

as well as several lifestyle and health monitoring technologies, like the fitbit. These make this discussion relevant for growing movements within Personal Informatics such as the Quantified Self. As we adopt these tools we will equally take on the work of caring for them. Making sure they are powered to fulfill their purpose will certainly be one central concern. While it may be more exciting and inspiring to focus on and discuss their potential, we must complement that discussion with how these power-hungry mobile and wearable technologies will fit in context. We must understand how we can design these devices, not just as isolated artifacts, but within a growing ecosystem and a necessary infrastructure for ensuring their batteries are properly cared for.

These technologies will compete for space on our bodies [9] and in our lives, as well as our attention and ability to care for them. They will also, as we saw with some of our participants, complement each other through shared functionality, such as tablets allowing for messaging if the phone is out, and infrastructure, in its simplest form of similar chargers that can be shared. We hope that our work will serve as inspiration for how these technologies and their ecosystems are designed, as well as studied and understood in context, within this rapidly changing landscape of data-rich, ever connected, battery powered and care-needing technologies.

CONCLUSION

In this paper, we have argued for a holistic and context-driven approach to understanding battery care, rather than one focused on individuals and their personal devices as independent units of analysis. This shift is relevant for the study of mobile phones, as well as the myriad other battery-powered everyday devices that enrich our lives through collecting personal data, providing recommendations, and keeping us connected. By shifting the concern to the broader material context and practices, we are able to move some of the focus of HBI toward addressing ad-hoc infrastructures as well as the social context of battery care.

REFERENCES

- [1] Anderson, K. et al. 2009. Numbers Have Qualities too: Experiences with Ethno-Mining. *Ethnographic Praxis in Industry Conference Proceedings* (2009), 123–140.
- [2] Athukorala, K. et al. 2014. How carat affects user behavior: implications for mobile battery awareness applications. *Proceedings of the 32nd annual ACM conference on Human factors in computing systems* (2014), 1029–1038.
- [3] Banerjee, N. et al. 2007. *Users and batteries: Interactions and adaptive energy management in mobile systems*. Springer.
- [4] Dhir, A. et al. 2012. Understanding mobile phone battery-Human interaction for developing world A perspective of feature phone users in Africa. *Future Internet Communications (BCFIC), 2012 2nd Baltic Congress on* (2012), 127–134.
- [5] Ericsson, L.M. 2011. *More than 50 Billion Connected Devices*. February.
- [6] Farias, P. and Östgård, P. 2006. *A Rich Picture of Mobile Energy Management from a User's perspective*. IT University of Gothenburg.
- [7] Ferreira, D. et al. 2013. Revisiting human-battery interaction with an interactive battery interface. *Proceedings of the 2013 ACM international joint conference on Pervasive and ubiquitous computing* (2013), 563–572.
- [8] Ferreira, D. et al. 2011. Understanding human-smartphone concerns: a study of battery life. *Pervasive Computing*. Springer. 19–33.
- [9] Ferreira, P. and Höök, K. 2011. Bodily orientations around mobiles: lessons learnt in vanuatu. *Proceedings of the 2011 annual conference on Human factors in computing systems* (New York, NY, USA, 2011), 277–286.
- [10] Froehlich, J. et al. 2007. MyExperience: a system for in situ tracing and capturing of user feedback on mobile phones. *Proceedings of the 5th international conference on Mobile systems, applications and services* (2007), 57–70.
- [11] Morrison, A. et al. 2012. A hybrid mass participation approach to mobile software trials. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (2012), 1311–1320.
- [12] Oliner, A.J. et al. 2013. Carat: Collaborative energy diagnosis for mobile devices. *Proceedings of the 11th ACM Conference on Embedded Networked Sensor Systems* (2013), 10.
- [13] Rahmati, A. et al. 2007. Understanding human-battery interaction on mobile phones. *Proceedings of the 9th international conference on Human computer interaction with mobile devices and services* (2007), 265–272.
- [14] Rahmati, A. and Zhong, L. 2009. Human-battery interaction on mobile phones. *Pervasive and Mobile Computing*. 5, 5 (2009), 465–477.
- [15] Ravi, N. et al. 2008. Context-aware battery management for mobile phones. *Pervasive Computing and Communications, 2008. PerCom 2008. Sixth Annual IEEE International Conference on* (2008), 224–233.
- [16] Rose, D. 2014. *Enchanted Objects: Design, Human Desire, and the Internet of Things*. Simon and Schuster.
- [17] Sellen, A. et al. 2006. The whereabouts clock: early testing of a situated awareness device. *CHI'06 extended abstracts on human factors in computing systems* (2006), 1307–1312.
- [18] Weiser, M. 1993. Some computer science issues in ubiquitous computing. *Communications of the ACM*. 36, 7 (1993), 75–84.