

---

# Reflecting on the Study of Mobile Collocated Interactions: The Changing Face of Wearable Devices

## Martin Porcheron

The Mixed Reality Laboratory  
University of Nottingham, UK  
martin.porcheron@nottingham.ac.uk

## Abstract

Wearables, unlike smartphones, typically afford increasingly private or discrete interactions that are invisible to the casual observer. This shifting paradigm of device interaction combined with the increasing popularity of wearables presents an exciting opportunity for researchers to reflect on existing qualitative methodologies employed in observational studies of mobile collocated interactions, and how these can be adapted to the changing landscape of technological interaction. This position paper discusses some of these methodologies, and questions the suitability of these approaches with respect to the changing form that devices can take.

## Author Keywords

mobile devices; smartphones; wearables; ubiquity; socialising; collocated interactions; collaboration

## ACM Classification Keywords

H.5.3 [Group and Organization Interfaces]: Evaluation/methodology

## Introduction

Mobile devices and smartphones have become commonplace in all walks of life and the capabilities of such devices have engendered their usage throughout the day [1, 3, 13]. This usage has encouraged research on the potential tasks that mobile devices can be utilised for, such as photo shar-

---

Permission to make digital or hard copies of part or all of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for third-party components of this work must be honored. For all other uses, contact the Owner/Author. Copyright is held by the owner/author(s).  
*MobileHCI '15 Adjunct*, August 25-28, 2015, Copenhagen, Denmark  
ACM 978-1-4503-3653-6/15/08.  
<http://dx.doi.org/10.1145/2786567.2794345>

ing and collaborative search (e.g. [4, 7, 11]). In addition to an increased focus on human-device interaction, the rise in ownership has also led to assessments of how device interactions interplay within everyday activities such as conversing with others (e.g. [3, 10, 12, 14, 15]).

This position paper discusses a number of evaluative methods used within mobile HCI research that are geared towards understanding the interactional methods and behaviours employed by individuals and groups. However, we hasten to add that we wish to engage in a discussion around how the future of research within this field will look as opposed to making judgements of the various approaches.

### **Existing Qualitative Approaches**

In reviewing existing literature, we became aware of a growing contingent of researchers who wish to examine and unpack naturally occurring behaviours of individuals in relation to their mobile device usage, within various mundane settings, ranging from campus life [1] to pubs [14, 15]. A number of these adopt an ethnographic orientation with respect to fieldwork and the respective analysis of data, with an intent of working towards building an understanding of the 'social organisation of human action' [5, 16]. Briefly, adopting an ethnographic approach allows for the researchers to examine naturalistic settings to test hypotheses, or to ground their understanding of work in a setting [6, 8, 9].

Other mobile HCI research has focused on observations and employed the analysis of semi-structured interview data, structured around field-based observations. This method can be used to further elicit introspective contemplations of such interactions [15]. The merits of orienting towards reflection allow for opinions to be identified that individuals may otherwise have concealed through their accountable actions. Furthermore, the combination of both

observational and interview data provide a rich corpus suitable to a grounded theory approach, allowing researchers to correlate both actions and retrospective considerations when constructing an ecological picture of the setting.

Finally, we highlight a recent ethnographic study that exceeded in not only documenting the visible actions but also documenting the specific work, including what users saw [2]. The study, focused on collaborative mobile search in everyday conversation, employed screen-capture technology during studies as well as making use of video and audio data capture through fieldwork. The technique of appropriating screen-capture provides a level of detail not achievable with other methods and contributes towards a different perspective during analysis. The strength of adopting this approach is that observation alone does not always provide an explanation of the interaction methods used.

### **Changing Interaction Paradigm**

History is littered with examples of technology that failed to reach mass appeal, either at all or in a protracted fashion<sup>1</sup>. In essence, the form that wearable devices take today, and the ways we interact with them may evolve over time, dependant upon their reception. However, a growing possibility is that interactions with devices become evermore discrete. One recent example is of how some new 'smart-watches' include pressure-sensitive touch and haptic elements in their design to communicate with the wearer<sup>2</sup>, concealing details of the interaction from casual observers.

---

<sup>1</sup>Two such recent examples of 'technology flops' are the Sony Mini-Disc format, which failed to make the case against digital formats, or early tablet PCs released in the 1990s, which were later popularised in the late 2000s after a shift towards finger-based input.

<sup>2</sup>For example, the Apple Watch includes a haptic 'taptic' engine and a touch screen with 'force touch' to enable more varied interactions.

With respect to smartphones, the typical interaction practice of touching a touch-sensitive display provides visibility of the interaction to those in the setting. Furthermore, the portability of devices, combined with the gaze and posture of the user yield additional inferable cues about the nature of the interaction. Nonetheless, wearables may drop the affordance that existing devices foster in favour of more subtle interactions. If wearables do indeed proceed along this path, where interactions with wearable devices dispense with visible and naturally accountable actions, this will, in turn, impact the setting and other members.

Moreover, such a loss of visibility could possibly lead to a problematic situation within qualitative studies, whereby explicating the interactions of members' work becomes evermore challenging. While mobile phones and other large-screen devices allow for an ethnographic approach that does not purposefully monitor the interactions with technology, wearables and other devices with subtle interaction methods, are likely to require additional aspects in understanding the nature of interaction. An approach might be to use screen-capture, although wearables are unlikely to offer this functionality. A more suitable option might be to record interactional metrics and communications with the device using exposed APIs<sup>3</sup> to later reconstruct interactions.

Additionally, the increased personal nature of wearable devices will affect their use cases: anecdotally, we and others have observed smartphones used to share content by passing the device between users. Such scenarios are commonplace and are made possible through the portability ease-of-sharing of devices, however the picture could be different with wearables. Furthermore, there are also various use cases of mobile devices in collocated interactions

---

<sup>3</sup>Application Programming Interfaces, which are software routines that can be utilised to access specific device operational information.

which are likely to be less of a factor with wearables, for example individuals may prefer to perform information seeking tasks on larger-screened devices [17].

Finally, many wearable devices are being promoted as accessories to existing mobile devices, implying that members in the settings will merely use a wearable device to augment their experiences<sup>4</sup>. Such situations allow users to continue with existing interactional methods and amend them only in situations where a wearable is more preferable to that of mobile phone. The situation of users carrying both a multi-purpose mobile device and a wearable suited to specific tasks poses additional challenges to researchers in terms of how users engage in device selection, and how this selection is interdependent on other factors within the context, such as members' postures.

## Summary

The ideas and questions in this position paper were catalysed by the recent increased popularity of wearables and through realisations of a lack of existing best practice in studying mobile HCI with wearables. As a first step towards such a situation, this paper discussed a number of research approaches employed in studies of the usage of mobile device interactions in collocated groups. Additionally, a number of considerations to take into account in adapting these approaches for work with wearables was also highlighted.

This paper was oriented towards supporting a debate on how best to attack the changing landscape of mobile collocated interactions from a research perspective, without making judgements one way or another. With smartphone-based studies, for example, researchers have made use of

---

<sup>4</sup>For example, the Pebble Watch requires a recent smartphone to function. Additionally, wearables other than smartwatches may provide minimal direct interaction and instead use software on another device.

body mounted cameras or top-down cameras to capture screens from the user's point-of-view and others resorted to capturing usage metrics from smartphones, or screen-capture software to record interactions. Wearable devices, which come in various forms, are likely to pose problems in sticking to these ideals due to the change in interaction from visible interactions on (relatively) large touch screens to discrete and subtle interactions that may be barely visible to an observer. As the design of wearable devices evolve and the interaction paradigm develops, the practice of observing such interactions must also evolve.

### Acknowledgements

Thank you to the anonymous reviewers for their constructive feedback. Martin Porcheron is supported by the Horizon Centre for Doctoral Training at the University of Nottingham (RCUK Grant No. EP/G037574/1) and by the RCUK's Horizon Digital Economy Research Institute (RCUK Grant No. EP/G065802/1).

### REFERENCES

1. Morgan G Ames. 2013. Managing Mobile Multitasking: The Culture of iPhones on Stanford Campus. In *CSCW '13: Proceedings of the 16th ACM conference on Computer Supported Cooperative Work Social Computing*. ACM, New York, New York, USA, 1487–1498. DOI : <http://dx.doi.org/10.1145/2441776.2441945>
2. Barry Brown, Moira McGregor, and Donald McMillan. 2015. Searchable Objects: Search in Everyday Conversation. In *CSCW '15: Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing*. ACM Press, New York, New York, USA, 508–517. DOI : <http://dx.doi.org/10.1145/2675133.2675206>
3. Karen Church, Antony Cousin, and Nuria Oliver. 2012. I Wanted to Settle a Bet!: Understanding Why and How People Use Mobile Search in Social Settings. In *MobileHCI '12: Proceedings of the 14th international conference*. ACM, New York, New York, USA, 393–402. DOI : <http://dx.doi.org/10.1145/2371574.2371635>
4. Helen Cole and Dana Stanton. 2003. Designing mobile technologies to support co-present collaboration. *Personal and Ubiquitous Computing* 7, 6 (Dec. 2003), 365–371. DOI : <http://dx.doi.org/10.1007/s00779-003-0249-4>
5. Andrew Crabtree, Steve Benford, Chris Greenhalgh, Paul Tennent, Matthew Chalmers, and Barry Brown. 2006. Supporting Ethnographic Studies of Ubiquitous Computing in the Wild. In *DIS '06: Proceedings of the 6th conference on Designing Interactive Systems*.
6. Andrew Crabtree, Mark Rouncefield, and Peter Tolmie. 2012. *Doing Design Ethnography*. Springer London, London. DOI : <http://dx.doi.org/10.1007/978-1-4471-2726-0>
7. Abigail Durrant, Duncan Rowland, David S Kirk, Steve Benford, Joel E. Fischer, and Derek McAuley. 2011. Automics: Souvenir Generating Photoware for Theme Parks . In *CHI '11: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. ACM, New York, New York, USA, 1767–1776. DOI : <http://dx.doi.org/10.1145/1978942.1979199>
8. Joel E. Fischer, Chris Greenhalgh, and Steve Benford. 2011. Investigating Episodes of Mobile Phone Activity as Indicators of Opportune Moments to Deliver Notifications. In *MobileHCI '11: Proceedings of the 13th International Conference*. ACM, New York, New York, USA, 181–190. DOI : <http://dx.doi.org/10.1145/2037373.2037402>

9. Lesley Fosh, Steve Benford, Stuart Reeves, and Boriana Koleva. 2014. Gifting Personal Interpretations in Galleries. In *CHI '14: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. ACM Request Permissions, New York, New York, USA, 625–634. DOI : <http://dx.doi.org/10.1145/2556288.2557259>
10. Hans Geser. 2006. Is the Cell Phone Undermining the Social Order?: Understanding Mobile Technology from a Sociological Perspective. *Knowledge, Technology & Policy* 19, 1 (2006), 8–18. DOI : <http://dx.doi.org/10.1007/s12130-006-1010-x>
11. Andrés Lucero, Jussi Holopainen, and Tero Jokela. 2012. MobiComics: Collaborative Use of Mobile Phones and Large Displays for Public Expression. In *MobileHCI '12: Proceedings of the 14th International Conference on Human-computer Interaction with Mobile Devices and Services*. ACM, ACM, New York, NY, USA, 383–392. DOI : <http://dx.doi.org/10.1145/2371574.2371634>
12. Sus Lundgren and Olof Torgersson. 2013. Bursting the Mobile Bubble. In *Proceedings of the Designing Mobile Face-to-Face Group Interactions at ECSCW '13*. <http://www.cse.chalmers.se/research/group/idc/ituniv/courses/13/mc/lundgren-mogi2013.pdf>
13. Kenton P O'Hara, Michael Massimi, Richard Harper, Simon Rubens, and Jessica Morris. 2014. Everyday Dwelling with WhatsApp. In *CSCW '14: Proceedings of the 17th ACM conference on Computer Supported Cooperative Work Social Computing*. ACM, New York, New York, USA, 1131–1143. DOI : <http://dx.doi.org/10.1145/2531602.2531679>
14. Martin Porcheron and Joel E. Fischer. 2015. Mobile Behaviours around Social Collocated Interactions. In *CHI EA '15: Proceedings of the CHI Workshop on Mobile Collocated Interactions From Smartphones to Wearables*. ACM, New York, NY, 1–4.
15. Norman Makoto Su and Lulu Wang. 2015. From Third to Surveilled Place: The Mobile in Irish Pubs. In *CHI '15: Proceedings of the 33rd Annual ACM Conference*. ACM Press, New York, New York, USA, 1659–1668. DOI : <http://dx.doi.org/10.1145/2702123.2702574>
16. Peter Tolmie, Steve Benford, Chris Greenhalgh, Tom Rodden, and Stuart Reeves. 2014. Supporting Group Interactions in Museum Visiting. In *CSCW '14: Proceedings of the 17th ACM conference on Computer Supported Cooperative Work Social Computing*. ACM Request Permissions, New York, New York, USA, 1049–1059. DOI : <http://dx.doi.org/10.1145/2531602.2531619>
17. Ran Wei and Ven-Hwei Lo. 2006. Staying connected while on the move: Cell phone use and social connectedness. *New Media & Society* 8, 1 (Feb. 2006), 53–72. DOI : <http://dx.doi.org/10.1177/1461444806059870>