Why Are Cross-Device Interactions Important When It Comes To Digital Wellbeing?*

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1 Abstract

Under the overwhelming amount of distractions in our multi-device environment, we have come to realise that more work could be put into evaluating cross-device ecosystems to enhance digital wellbeing. In the workshop, we would like to address and exchange ideas about the topic of digital wellbeing in the following areas of cross-device interactions: (1) the tracking of cross-device activities (i.e., how to better track users' interactions on multiple devices and how to deliver cross-device actionable insights), and (2) cross-device notifications (i.e., how to better fit cross-device notifications into users' lives).

2 Motivation

Only 11% of people in the United Kingdom say they own solely one device [4]. Most people (30%) say that they use five or more devices, followed by 17% who say they own three devices. In a Google survey in 2016 [8], 21% of multi-device owners said they use a second device while using their computers.

In a multi-device environment, small steps are being taken towards presenting cross-device usage data. Digital wellbeing applications aim to empower people

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by presenting them with the amount of time they spend on their phones and on different applications. For example, RescueTime released in 2018 a new feature through which users can track and combine the time spent on their devices. Apple's Screen Time also allows people to share information about time spent on different apps across multiple Apple devices. However, the assumption here is that one person will be part of only one phone's ecology [3].

Cross-device notifications have also been creeping up. Research has shown that users had problematic patterns of use of notifications. An average user receives more than 63 smartphone notifications a day [9] and would check their phone 80 times a day [1]. We can only see the problem being amplified in a multi-device environment by the repetitive and overloading number of alerts.

We believe that digital wellbeing in cross-device interaction is an important subject to address as it has an impact on people's work productivity, and emotional and psychological wellbeing. By attending the workshop, we would like to gain insights into how we could design future cross-device systems which would allow for ubiquitous cross-device interactions, yet be able to promote reflective thinking when it comes to users' own wellbeing.

2.1 Cross-device tracking

The current cross-device systems may fail to give answers to how we actually interact with our multitude of devices. We see that cross-device tracking is not done systematically by digital wellbeing applications. Applications that aim to promote digital wellbeing essentially act as simplistic productivity overviews for users [10], which can leave users feeling anxious about their screen time. We see that this happens when users are presented with information of no practical value [6].

Therefore, we begin to wonder how well can users extract meaningful information from the numbers they are presented with, especially in a multi-device environment? How well categorised are the applications? For example, does Google Chrome belong to the productivity category or would using it on a second device lead to two different categorisations?

We would like to discuss during the workshop about ways in which we could improve the understandability of cross-device tracking data. We imagine a digital wellbeing future in which people can quickly glance over their cross-device usage and make educated decisions about which device interactions add the most to their lives, and which do not.

2.2 Cross-device notifications

We also believe that it is important to address cross-device notifications. Studies have investigated people's preferences in receiving notifications on specific devices. Regardless of the type and content, multi-device users prefer receiving notifications on their smartphones [12]. However, depending on the type of device, some notifications are seen as more important than others e.g. text

messages are perceived the most important notifications on smartphones but not on PCs or on tablets [11].

We, therefore, believe that people's digital wellbeing can be improved by addressing device-specific and device-independent notification preferences. Different notification managing strategies and models have been proposed so far. Corno et al. [5] designed a multi-device handling system for notification that incorporate users' preferences and context. Another notification filtering manager that takes into account the content of the notification (e.g. notifications containing specific words are selectively filtered out) was explored by Auda et. al [2]. However, a link between those proposed systems and wellbeing has not yet been established.

We aim to gather ideas in the workshop about how we can design better notification systems that will improve people's digital wellbeing; ideally, we would be able to paint a fuller picture of people's interactions with cross-device notifications. Moreover, in the future, we envision adaptive user-centred notification systems which are tailored to users' behaviours and routines and are context and content-dependent. Ultimately, we would like to see systems that are semi-automated and self-explanatory to users, and which would eliminate any unnecessary disruptions caused by notifications.

3   Conclusion

In this workshop, we propose to explore the future of cross-device tracking and notifications. Cross-device interactions play an increasingly important role in people's lives at work and at home. We believe that improving users' digital wellbeing in these everyday interactions is crucial. By evaluating and making appropriate changes to the current cross-device ecosystems, we expect to see improvements in people's work quality, and emotional and psychological wellbeing.

4   About the authors

Laura Lascău is a PhD student at the UCL Interaction Centre (UCLIC) working with **Prof Anna Cox**, **Dr Duncan Brumby** and Dr Sandy Gould, University of Birmingham. In her PhD, she is looking at crowdworking, multitasking and work-life balance [7]. Previously, she worked as a User Experience Designer for IBM Design.

Priscilla Wong is a PhD student at UCLIC working with **Dr Duncan Brumby** and Dr Nicolai Marquardt. She has an MSc in HCI from UCL and an MSc in Organizational Psychology from LSE. Her interest currently lies in people's cross-device interaction with notifications, and previously in autonomous vehicles and people's immersive experience in Let's Play gaming videos [13].

References

[1] ASURION. Americans don't want to unplug from phones while on vacation, despite latest digital detox trend. *Asurion* (2018).

[2] AUDA, J., WEBER, D., VOIT, A., AND SCHNEEGASS, S. Understanding user preferences towards rule-based notification deferral. In *Extended Abstracts of the 2018 CHI Conference on Human Factors in Computing Systems* (New York, NY, USA, 2018), CHI EA '18, ACM, pp. LBW584:1–LBW584:6.

[3] BØDKER, S., AND KLOKMOSE, C. N. Dynamics in artifact ecologies. In *Proceedings of the 7th Nordic Conference on Human-Computer Interaction: Making Sense Through Design* (New York, NY, USA, 2012), NordiCHI '12, ACM, pp. 448–457.

[4] BUILD AWARENESS. Connected consumers survey (2017). *Think with Google* (2017).

[5] CORNO, F., DE RUSSIS, L., AND MONGE ROFFARELLO, A. Awarenotifications: Multi-device semantic notification handling with user-defined preferences. *Journal of Ambient Intelligence and Smart Environments 10*, 4 (2018), 327–343.

[6] GRIFFIN, A. ios 12: New iphone update's screen time feature horrifies people as they discover what they do on their phone. *Independent* (2018).

[7] LASCAU, L., GOULD, S. J. J., COX, A. L., KARMANNAYA, E., AND BRUMBY, D. P. Monotasking or multitasking: Designing for crowdworkers' preferences. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems* (Glasgow, Scotland UK, 2019), CHI '19, ACM.

[8] MOBILE, CONSUMER INSIGHTS, MICRO-MOMENTS. Latest mobile trends show how people use their devices. *Think with Google* (2016).

[9] PIELOT, M., CHURCH, K., AND DE OLIVEIRA, R. An in-situ study of mobile phone notifications. In *Proceedings of the 16th International Conference on Human-computer Interaction with Mobile Devices & Services* (New York, NY, USA, 2014), MobileHCI '14, ACM, pp. 233–242.

[10] ROOKSBY, J., ASADZADEH, P., ROST, M., MORRISON, A., AND CHALMERS, M. Personal tracking of screen time on digital devices. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems* (New York, NY, USA, 2016), CHI '16, ACM, pp. 284–296.

[11] SHIRAZI, A. S., AND HENZE, N. Assessment of notifications on smartwatches. In *Proceedings of the 17th International Conference on Human-Computer Interaction with Mobile Devices and Services Adjunct* (New York, NY, USA, 2015), MobileHCI '15, ACM, pp. 1111–1116.

[12] WEBER, D., VOIT, A., KRATZER, P., AND HENZE, N. In-situ investigation of notifications in multi-device environments. In *Proceedings of the 2016 ACM International Joint Conference on Pervasive and Ubiquitous Computing* (New York, NY, USA, 2016), UbiComp '16, ACM, pp. 1259–1264.

[13] WONG, P. N., RIGBY, J. M., AND BRUMBY, D. P. Game & watch: Are "let's play" gaming videos as immersive as playing games? In *Proceedings of the Annual Symposium on Computer-Human Interaction in Play* (New York, NY, USA, 2017), CHI PLAY '17, ACM, pp. 401–409.