disappearing from our tabletops. Two designers created the *Daily Stack* [20] a series of wooden blocks with built-in RFIDs that help users become more aware of their workload and time management (Figure 5).

Creating Awareness in Others

Gilly Leshed criticizes existing productivity tools as they do not help "combat rush, busyness, and overload" ([23], p.61), which are the norm in our culture. She argues that in order to have some personal time, current solutions prompt us to block out that time in our calendars (e.g. allowing no interruptions), exacerbating the reality that we are overloaded and it is acceptable and expected. Moreover, boundary theory is based on the idea that how we experience the world is the result of social interactions [22], yet none of its ramifications take into consideration how boundaries are communicated, before they become source of a boundary conflict. The two examples we present in this section are used to make others aware of one's working patterns, and by adding the physical interaction and the physical representation we argue that they create more mindful awareness.

Bit-planner is a LEGO based calendar where columns are months, rows represent the schedule of every person in an office, and each tile of LEGO is a 30min unit of time [30] (Figure 6). By colour-coding the projects, it becomes quickly glanceable when one is available or not. In addition, a digital version of the calendar is available for those who don't always work from the office. While this is not a novel idea and many digital calendars already offer the possibility of sharing, it is the physical action of organizing the physical tiles that could help users engage with slow technology and help them better negotiate their time.

The second example brings us to the home environment. *The Goodnight Lamp* [13] is a series of Bluetooth-connected lamps that can sit in the office and at home (Figure 7). These lamps re-create the action of



Fig.6 Bit-planner [30]



Fig.7 The Goodnight Lamp [13]

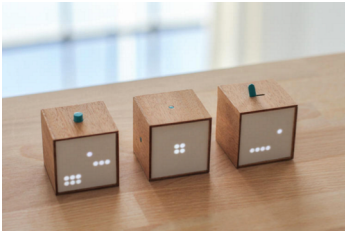


Fig.8 Slow Games [5]



Fig.9 Ritual machine 1 [28]

switching off the light in a room to signify, for example, when one is leaving the office to head home. It could potentially be used also as a work from home desk lamp that communicates to co-workers and supervisors when one is in working mode or not.

Recovering from Overload and Stress

The final set of examples takes us to the end of a working day, when feelings of stress and burnout are likely to continue even after leaving the office as a result of poor boundary management and control. The designs presented here recall Hallnäs and Redström's slow technology [17] to enable reflection and recovery from a busy lifestyle.

Collins and Cox [11] found that gaming is successful in promoting post-work recovery and thus reducing stress. The designer Ishac Bertran developed Slow Games [5] a tangible exploration of what gaming and slow technology could lead to (Figure 8). His idea is that users can only play one move a day, in order for them to reflect on their use of technology.

People have several preferred ways to recover from a stressful day at work, such as drinking a glass of wine. Researchers involved in the EPSRC-funded project *Family Rituals 2.0* [28] developed a series of ritual machines to connect distant family members. One of these proof-of-concepts sees two people enjoying a glass of their preferred drink together, even whilst apart (similar to the idea of *Drinky Robot* [25]). When one person opens a bottle with a special bottle opener, the wine dispenser at home automatically pours out a glass (Figure 9).

CONCLUSIONS AND FUTURE DIRECTIONS

Over the next ten years tangibles an IoT will become the norm and smart technology will become more intelligent [18]. We have presented here nine examples of how TUIs and IoT can be used to promote wellbeing throughout the day, and how at least some can encourage reflection and slow interactions. Nonetheless, none of the ideas presented here have been tested in the wild to evaluate the effects and user experience; therefore we cannot claim that these designs will necessarily succeed in their intent.

Research efforts in the next 10-15 years should concentrate on evaluating the effectiveness and user experience of these and other tools, much like was done in [19]. These evaluations could focus not only on how participants may use such devices, but also touch on non-use and abandonment [26]. As shown through examples in this paper, tangibles for health and wellbeing could leverage methods used to evaluate peripheral interaction and self-reflection. Studying how TUIs for wellbeing are used is crucial to inform the design of their next generation.

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