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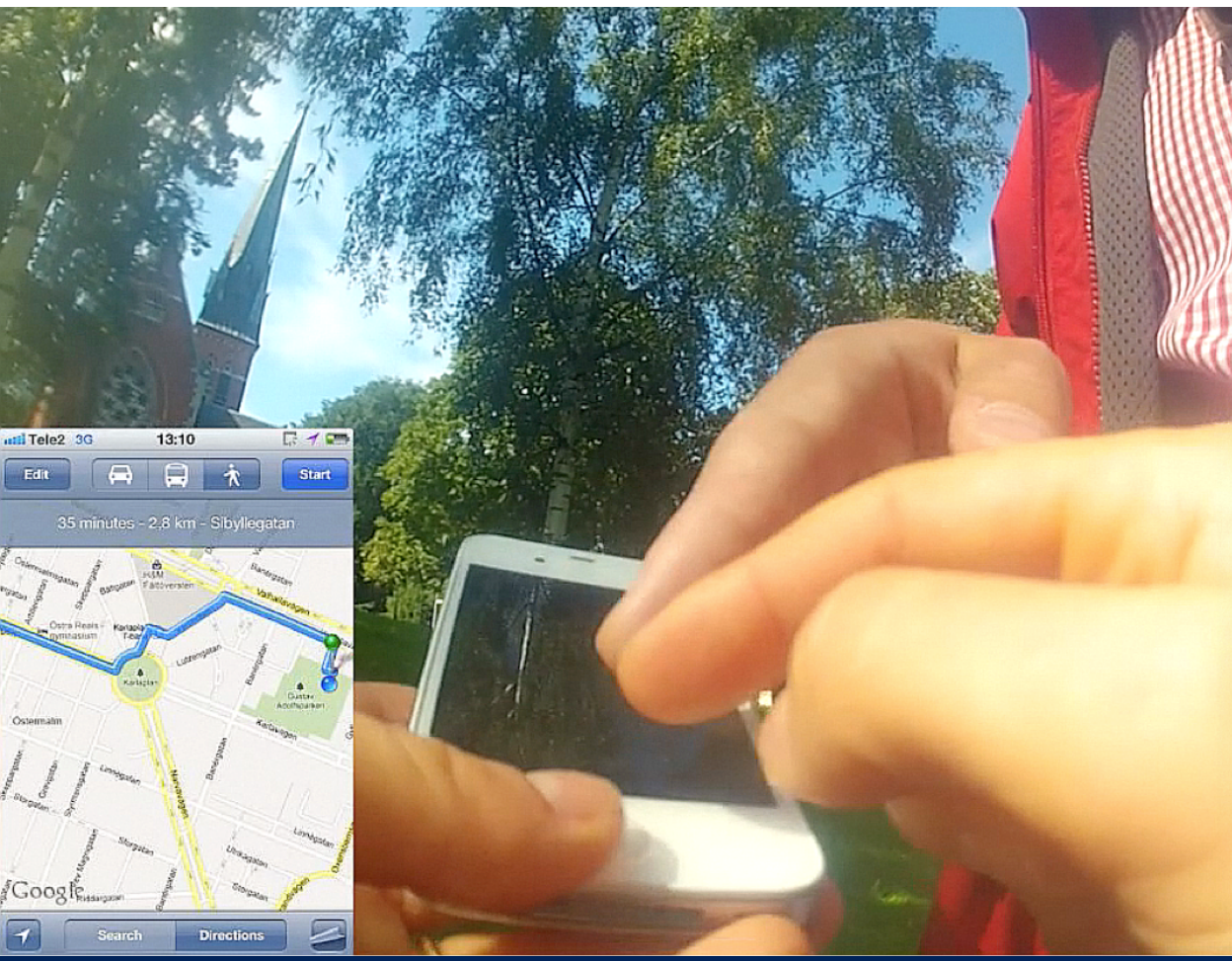
Social Order of the Co-Located Mobile Phone

Practices of collaborative mobile phone use

Moira McGregor



Doctoral Thesis in Computer and Systems Sciences at Stockholm University, Sweden 2020

Social Order of the Co-Located Mobile Phone

Practices of collaborative mobile phone use

Moira McGregor

Academic dissertation for the Degree of Doctor of Philosophy in Computer and Systems Sciences at Stockholm University to be publicly defended on Friday 28 February 2020 at 09.00 in Aula NOD, NOD-huset, Borgarfjordsgatan 12.

Abstract

This thesis examines mundane practices of everyday phone use to make conceptual, empirical and methodological contributions to ongoing research on mobile technology. It argues that we do not yet have a clear understanding of how the mobile phone is used–who does what, when and why. Yet these details are important if we are to judge the impact of mobile technology, understand the possibilities and dangers it offers, or evaluate claims about its broader impact on our sociality.

The participation of both the phone user and those co-located is examined–to understand how we actively create and maintain a new 'social order' with mobile phones. Across five separate studies, a mix of methods is used to look closely at phone use. Drawing extensively on *in situ* video recording of device use, as well as interviews and ethnographic observations, the empirical chapters cover three different types of device use: search, messaging, and way-finding. The chapters look at the specifics of how the applications manifest themselves in practice (such as message notifications, or the 'blue dot' in map apps), as well as the practices adopted to use, manage and balance those applications within ongoing co-located, face-to-face interactions.

Empirically, the studies document how co-located phone use is dependent upon the technology, but is also reliant upon new practices of collaboration and co-operation. I discuss how participation is managed (who is involved), the temporal organisation of action (when use occurs), and the recurrent actions and materiality of those practices (what happens). Moment-by-moment analysis of the practices highlights the importance and value of making phone use publicly accountable to avoid disturbing the 'local order', but also for sharing knowledge and making sense of the world together, as well as having fun and maintaining friendships.

The methodological contribution is found in the hybridity of methods adopted to meet the challenge of collecting and analysing data relevant to studying what is happening when we use our phones. A combination of ethnography with video and conversation analysis, and the creative use of probes to support interviews is proposed, to gain access to a broader perspective on phone use. Through reliance upon empirical observation, we can avoid abstract and reductive generalisations about phone use, discussing instead the observable action and resources that do occur recurrently around mobile phone use–how things get done with mobiles.

Conceptually, the thesis draws on ethnomethodology and conversation analysis for a perspective on how we make sense of the day-to-day interactions we have with one another–how we bring about and sustain the 'local' social order. I argue that practices of mobile phone use are constituent parts of local order in everyday life, and that their examination is key to understanding what social order is now like. A conceptual 'diamond' of mobile phone practice, broken down into elements of time, body, materiality, and repair is proposed. In conclusion, the thesis highlights the prevalence of phone practices beyond individual, task-oriented pursuits and I finish by reflecting on possible future research to enhance the collaborative, social aspects of mobile technology.

Keywords: *Human-computer interaction, Mobile phones, Ethnography, Video analysis, Collaborative interaction, Field studies.*

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To life-long curiosity and learning!

Sammanfattning

Avhandlingen undersöker hur telefoner används i vardagen och bidrar därigenom till aktuell forskning och förståelse för mobil informations- och kommunikationsteknik såväl metodologiskt och empiriskt som begreppsmässigt. Den hävdar att vi ännu inte har en full förståelse för hur mobiltelefonen används - vem gör vad, när och varför. Ändå är dessa detaljer essentiella om vi ska bedöma inverkan, förstå möjligheterna och farorna av mobilteknologi samt utvärdera påståenden om dess bredare inverkan på vår socialitet.

De empiriska kapitlen, som bygger på in situ-videoinspelning av mobilanvändning, samtintervjuer och etnografiska observationer, täcker olika typer av användning, specifikt: informationssökning, chattande och orientering. Det metodologiska bidraget återfinns i hybriditeten i forskningsmetoder som har använts för att möta utmaningen att samla in och analysera data om mobil teknikanvändning. Begreppsmässigt bygger avhandlingen på metoder för etnometodologi och konversationsanalys för ett perspektiv på hur vi skapar och upprätthåller den"lokala" sociala ordningen. Avhandlingen formulerar en begreppsmässig romb mellan tid, kropp, materialitet och reparation(?), för att stödja analysen av användning av mobiltelefoner.

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Abstract

This thesis examines mundane practices of everyday phone use to make conceptual, empirical and methodological contributions to ongoing research on mobile technology. It argues that we do not yet have a clear understanding of how the mobile phone is used–who does what, when and why. Yet these details are important if we are to judge the impact of mobile technology, understand the possibilities and dangers it offers, or evaluate claims about its broader impact on our sociality.

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Acknowledgements

My thanks go to my committee: the work of my opponent, Professor Christian Licoppe, ParisTech, has been deeply influential on my research and I appreciate his engagement with my thesis. Warm thanks also to Amanda Lagerkvist from Uppsala University, Madeline Balaam from KTH Royal Institute of Technology, Stockholm, Jakob Tholander from Stockholm University and Gustav Lymer, also Stockholm University. Thanks also to Professor Alexandra Weilenmann, Gothenburg University, for her indepth feedback in August 2019. Finally, I extend my gratitude to the committee chairperson–my supervisor, Professor Barry Brown.

The years spent working on this PhD have been exhilarating, challenging and extremely fulfilling. At all times, Barry has been an inspiring educator and researcher. Generous and trusting in equal measure–his confidence in me has been daunting at times, but I have enjoyed feeling the fear, and doing it anyway! The projects have been topical, exciting and intellectually demanding and have introduced me to a world of fascinating and new research techniques and theoretical philosophies. No question, the experience has changed the way I look at the world–not least because I have been able to experience life in the heart of Scandinavia. In addition, through Barry's tutelage I have been privileged to meet extraordinary researchers and academics along the way. I thank Barry profoundly, and now try to acknowledge some of the opportunities his imitable supervision have created for me.

I thank the founders of Mobile Life research centre, where I first worked with Barry–in particular, Kia Höök, Oskar Juhlin and Annika Waearn. When I first arrived in Stockholm, they extended to me and the other students, the warmest welcome imaginable. I had never been to Sweden, and I could hardly believe such an place of collaborative learning and research existed. I continue to be amazed, intrigued and utterly charmed by the Swedish way of doing things - and I look forward to contributing more to Swedish life and culture in future! Being part of Mobile Life was quite unforgettable, with its unique blend of artists, and social and computer scientists. With them, I visited research centres in Europe, Japan and the US. I met great people who have brightened and enabled the journey; Maria Holm, Vasiliki Tsaknaki, Johanna Mercurio, Anna Ståhl, Asreen Rostami, Pedro Sanches, Antoine Loriette, Lucian Leahu, Ylva Fernaeus, Elsa Vaara, Elena Marquez, Sophie Landwehr, Jinyi Wang, Celia Zhang, Petra Sundström, Jordi Solsona, Ville Sundberg (by association!),

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Then Airi Lampinen joined Barry's team as a post-doctoral researcher. Airi practically radiates good advice on how best to navigate the mysterious waters of PhD studies. On her suggestion, I applied for the doctoral colloquium at CSCW, 2015 (led by Abigail Sellen, Carl Gutwin, Dave Randall and Helena Mentis), which was a turning point for me in my studies. However, perhaps Airi's most memorable advice to me was to not delete the email inviting me to intern in California for the summer 2015–which I had thought was spam! With generous intellect and empathy, Airi has lead studies that I have worked on, and has helped me wrangle with writing this thesis–all with equal measure of joy and rigour. I am fortunate to have benefitted both from her co-supervision, and the friendship of she and Ville.

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Throughout everything, my family have given me every encouragement and support. I grew up under the influence of a mum and dad who, along with fond aunts and uncles, instilled the belief that we can all achieve what we want in life, 'if we put our mind to it'. Of course, reality is not quite so simple, but it's probably a really good mindset to start out with. I am grateful for the spirit of curiosity and endeavour by which they lived and encouraged us. My brother and sisters, with their spouses and amazing children–Lyndsay, Amy-Lo., Andrew, David, Amy-To. and Archie–have been a constant source of joy and strength to me.

Special gratitude and appreciation is directed to my sister Lorna, who alerted me that one Professor Barry Brown in Stockholm was looking for a student to collect 'interesting' data for a project about mobile phones. Thanks also go to Peter, her husband, who on hearing that I was dithering about whether to pursue the *iPhone in vivo* project, got on the phone to 'suggest' I grab the opportunity with both hands and run. Dear reader, he was correct!

To friends in Stockholm, and back home in Scotland in particular, I apologise for the neglect! I don't want to name names, for fear of missing folk out–but I am very grateful to have you in my life. The messages, calls and occasional *face-to-face interactions* have been essential to my sanity. I must thank the 'super-nodes' in my life–Jane, Stephen and Angela–who, whenever I get in a pickle, reach out to me with a message or a contact, and by the powers of the networked cosmos, they alleviate things and off I trundle again! Finally, a nod to my dear Essex chum, whose phrase seems to have become my life motto: *"Slowly, slowly, catchy monkey"* It has taken me a while, but I got there in the end. Hurrah!

1 Introduction

The use of mobile phones has become a defining characteristic of contemporary life. Being an active and successful citizen is, to an extent, dependent upon the ownership and use of a mobile device. Researchers have investigated mobile devices in terms of their design and the role they play in our lives, with technical development taking the lead in advancing what is functionally possible with these devices (González, Hidalgo, & Barabási, 2008; Katz & Aakhus, 2002). Yet there is a notable absence of empirically grounded understanding about what is actually done with these devices, especially considering the numerous hours of our lives that they occupy. While the impact of mobile devices on specific occupations, such as taxi driving, do periodically become newsworthy (Ahmed et al., 2016; Mcgregor et al., 2015; Raval & Dourish, 2016), it is issues of addiction, overuse, social exclusion, bias and discrimination (Brookshire, 2013; González et al., 2008; Schüll, 2014; Slade, 2012; Van Damme et al., 2015) that tend to dominate the public narrative, in a state of moral panic (Badham, 2019; Twenge, 2017). However, there is little academic work that gives us detailed insights on the issues concerned–we lack in-depth research data (Ellis, 2019). In developing these technologies, designers often rely upon system-generated statistical data on the device use that fails to capture the context in which applications and the technology are ordinarily used, or the meanings attributed to those uses. This serves to distance designers and researchers alike from everyday routines and practices that constitute the 'local order' of mobile phones.

Mobile technology is being used in ways that are transforming many aspects of everyday life. While some uses originate in existing practices, other, unanticipated, practices have emerged from the appropriation of novel digital affordances. The mobile camera, for example, has largely replaced the erstwhile rituals of film cameras and printed photography, but perhaps more significant than that are the new, distributed practices of photography which the mobile phone camera now affords. The camera, embedded in a mobile communication device, can be used to take and transmit images and videos in new forms of messaging, offering the potential of enhanced, richer message content between sender and recipient. The mobile phone camera can further transform the communicative skills of previously excluded populations who are now able to work around the barriers of literacy and language, by sending short videos rather than written messages. The increasingly

sophisticated camera is one element of transition in mobile phone technology afforded by advances in processing power, wireless network support, screen size, multimodal input, and more, all of which has resulted in a world of affordable smartphones, and increased mobile phone penetration (Höst, 2019) which, in turn, contributes to an ongoing evolution of new practices of use.

The focus of this thesis is on understanding these new and old emergent practices, and in particular it will draw upon ethnographic research materials, including video recordings of situated mobile phone use, to investigate how the use of mobile phones is managed in the collaborative, co-located[1] settings.

1.1 The social order of co-located mobile phone use

Alarming media reports (Ducharme, 2018) and behavioural studies (Chotpitayasunondh & Douglas, 2016; Roberts & David, 2017) report on the harm that phones can do to our face-to-face interactions (Pew Research Center, 2015) with friends and family. Yet people *choose* to use their mobile phones in the presence of friends, family and work colleagues, and still lead fulfilling lives. Our social interactions with those around mobile phones are orderly and unproblematic. This suggests– moral panics aside–a pressing need to better understand how orderliness is maintained as we go about our everyday activities, while managing our use of mobile devices.

Out of curiosity and the desire to gain a fresh perspective on the ongoing ubiquity of mobile phones, the starting point for this thesis was to study *what people do* with and around mobile phones. By focusing on how phones are used in the group setting, the thesis moves to re-frame the mobile phone as a *collaborative* tool–in contrast with the prevailing framing of them as devices which distract us from more valuable, co-located face-to-face interactions (Twenge, 2017).

To understand co-located phone use, my research proposes a typology of collaborative mobile phone practices by examining the participant roles involved, when they occur and the settings of use. Through describing the core practices of activities which typically arise in social settings, such as way-finding with mobile maps, it examines the resources drawn upon

[1] *Co-located* is used in this thesis to refer unambiguously to physically proximate, face-to-face interactions. Ling uses 'co-present' (R. Ling, 2008) to describe face-to-face interactions, while Zhao and Elesh argue for using the term 'co-located' for interactions conducted in physical proximity and reserving 'co-presence' (Zhao & Elesh, 2008) to include both face-to-face and remote interactions mediated through technology.

by participants[2] for them to be able to use phones together, and how co-located others make sense of each other's phone use. The findings highlight issues of spoken versus written language, the social distribution of knowledge, the material influence of the device itself, the affordances of different features and applications, as well as other constituent features of everyday mobile phone use. More specifically, how does an activity on a mobile phone become a practice, and not simply randomly selected action mediated via the device? In explaining why *practices of use* are relevant in identifying what makes up the everyday 'local order', the sociologist Howard Garfinkel outlines his ethnomethodological argument that all actions are produced in orderly and expected ways, making them *socially recognisable* in a multitude of possible settings (Rawls, 2011). He explained that the empirical observation of the patterned, concrete orderliness of enacted practice provides onlookers with immediate access to the constitutive process of 'local order'. This thesis presents a range of the pervasive practices of mundane, co-located mobile phone use; these are the distinct and recurrent practices that people use to build recognisable action around mobile devices in concert with each other. I argue that the practices of collaborative mobile phone use have become constitutive to Garfinkel's *local order of everyday life*–and that the study of these practices is key to understanding what the social order of everyday life is now like.

Social functioning in society is a critical aspect of sociology and its theoretical approaches. People are both social creatures and individuals–we need to be happy, and we need others to be happy so that we can be happy. To create a world that we want to live in we must have *social order* and Garfinkel was interested in how social order is achieved. While functionalist sociologist Parsons argued that it is achieved through a process of structural socialisation into a shared value system, Garfinkel argued that people create social order from the bottom up and actively produce social order (Heritage, 1991) through their everyday interactions using *common sense knowledge*. Social order enables society to function smoothly, and without it society would break down and become chaotic. Garfinkel's ethnomethodology (EM) is an approach that gives us the tools and analytic perspective to study, at the micro level, how we make sense of the day-to-day interactions we have with one another. EM investigates the 'accounts' of events and interactions that people produce together, how they perform that accounting (members' methods), how the accounts are

[2] Participant is the term used throughout this thesis to describe the people observed and interviewed in the course of my fieldwork. Other researchers have used the terms 'informant', 'user' and 'interlocutor' to describe the same.

received and the contexts within which the accounts are being provided. These accounts are most apparently produced through talk, but also draw upon other contextual resources including prosody and intonation, eye gaze, bodily gestures, objects and environmental landscape.

For example, when someone extends a hand upon meeting it is a commonly understood gesture which, depending upon the setting and recipient of the gesture, will likely be reciprocated in a handshake. Of course, this is one example of a shared gestural routine of common understanding, developed over time. The more experiences we individually have, the better our understanding is of the reality of society–moreover, these 'shared understandings' come through our interactions with each other, from our parents, teachers, friends and beyond into adulthood. The majority of us observe and work with these shared understandings, which can be considered the 'rules' of social order, since they give us a means through which to navigate the social world. The challenge of maintaining social order brings up two important concepts–cooperation and coordination. Requiring predictability and stability, cooperation involves doing things that benefit others, not only ourselves, and requires high levels of coordination to allow us to cooperate with each other–in activities ranging from how we drive, to how we share public spaces. Social order is fragile, and Garfinkel famously showed this through designing 'breaching experiments'(Garfinkel, 2002). Students were asked to act as if they were in a hotel when they were actually at home with their families. They behaved in an overtly formal way and avoided personal chat, and their behaviour had the effect of disrupting the sense of order in the home, and served to demonstrate that 'social order' is a shared accomplishment of those taking part in the social interaction, and is neither inevitable nor external.

Part of the work here is also necessarily focused on developing new research materials and methods which are required to access and study the relatively new phenomena of mobile technology use. The little research that we have on mobile phone use has been much dominated by *quantitative* data collected by instrumenting the technology, and the resulting data subsequently explicated through deductive correlations–with the objective of making the technology more effective and efficient. Increasingly, it is apparent that an overriding focus on individual cognition overlooks important considerations concerning the sociality and social setting where the technology is being used (Srinivasan & Burrell, 2015). A desire to include more of the context of use in research materials leads to new analytic approaches, underpinned by sociological and ethnographic accounts of mobile technology and associated practices (Dourish & Bell, 2011; Horst & Miller, 2012). Ethnographic examination of mobile

phone use therefore introduces the consideration of both the context and culture of use–both of which have an influence on use, as well as a complex lens through which each of us encounters and makes sense of the world around us.

In taking an ethnographic approach to researching mobile technology use, the technology itself becomes less the locus of attention. Instead, the focus moves to practices in which the mobile phone is a constituent part–along with the local talk, gestures, surrounding material environment, time and place. Methods and analytic tools have been selected and developed, over the course of the research presented here, to capture and record, to the best extent possible, the constituent parts and phenomena of the collaborative practices *in situ*, meaning the moment-to-moment setting of their production. This holistic ethnographic perspective requires data collection methods that can record aspects of the context of use, highlighting the value of recording *in situ* video of the moment-by-moment constitution of mobile phone practices. A significant portion of the empirical research material used to examine mobile phone practices has taken the form of video collected via a recording app loaded on to the phone of participants, as well as lightweight cameras worn on the body. Pragmatically, the video recordings reveal how people are able to use their phone while managing their own participation–and the participation of co-located others–in face-to-face interactions. Analytically, the video material provides access to seldom observed aspects of phone use, including the sequence of action and the details of the physical environment. Video research material can then be viewed iteratively and collaboratively with others to develop a full appreciation of the contextual details and, through this process, build an empirically guided understanding of the emergent practices at play in collaborative mobile phone use.

The study of practice has long been emblematic of workplace studies, the "moment-by-moment flow of activity […] the situated integration of tools, documents, action, and interaction" (Barley & Kunda, 2001). This thesis proposes an expansion of technology-in-practice work (Orlikowski, 2000) by looking at the integration of tools and action in both the work and non-work setting.

Focusing on practices (rather than 'things', 'givens' or 'facts of life') can lead us to the close examination of the local interactions and interrelations through which people get stuff done. Goodwin's *co-operative action* recognises that human action is built by performing systematic operations on the detailed organisation of structured materials placed within a public environment by others. The mobile phone can increasingly be perceived as a feature of the process through which those structured environments are accomplished. Our interaction with mobile phones has become part of the 'quiddity of life', the 'just whatness' of social

practice (Garfinkel, 1988; Garfinkel et al., 1981), more of which later in the theoretical resources of the thesis.

1.1.1 Co-operative action

Within my home research field, human–computer interaction (HCI), despite its interdisciplinary nature, specific types of mobile phone usage have often been studied in isolation from other types of use. Mobile messages, for example, may be analysed in terms of the semantic content of the messages alone, using content analysis research techniques to make inferences by interpreting and coding the textual material using automated machine learning technology (Almeida et al., 2016; Riffe et al., 2019). However, the ecological design and functional power of smartphone technology has led to an increasing entanglement of mobilities and diverse types of phone activity occurring in distinctive collaborative manifestations, such as the key activities which are examined in this thesis: search; messaging; and way-finding. These distinct phone activities may be provided via standalone apps; however, mediated by a single mobile device, they can be blended together in a way that is consequential to the outcome of each–an incoming message can prompt a map search using a location linking from one to the other, for example.

This thesis will focus on the practices through which people use technology to build action in concert with each other. While Garfinkel gives a theoretical basis for thinking about the order of mobile phone use, it is Goodwin and his colleagues who provide a rich empirical framing. Goodwin's framework of co-operative action (Goodwin, 2017). Co-operative action is deeply implicated in a range of human social life and encompasses people, artefacts and practices in many different ways. In this thesis, the analysis will focus on research material of people interacting with mobile phones and co-located others in a variety of different settings–buying a sandwich, working in a salon, in bed, on a train. Through empirical analysis, the thesis will work to understand the role of mobile phones in the organisation of accumulative co-operative action in the practices of mobile phone interactions with co-located others.

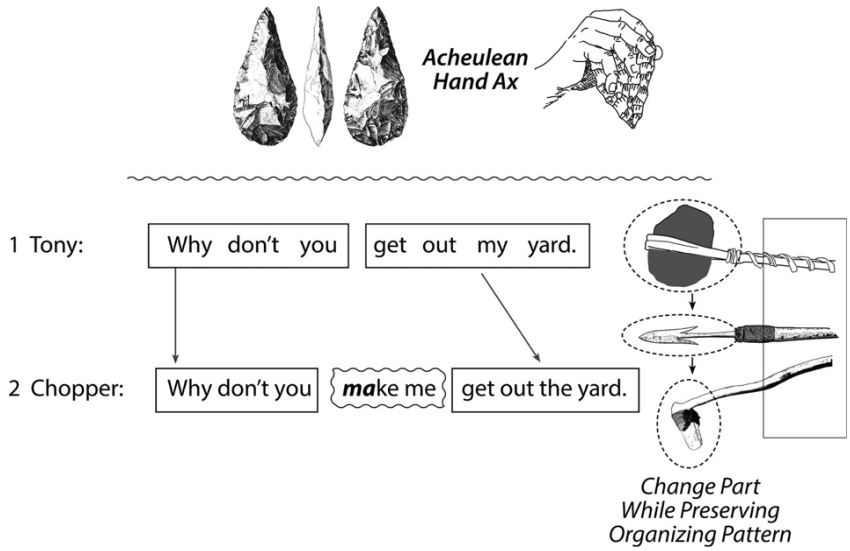


Figure 1 Building new action by performing accumulative transformations on materials created by earlier actors (Goodwin, 2017, p4)

Figure 1 shows two items that demonstrate what Goodwin means by co-operative action. On the left is the transcription of a short clip of talk involving two boys playing in a yard. On the right and above are illustrations of two stone tools used by ancient humans, and Goodwin provides the following observations on each. In the transcript, first Tony puts together an utterance using different parts–simply the words, which on their own would not convey the meaning that they do in the order that they were said. Second, Chopper builds his action–a response–by using the materials found in Tony's action. Chopper's *systematic operations* include *decomposing*; that is, he breaks down Tony's utterance, then he *reuses* the parts into his own new action. He rearranges the parts of the utterance, dismisses Tony's claim for 'my' yard and adds something new; '**ma**ke me'. Through these operations, Chopper has *transformed* Tony's provocation to get out of his yard, and raised a challenge. This process of building something new through decomposing, reusing and transforming existing resources has happened within a public environment setting.

This accumulative, publicly available, process of building something new which makes sense is co-operative action. As these are public resources, this action is not arising from unseen psychological states of the mind. Tony and Chopper have worked together to build a new action, and this action demonstrates well that this is not cooperation of mutual benefit necessarily. Indeed, this action becomes a challenge to Tony. Also, Goodwin asserts that this

is not a 'joint action' in the way that two actors might contribute equally to achieve some action. The outcome of the interaction shown here is a distinct and new action, which has been crafted through the transformative operation by Chopper, on the elements of Tony's previous utterance.

Co-operative action is not restricted to language: tools and other material artefacts can be similarly decomposed, and accumulatively built through sequential actions–and that is how the axe in Goodwin's figure has evolved; by taking the earlier tool, an Acheulean hand axe which was fashioned from a single rock, and transforming it into the form of a more powerful tool by binding together a wooden handle. Goodwin elaborates co-operative action further:

> *"Co-operative action provides an alternative, quite general mechanism, for both accumulation and incremental change, one lodged within the interstices of mundane action itself… This is made possible by the ways in which participants not only attend to, but actively participate in, the detailed organization of each other's action as it unfolds though time." (Goodwin, 2017, p7)*

The practices identified and presented in the findings chapters are not only recognisable recurrent actions, but rather they reflect Goodwin's *systematic operations* of decomposing, reusing and transforming existing resources available around the phone, including the talk of co-present interlocutors, embodied gestures, as well as resources found onscreen and via the mobile device, such as messages and online searches. Goodwin's co-operative action is generative rather than repetitive, and within the co-located settings presented, sociality is produced through these systematic operations upon the device. This can be seen to contribute further to the local order–and the mobile phone as a source of topical cohesion in the mediation of friendship is discussed in findings around core practices of mobile messages.

1.2 Thesis outline

This thesis is organised in eight chapters. Chapter one introduces a practice-orientated perspective and co-operative action as fruitful ways of investigating the evolving nature of mobile phone use within our everyday interactions with others. The first chapter also lists the publications discussed in the thesis, and the research questions which motivated re-visiting the original papers in search of an additional contribution to the field of human computer interaction (HCI). Chapter two presents the theoretical foundations of the research, and situates the work in the multi-disciplinary domain of mobile phone research. Chapter three provides a thorough explication of the adaptive approaches to ethnography that have been

adopted in each of the five empirical studies presented, including the description of methods and their application in the different studies. These are characterised as 'hybrid methods' and they were developed in order to meet the demands of the research questions being pursued, as well as the variety of settings. Chapters four, five and six present the empirical findings, which are guided by research materials drawn from across all studies. Chapter seven provides empirical discussion in relation to the research questions, and then further reflection on contribution of the work to knowledge around co-located mobile phone practices. The final chapter presents conclusions, as well as reflections on future work which could flow from the research presented in the thesis.

1.2.1 Research questions

The scope of this thesis extends to five empirical studies, each having made different methodological, conceptual and empirical contributions to ongoing research around mobile phone practices in different publications, seven of which are presented here and which have been summarised in the preceding section. The desire and purpose for my thesis is to make cross-study observations that could form a research contribution, whilst also taking the opportunity to articulate my own 'sedimented learning' about the study of mobile phone use in everyday life. The following research questions guided the work of the thesis:

RQ 1 *What are the distinctive practices of mobile phone use in interaction in co-located settings?*
RQ 2 *How can video analysis be introduced to ethnographic research methods to understand distributed and co-operative technology use?*
RQ 3 *How can we conceptualise smartphone use ethnomethodologically?*

1.2.2 Contribution

This thesis examines mundane practices of everyday phone use to make conceptual, empirical and methodological contributions to ongoing research on mobile technology. Across five separate studies, a mix of methods is used to look closely at phone use. The empirical contribution is a typology of co-operative mobile phone practices used to accomplish the activities of search, messaging and way-finding in the co-located setting. Empirically, the studies document how co-located phone use is dependent upon the technology, but is also reliant upon new practices of collaboration and co-operation. I discuss how participation is managed (who is involved), the temporal organisation of action

(when use occurs), and the recurrent actions and materiality of those practices (what happens).

A methodological contribution is made through the hybridity in research methods developed and deployed to access the practices of phone use *in vivo*. Drawing extensively on *in situ* video recording of device use, as well as interviews and ethnographic observations, the hybrid research methods described provide access to the ongoing use of mobile technology *in situ*, and research materials which can be analysed repeatedly.

Finally, the thesis makes a conceptual contribution by providing a perspective on how we make sense of the day-to-day interactions we have with one another–how we bring about and sustain the 'local' social order. I argue that practices of mobile phone use are constituent parts of local order in everyday life, and that their examination is key to understanding what social order is now like. Mobile phone practice is broken down into elements of time, body, materiality, and repair, in a conceptual perspective which may be used for future studies.

1.2.3 Original publications list

i. Brown, B., McGregor, M., & Laurier, E. (2013). iPhone *in vivo*: Video analysis of mobile device use. Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, 1031–1040. https://doi.org/10.1145/2470654.2466132

ii. Brown, B., McGregor, M., & McMillan, D. (2015). Searchable objects: Search in everyday conversation. Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing, 508–517. https://doi.org/10.1145/2675133.2675206

iii. McGregor, M., Brown, B., & Glöss, M. (2015). Disrupting the cab: Uber, ridesharing and the taxi industry. Journal of Peer Production, (6). http://urn.kb.se/resolve?urn=urn:nbn:se:su:diva-125139

iv. Ferreira, P., McGregor, M., & Lampinen, A. (2015). Caring for batteries: Maintaining infrastructures and mobile social contexts. Proceedings of the 17th International Conference on Human-Computer Interaction with Mobile Devices and Services, 383–392. https://doi.org/10.1145/2785830.2785864

v. McGregor, M., & Tang, J. C. (2017). More to meetings: Challenges in using speech-based technology to support meetings. Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing, 2208–2220. https://doi.org/10.1145/2998181.2998335

vi. Brown, B., O'Hara, K., McGregor, M., & McMillan, D. (2018). Text in talk: Lightweight messages in co-present interaction. ACM Journals; Transactions on Computer-Human Interaction (TOCHI), 24(6), 42:1–42:25. https://doi.org/10.1145/3152419

vii. McGregor, M., Bidwell, N. J., Sarangapani, V., Appavoo, J., & O'Neill, J. (2019). Talking about chat at work in the Global South: An ethnographic study of chat use in India and Kenya. Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems - CHI 2019, 1–14. https://doi.org/10.1145/3290605.3300463

1.2.3.1 Main publications not included

1. McGregor, M., Brown, B., & McMillan, D. (2014). 100 days of iPhone use: Mobile recording in the wild. Proceedings of the 2014 CHI Conference on Human Factors in Computing Systems: Extended Abstracts on Human Factors in Computing Systems, 2335–2340. https://doi.org/10.1145/2559206.2581296
2. Laurier, E., Brown, B., & McGregor, M. (2016). Mediated pedestrian mobility: Walking and the map app. Mobilities Journal 11(1): 117–134. https://doi.org/10.1080/17450101.2015.1099900
3. Glöss, M., McGregor, M., & Brown, B. (2016). Designing for labour: Uber and the on-demand mobile workforce. Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems, 1632–1643. https://doi.org/10.1145/2858036.2858476
4. Lampinen, A., McGregor, M., Comber, R., & Brown, B. (2018). Member-owned alternatives: Exploring participatory forms of organising with cooperatives. Proceedings of the ACM on Human-Computer Interaction. CSCW November 2018 https://doi.org/10.1145/3274369

1.2.4 Selection of publications

This thesis encompasses the research design, research data, and findings of five separate empirical studies. The outcomes of each research study have been reported in a number of peer-reviewed articles, seven of which are brought into discussion here to form the foundations of this thesis. The publications are listed in chronological order above and in the table below. I was responsible for the data collection in all studies; that is, I was fully involved in the design of each research method, and undertook diverse participant recruitment and subsequent data collection. In all five studies, I prepared the raw primary data for analysis, and subsequently contributed to group data analysis sessions. My authorship has expanded through the chronology of the publications: I am second author on three earlier publications, and third author in the journal article listed. I am lead author in the two most recent publications, and the 2015 publication concerning Uber and disruption of the cab industry. I summarise each publication below by highlighting, in brief, relevant details of methodology and findings. Key findings in relation to *practices of collaborative mobile phone use* will be explored and discussed in the empirical sections of the thesis.

The reasoning behind the selection of papers is two-fold: First, the research materials (data) and findings from all studies have been used to develop the central proposition of my thesis that recognisable practices are used by people to actively produce and maintain the 'local order' of mobile phone use in the co-located setting. Then, and in support of the typology of practices of collaborative mobile phone use, the publications selected here describe the arc of my methodological journey developed across the doctorate studies.

Table 1 Publications including title and the empirical study upon which they were based.

Paper	*Publication Title*	*Research Study*
I	**iPhone *in vivo*:** Video analysis of mobile device use	Research *in vivo* 1
II	**Searchable objects:** Search in everyday conversation	Research *in vivo* 1
III	**Disrupting the cab:** Uber, ridesharing and the taxi industry.	The Future of Money
IV	**Caring for batteries:** Maintaining infrastructures and mobile social contexts.	Batteries and Internet of Things
V	**More to meetings:** Challenges in using speech-based technology to support meetings	Speech Interaction
VI	**Text in talk:** Lightweight messaging in co-located interaction	Research *in vivo* 2
VII	**Talking about chat at work in the Global South:** An ethnographic study of chat use in India and Kenya	Technology for Emerging Markets

The general practices of mobile phone use were initially observed in the corpus of video material collected in the first study, *research in vivo* 1 (which was iterated for a second round of data collection one year later). The rich nature of the video research material collected and archived was such that the original corpus of video sustained repeated analysis. Classification of the research material was viable over different categorical aspects such as the activity observed, number of persons present, application in use and so on.

The first article listed reported on the range of activities undertaken and observed during a city daytrip, while the second publication was an opportunity to focus on one pervasive mobile activity found in the video material–the practice of collaborative search.

Research in vivo 2 revised the method, and abandoned body-worn cameras to rely solely on an updated version of the recording app. The streamlined configuration of the method allowed for participants to run the recording app for longer periods of time, and enabled remote participation. Fifteen participants recorded their mobile device use for an average of seven days each, and the resulting corpus of content spans a range of messaging applications. Indeed, communication apps represented almost the majority of device use recorded. As a result, a journal paper was written which examines the role of text messaging in the context of co-located face-to-face interaction.

The corpus of *in vivo* video material and the three publications included here (Papers I, II and V) are at the heart of the decision to adopt a practice orientation in analysis of the video recordings of co-located mobile phone use–the uniquely person-centred perspective afforded by the video material reveals more than individual logged usage. The practice lens also helps us to see the additional resources which are drawn upon in interaction with co-located others, including those observably present in the immediate environment such as local talk, gesture, bodies, objects and, of course, mobile technology. This will be explored in full as the thesis progresses.

The additional papers listed augment the practice orientation (Papers III, IV, VI and VII), while also expanding the range of methods I have adopted to research mobile phone use in its various forms and settings. The Uber ride-hailing study set out to understand, through interviews, the motivations and experiences of the multiplicity of different stakeholders implicated by the new taxi service, which is mediated entirely through a mobile phone app. We discovered how the technology was changing the work practices of drivers the world over. By extracting the management of both labour and money from the purview of the driver, the skills and work practices of taxi drivers have been transformed from finding passengers and navigating to their destination to a focus on maintaining a good customer rating to stay on the platform.

In these studies (Papers III, IV, VI and VII), specific technologies were under scrutiny, rather than the general use of mobile technology reflected in the earlier video research material: specifically ride-hailing taxi apps, mobile battery maintenance, speech-based agents for workplace meetings and chat apps for workplace communication. These varied settings revealed that practice is a complex assemblage with elements which are difficult to discern, identify and address: these are the socioeconomic circumstances, cultural norms and values, and a variety of other factors which shape the ongoing ordering of the setting and practice of mobile technology, such elements largely elude the purview of micro-focused video analysis of co-located interaction. This called for different research approaches and methods to access research material that would serve us well in understanding the broader impact of mobile technology in action.

The publications selected reflect the methodological hybridity that has developed through the doctorate. The early studies involved micro-focused conversation analysis of hours of video recordings of mobile phone interactions in face-to-face settings. There then followed a number of interview-based studies of technologies-in-action using a combination of interviews, some with probes to aid recall of everyday, mundane technology usage. The

methods used culminated in the final and most recent ethnographic study of the overall communications ecology of several large-scale organisations–to discover the role of chat app technology in workplace communications. This research approach adopted traditional ethnographic techniques of observational field notes and interviews, and these were augmented by the use of video and conversation analysis. While my researcher's analytic perspective has evolved, becoming more distant from the technology itself, there have been consistent theoretical anchor points found in ethnomethodology, and, more broadly, in the fields of human–computer interaction (HCI) and computer-supported cooperative work (CSCW). These theoretical resources will be discussed in Chapter 2 'Background and Theoretical Resources'.

1.2.5 Publication summaries

I now provide brief summaries of each of the seven publications which animate the thesis. Table 1 aligns each paper with the empirical study upon which their findings are based.

1.2.5.1 iPhone in vivo: Video analysis of mobile device use

This paper was the first publication based upon a corpus of research material gathered using a novel research method, the *in vivo* approach. The fieldwork took place in Stockholm and London, with the initial aim of collecting video recordings of groups of participants using digital maps on mobile phones. Study participants were recruited in pairs, and they took part in sessions lasting 2–3 hours. The research method deployed novel configurations of lightweight cameras worn on the body, and a recording app loaded on participants' phones to collect video recordings of their everyday mobile phone use. The details of the research design are discussed in chapter 3, hybrid methods. The videos collected became primary empirical material for a previously unseen perspective on the situated use of mobile phones: an uninterrupted view of onscreen interaction with the phone, alongside recordings of the visible and audible setting of the phone use–to the extent possible with a discrete recording set-up.

The corpus of rich video data of mobile phone use resulting from a collaborative 'city day trip' encouraged us to think less in terms of the performance of the digital map apps or the mobile phone itself, but rather to consider how phone use more broadly was being introduced into other tasks happening in parallel; tasks like paying for a drink, or checking an email. More than simple multi-tasking, the interactions with the mobile device often became

part of social interactions with co-located others. It was the fieldwork, the data and research materials finally achieved that shaped the initial research objectives of this study to expand the investigation of the practices of mobile map use to include the broader range of social interactions to which the video research material now gave us access; this included information search, activity planning, and the ways these practices were introduced to and managed within the co-located setting. As such, Paper I iPhone *in vivo*, provides the nexus of my interest in the emerging collaborative practices of co-located mobile phone use.

1.2.5.2 Searchable objects: Search in everyday conversation

The second publication draws upon the original *in vivo* video corpus, and it is underpinned by a number of established ethnomethodological concepts; 'occasioned use' (Goodwin, 1987) refers to mobile phone use which is prompted by elements occurring in the immediate environment in which it is embedded. The roles of mobile phone participation which are used for all analysis of the corpus (Sacks, 1995, vol. 11) are 'driver' and 'passenger' and 'managing participation' (Goodwin, 2007) and these are used to classify a person's respective social role in the instance of collaborative mobile phone interaction, which is unrelated to other skills, characteristics or activities. For the paper, we describe an item which can reasonably be found via internet search as a 'searchable object'.

The publication uses interactional video analysis and conversational analysis to re-conceptualise search as a social and interactional activity–rather than simply an information-seeking task. The paper argues that search should aim to integrate with the conversational context as much as it does with the goals of a single searcher, since the conversational context will provide many of the cues to search.

1.2.5.3 Disrupting the cab: Uber, ridesharing and the taxi industry

This was a qualitative study exploring the motivation and experience of key stakeholder groups involved in ride-hailing taxi services such as Uber and Lyft. The study took place in 2014 in San Francisco and London, two cities with very different legislative and commercial history in taxi driving. San Francisco is where Uber was launched in 2009, while Uber London only launched in 2012–and the difference was reflected in the experiences of our study participants.

The participant group was drawn from traditional taxi drivers–including black cab drivers, yellow cab drivers, mini cab drivers and ride-hail drivers–passengers of both kinds of taxi services, as well as different industry stakeholders including Uber management and

transport workers union representatives. The aim was to understand different perspectives on what was happening in the world of taxi services–and purposefully not only a single stakeholder group.

We employed *situated* interviews, and interview transcriptions. Analysis revealed existing theoretical concepts such as processes of increased surveillance, de-skilling, casualisation and intensification affecting the work practices of traditional taxi drivers with the advent of ride-hailing technologies. The app allows ride-hailing passengers and drivers alike to circumvent and disregard the incumbent systems of taxi company despatch and civic regulation. The *changing motivations and experiences of both drivers and customers*, as described in the interviews and through our observations of the work, highlighted the technology's transformative role in managing labour and money in taxi-driving services. The threat posed to the incumbent taxi service providers, regulators and users resides in the transfer of control over aspects of an entire industry–such as pricing, discrimination and work allocation–which goes to whoever controls the software.

The findings show that a more nuanced perspective on the economic effect of a new technology can be simultaneously critical without ignoring the benefits that the same technology can provide. Avoiding simplistic descriptions of Uber as wholly 'good' or 'bad' reveals whom it affects and how so-called disruptive apps like Uber make winners and losers.

1.2.5.4 Caring for batteries: Maintaining infrastructures and mobile social contexts.

This was a qualitative study conducted in 2014 and 2015 investigating how the batteries in our mobile phones are used and cared for in our everyday lives. This was part of a project looking at the 'internet of things' (IoT), which involves the design of systems relying heavily on power and connectivity.

The details of the research design are described in the hybrid methods chapter. This was an interview study using a technological probe–an app loaded on to participants' phone for at least a week to monitor their battery level alongside coarse-grained location data. The automated trace data was used to prompt discussion, and we were largely inspired here by the approach of ethno-mining (Anderson et al., 2009), a mixed methods approach that combines quantitative and qualitative data in order to co-interpret and co-create data, together with participants.

The findings of this study outline battery management and care as a situated material practice–including details of when and how it is done, who is involved in doing it and what happens when the work to maintain the battery goes wrong. The inclusion of the study in the

thesis is chiefly methodological: the research design focused on the experience and accounts of our participants, rather than analysis of their automated log data in isolation. The trace data collected via the app was used to prompt discussion of a mundane, secondary and largely overlooked activity around the fundamental practice of maintaining one's mobile phone in good order.

1.2.5.5 Text in talk: Lightweight messaging in co-located interaction

This journal paper reports the video corpus collected in a second iteration of the original *in vivo* approach, deploying the same configuration of a recording app loaded onto participants' personal devices. The revised iteration of the method abandoned body-worn cameras and relied solely on an updated version of the recording app, which now captured enhanced recording of surrounding audio to help compensate for the lack of contextual video. The streamlined configuration of the method allowed for participants to run the recording app for one week, and enabled remote participation. The research material gathered was used for the journal paper VI. Fifteen participants recorded their mobile device use for an average of seven days each, and the resulting corpus of content spans a range of messaging applications including WhatsApp, Facebook Messenger, iMessage, and Skype. Indeed, communication apps represented the greatest part of device use recorded in the corpus, with a third of the videos featuring applications including Messages (iMessage), Mail, Skype, Google Hangouts, Viber, and WhatsApp.

This publication focuses on text messaging in the context of co-located face-to-face interaction. Early ethnographic work on mobile phone interaction highlighted the importance of considering the part played by mobile phone interactions in the context of local interactions. Yet much of this work was concerned with how mobile phone interactions were uneasily positioned within the context of co-located interaction—with messaging a disturbance or something that needed to be respectfully managed in the co-located setting. Phone interactions were still conceived as disruptive to the particular unfolding of local conversations. Yet, as mobile phones' functionality and mobility increasingly matches and overtakes desktop computing, this paper explores the role of mobile messages in co-located interaction.

The paper presents the micro-analysis of four separate short recordings of video research material in which mobile messages are implicated in co-located face-to-face interactions. A number of arguments are made about less well-documented aspects of text messaging practices which relate to their position in co-located interaction. Analysis used existing

theoretical approaches including Bakhtin's notion of the 'dialogic' form of meaning, to give us resources to understand how messages and messaging rely to an extent on previous conversations. The paper seeks to shift, or reconceptualise, text messages from being either simply a tool for distributed communication or a source of disruption. Instead, the paper argues, messages have become an important and valuable part of our everyday sociality and relationships.

All of the video data was collected and prepared by me, and I was involved in the data analysis and writing. This publication contributed greatly to the thinking behind this thesis; it was written some time after the video corpus had been collected, processed and become thoroughly familiar. The arguments go some way to acknowledge a growing recognition of the nuanced and entangled role and significance of mobile messages in our everyday interactions and friendships. The distinctive practices brought to bear by participants for the purpose of dealing with mobile messages highlighted that there were different ways that the features and affordances of the technology could be adapted and exploited within the social setting unfolding. This called for further reflection on my part, on the nature of the practices of mobile phone use in co-located, social settings in general.

1.2.5.6 More to meetings: Challenges in using speech-based technology to support meetings

This paper was written based on research conducted in a three-month internship with the Speech Interaction team in Microsoft Research, California. I joined a large, interdisciplinary team working across different locations, amidst the rising popularity of speech-based agent systems operating in the personal assistant space–such as Microsoft Cortana, Apple Siri and Amazon Alexa–as well as in other more established settings such as call centres and in-vehicle systems.

Overall, the team goal was to develop a speech-based 'assistant' system for business, using automated speech recognition to support business meetings without disrupting them. I was the sole qualitative researcher in the team, with other interns working to develop algorithms and other features of speech recognition like diarisation, which would ultimately be brought in to the envisioned *speech agent for business meetings*.

The research challenge, then, was to explore the concept of a system that could use speech agent technology similar to the personal assistants already established for use on mobile phones. So, for example, the new Meeting Assistant technology might hear in a meeting one person say to another "We should meet offline to talk about this", and it would

automatically open the calendar of the speaker and create an action item to set up a new meeting.

I conducted ethnographic observation of contemporary business meetings and surveyed attendees to learn what they valued in the meetings. I then developed a speculative low-fidelity prototype of this envisioned speech-based agent technology, to support interviews with meeting attendees, the objective of which was to learn how people who attend meetings would respond to a technology that did not yet exist. The details of how the prototype was created and then used in interviews are to be found in the paper. However, by combining the observational fieldwork with the survey data, it was possible to identify the diversity of content, meaning and priority that participants took away from the meetings they attended. Using the probe in interviews highlighted how much interpretation of what gets said in a meeting is required in order to create relevant meeting notes. The interviews with meeting attendees revealed the mismatch between what can be understood from transcripts of a meeting alone, without the additional social and contextual knowledge of the setting. The hybrid combination of formative, observational methods used to create the low-fidelity technical probe and the findings from the interpretive interviews successfully culminated in an informed and holistic view of what happens in contemporary workplace meetings, which allows us to envisage how speech-based technology could potentially both help and hinder business meetings.

1.2.5.7 Talking about chat at work in the Global South: An ethnographic study of chat use in India and Kenya

The final publication was produced as part of an internship with the Technology for Emerging Markets team in Microsoft Research, India. It was the culmination of a six-month ethnographic study involving six large-scale organisations. The study was designed to allow the team to respond to two research objectives: the first was to understand the use of a new chat application that had been introduced unilaterally by the management of all six organisations. The second objective was to understand the role of chat applications in general within the overall communication ecology of each organisation.

Therefore we were interested in, and documented, what we could observe of the whole communication ecosystem of each organisation, from email to video conference calls, to face-to-face meetings. However, the particular focus was on so-called chat apps; lightweight, asynchronous mobile messaging applications, which have exploded in use alongside the mass

adoption of smartphones. Their popularity is due in part to their low cost, widespread availability and perceived security.

The organisations studied are built around a highly distributed work force–whose job it is to travel to meet clients on the ground, and who are rarely, if ever, in face-to-face contact with centralised management. The distributed worker accounts for as much as 80% of the global workforce[3]. These are workers who do not sit at a desk, but provide the human resources in healthcare, agriculture, manufacturing and retail the world over. These workers are mobile-first, they often operate in resource-constrained situations, and as a worldwide workforce are fluent in various local languages. Consequently, they are looking for lightweight tools to operate from their mobile phones–which are easy to understand and use.

In each organisation studied, both WhatsApp and Kaizala chat apps were being used by the staff. However, it was notable that the use of WhatsApp had been initiated from the ground up because workers saw a need for it, such as for sharing performance results within teams. By contrast, Kaizala was a top-down implementation, set up to fulfil various organisational communication functions.

Ethnographic studies are the detailed, empirical examination of the organisation of activity, using methods such as observation and interviewing, (ethnography is discussed more fully in chapter 3). The approach was adopted for this study, to avoid making assumptions about the work practices within which the chat apps were embedded. Instead, we wanted to understand and experience some of the setting and conditions of work, and also to learn about and document the extended system of tools, artefacts, processes and practices being used by those on the ground to actually get the work done. Of the six organisations involved, we made a longitudinal observational study of two organisations. The first was a large state-wide agency working across Andhra Pradesh with over 5,000 employees, followed by a nationwide high street bank across India, with 20,000 employees overall, 10,000 of whom are field sales staff. In both cases, we shadowed field staff working at different managerial levels. The remaining four organisations (another Indian bank and three expanding innovations companies based in Kenya) were dealt with in interviews after the main fieldwork had been completed. This allowed triangulation of the early findings, in particular with the experience of three emergent commercial organisations working in Kenya with fieldworkers in distributed parts of Africa.

[3] Source: The Rise of the Deskless Workforce, by Emergence Capital, 2018.

The research team extended to five, and I and another intern worked together in the field on data collection and data preparation. The whole team then worked together on group data analysis sessions, where all team members worked to reconstruct and understand the purpose and nature of the communication processes happening throughout the work documented, and thereby understand more clearly the part played by chat apps. Full discussion of the findings over the course of the study can be found in the publication itself.

2 Theory and Background

As described in the previous chapter, this thesis asks whether there are practices that people enact when using mobile devices in the company of other people–and are they consequential? Practices can be most simply thought of as recognisable and recurrent action constructed by accumulating together diverse resources which are 'to hand'–including language, talk, gesture, and objects such as mobile phones. To elaborate this simple conception of practice further, a practice cannot be fully described without reference to the particular setting, or the temporal organisation in which it occurs. Adopting a practice-oriented perspective on mobile phone use therefore requires us to broaden the lens, to consider the various constituent parts that make up the practice, in contrast to other approaches which seek to narrow the research lens, such as large-scale studies which isolate aspects of the technology, such as GPS location and time, and study them through abstract modelling and generalisation. To examine the everyday practice of mobile phone use, research must *go to where phone use naturally occurs* in order to observe and record the elements which make up the temporal trajectory of the practice, including the time and space, and the elements mentioned already of talk, bodies, gesture, objects to hand and features of the surrounding environment. This chapter discusses the theoretical resources which support this conceptualisation of practice, laying the foundation for my study of the social order of the co-located mobile. The sections which follow will introduce some ethnomethodological and sociological formulations of practice and related work. Other theoretical resources which have been influential in the publications and which situate the work in the multi-disciplinary domain of mobile phone research included in this thesis are also introduced and discussed.

2.1 Ethnomethodology and the 'local order' of situated practices

In the thirteenth century, John Duns[45] was considered one of the three most important mediaeval philosopher-theologians in western Europe (Williams, 2001). A Scottish theologian and philosopher, he was heralded for his subtle and nuanced contemplation of

[4] John Duns (1266-1308) known as Scotus Dun – origin of the term Dunce.

the challenge of accounting for the discrete qualities, properties or characteristics of a thing that make it a *particular* thing. It was Duns who defined *haecceity* as a person or object's *thisness*. Similar concerns of accountability and describability have constituted a long scholarly lineage for articulating what is unique about a thing–but also in describing what makes the thing quite ordinary and can therefore make it understood. The theoretical work in this area is foundational to the ethnomethodological stance of post-war sociologist Howard Garfinkel. His conception was that *members* of society must have some shared methods that they use to mutually construct the *meaningful orderliness of social situations*. Those 'shared methods', he argued, can be researched by appropriate methods available (and recordings were preferred). Similarly to contemporaries Goffman and Sacks, Garfinkel was working in post-war sociology to reject the use of positivist prescriptive theories and hypothesis. People are able to collaborate using the 'ordered properties' of talk to achieve meaningful interactions and that, for all three scholars, social order and social structure are not external to *action*, but that social order is endogenous: produced in and through local structures of interaction (Boden, 1990).

These authors have inspired much in the way of empirical work. Of particular relevance to my research, Boden's classic work The Business of Talk, combines the thinking of Garfinkel, Goffman, and Giddens on social order in her analysis of interaction in the workplace (Boden, 1994). Thoroughly immersed as she was, in the closely related theoretical worlds of ethnography, ethnomethodology, conversational analysis and symbolic interactionism, Boden is a pragmatic looker-at-the-world, describing the "*momentary yet recurrent and patterned quality of the world*" (Boden, 1990, p. 246). Less interested in rhetorics, she seeks ways to break the 'post-structural chill' in which the battling philosophical approaches to sociological research had become situated. Boden's view of talk in organisation, for example, is both profound and enlightening:

> *"Talk is not 'micro' nor are organisations 'macro'… Reality is a seamless web of actions, reactions and inactions. Using the reflexive prism of ethnomethodology, we can now see that all actions are embedded in a continuous stream of social relationships, which, in turn, are framed by a historical context… Talk is intensive in its local and delicately balanced turn-driven organisation. It is extensive in that the lifeblood of organisations flows through it." (Boden, 1994, p214-215)*

Boden's insight on the ongoing constitution of everyday working life in organisations is valuable for anyone embarking on research in such a setting. By taking account of face-to-face talk in the everyday ongoing mediation of organisational objectives and culture, the design and implementation of technological communication systems for the workplace setting can be properly situated, as I reported in Paper V. Using Garfinkel's ethnomethodological focus on practices (rather than 'things', 'givens' or 'facts of life') leads to an examination of the local interactions and interrelations through which people get stuff done. Human action is built by performing systematic operations on the organisation of structured materials placed within a public environment by others. The mobile phone is increasingly perceived as a feature of the process through which those structured environments are accomplished. Our interaction with mobile phones has become part of the 'quiddity of life', the 'just whatness' of social practice (Garfinkel et al., 1981). That mobile phones occupy this role in social life is not a fixed existential fact; it is an ongoingly developing characteristic of the technology–moving from disruption to constitution.

How can we observe what makes it possible for people to make sense together in everyday interaction? In her work with Garfinkel on extending the ethnomethodological approach, Anne Rawls turns to Garfinkel's explanation of the 'rationalities' (Rawls, 2011). This is a reference to Durkheim's rationalities which are, in turn, borne in *social practices*. Garfinkel argues that all actions need to be produced in orderly and expected ways for them to become socially recognisable, in heterogenous settings. This assumption–that the empirical observation of the patterned concrete orderliness of enacted practices can provide us with access to the constitutive process of local orders–underpins the ethnomethodological approach.

2.1.1 Co-operative action

As mentioned earlier, Barley & Kunda (2001) define practice as the situated integration of tools, documents, action, and interaction. Goodwin extends the social nature of action by proposing participation frameworks as a way of analysing meaning-making in co-located interaction (Goodwin, 2017). Human beings construct tools and actions by bringing different kinds of materials into an arrangement where they mutually elaborate each other to create something not found in any single part. Taking Goodwin's illustrative example mentioned earlier (Figure 1, chapter 1) we can see that actions are constructed by joining together different parts–such as in the ancient axe made from a wooden handle, a sharp head of metal or stone held together by rope or a binding material. The axe is only identifiable or usable in

the complete form–and not in any single element of the form. Likewise, the two-line repartee between Tony and Chopper in Goodwin's illustration performs in a similar way with language. Chopper uses and transforms Tony's words into a statement where he challenges Tony's authority in the yard–not to build some happy resolution (as 'co-operative' action may suggest). If you disassemble the axe, it cannot be found in any single part–and the same is true for language. Treating an utterance as a study of language, or the gaze, or even of sequence misses the point, as the meaning is found as a sum of all the elements as they were experienced in time and place.

Actions have an internal temporal and combinatorial structure–they are not monolithic building blocks which, once begun, must be completed. In interaction, both tools and actions are constructed through the simultaneous work of both speaker and hearer; for example, a speaker without a hearer often produces a re-start in her or his talk, in order to catch the attention of a hearer. While this is a sequential phenomenon, looking at it in a narrow sequential framework of talk alone misses the point, (Goodwin, 2000, 2017). Using a broader participatory framework will include the talk of the speaker, as well as the embodied orientation of the hearer–demonstrating Goodwin's claim that we inhabit each other's actions and inspiring the 'co-operative action' nomenclature.

2.1.1.1 Knowing and non-knowing participation

Goodwin proposes that awareness among participants of differential knowledge states is a constitutive feature of action, which drives its formal organisation and informs alignment between *knowing* and *non-knowing* participants (Goodwin, 1979; Heritage, 1984; Terasaki, 2004). This distinction does not relate to empirical claims to knowledge (who has the *most* knowledge), but rather it is the ontological constitution of different action-relevant identities as they are engaged with in the precise moment. As an action develops, there may occur *requests for information* and *tellings*–participants can respond to either giving a visible embodied orientation, or alignment to each actor in preparing to provide or receive information. The alignment can take various embodied forms such as gaze, as an non-knowing participant may look to a knowing participant for a response to a request for information, or through prosody of voice in modulating the voice to indicate a question. The role of *knowing* or *non-knowing* can change as an interaction develops, and actors hold themselves accountable for proper alignment. Each community is continually building a community of new skilled actors, and Goodwin uses an example in the educational setting of an archaeology group sharing its domain-specific language and inherited resources for

analysis. However, this transformative dynamic underpins many of our everyday and mundane interactions, as we share stories, respond to uncertainty with confirmations, and the multiple ways that information moves from one to another. Further, Sacks referred to a "general rule that provides that one should not tell one's co-participants what one takes it they already know"–which makes the teller in such a situation accountable for work to compensate for such a transgression, such as asking the knowing listener to contribute to the storytelling (Sacks, 1973).

2.1.2 Re-use of interactional resources

The transformative re-use and accumulation of our predecessors' actions to make something new means, in other words, that these actions are not something done in unison for mutual benefit, but co-operative action in taking something from a predecessor and transforming it into something unique. It is temporally situated, and the present is like a bridge or saddle, from which we can look in two directions at once; towards the past while contemplating the future.

Within co-operative actions, actions are built through the multiple use of different resources; resources such as tools like Goodwin's favourite example, the archaeological Munsell chart, which he refers to as an 'architecture for perception' (Goodwin, 2017, p. 292) (the tool is a simple cardboard chart with cut-out windows used to compare the colour of the earth around objects of archaeological interest). This accumulation of resources includes language and prosody, environmentally coupled gestures like pointing, and bodies in shared orientation. These phenomena occur within the domain of scrutiny, such as the earth to be transformed into archaeological data, using the Munsell chart.

In talk, utterances can become a composite set of layers of diverse resources, by the use of prosody, which refers to the inflections in talk, which is used to elaborate the basic language. Goodwin has characterised this kind of 'layering' of different semiotic resources as *lamination*, (Goodwin, 2017). Prosody is used by every person who speaks, in some form or another, for example, extending vowels for dramatic effect, as in "No::o!!!". Goodwin uses particularly affecting videos of communication with his own father, who could utter only three words as a result of a stroke, but who could communicate by laminating the talk of other people, using these three words as a form of prosody to indicate, along with hand gestures. Goodwin articulates this as the indexical incorporation of others' talk. In less extreme ways, all speakers do something similar by taking a sample from what has already

been said, and re-using it for their purpose to further the ongoing action. These varied resources are distributed across semiotic fields, talk utterances and actors.

These human actions are not a private mental phenomenon, for while separate actors will contribute in different ways, these actions are constructed by co-operatively combining materials to perform simultaneous and sequential structure-preserving transformative operations on a local, public substrate. The public nature of these actions is important for the purpose of learning–Goodwin extends this to the process of developing communities of language and skills through co-operative action–not through intentionality or psychology. The transformation is in the nature of sociality. In co-operative action, we have built action in concert with others by mutually elaborating others. However, there is no fixed pattern, meaning that we do need to figure out what people are trying to do or tell us every time. There is no mind-reading happening when in interaction with others, so knowledge construction, searching, way-finding and so on rely on the actors' inherent sociality.

Alongside language, there are different kinds of sign systems involved–including temporal scope and categories, for example, map. These classifications happen continually, not just for the sake of categorising signs, but having a consequential role for the relevant next action to the predecessor. Actors therefore accumulate knowing experience within developing bodies and so one might endogenously create the sensorium of a geologist through accumulative co-operative action. This process Goodwin describes as *sedimenting* a 'general type'(Goodwin, 2017) and then accumulating a diversity of instances. In talk, sentences are produced by operating on earlier talk–working within a process to build unique utterances. Goodwin describes this as inhabiting each other's actions through accumulative co-operative action, and he highlights the problem of linguistically analysing sentences in isolation from the other sources which combine to build utterances.

2.2 Related theoretical approaches to the study of practice

Practice is a broad and somewhat nebulous term; in the epistemological sense, it is used to describe fundamental phenomena of society in the work of several philosophers and sociologists such as Bourdieu, Lyotard, Foucault, and Taylor, as well as in ethnomethodology (Gherardi, 2009). For the ethnomethodologists, the reflexive tendency of social interaction provides for its own constitution through practices of *accountability* and *meaning-making*. In organisation studies, information science and computer-supported cooperative work (CSCW), the terms 'technology-in-use' (Orlikowski, 1992) and 'technology as social

practice' (Suchman, Blomberg, Orr, & Trigg, 1999) have been coined to distinguish this approach to technology.

Orlikowski established technological practices (Orlikowski, 2008) as a theoretical framework of 'structuration', connecting agency and structure in organisation. Orlikowski developed this practice lens to understand the use of technology in organisation–she was influenced by Giddens' perspective of structuration on technology (Giddens, 1984), but extended it further. Her practice-oriented understanding of interaction between people, technologies and social action was used to explain change in both technologies and their use; in particular, she highlighted the importance of social practices in ensuring the ongoing adoption and development of a workplace technology:

> *"A practice lens to examine how people, as they interact with a technology in their ongoing practices, enact structures which shape their emergent and situated use of that technology. Viewing the use of technology as a process of enactment enables a deeper understanding of the constitutive role of social practices in the ongoing use and change of technologies in the workplace." (Orlikowski, 2008, p. 255)*

Giddens' structuration theory[6] does not deal explicitly with technology, and that absence has been addressed by other social constructivist thinking (for example, Woolgar and Grint 1991) in the propositions that technology use becomes 'stabilised' after development and that technologies 'embody' various social and political structures. Orlikowski disputes both concepts; for Giddens, structure is presented as a set of rules and resources seen in 'recurrent social practice' and, with this in mind, Orlikowski focuses on the practices of technology use to better understand how people and organisations *enact* the structures which shape their technology use. Structures refer to external entities such as organisational policies, civic regulations, ownership, and internal entities such as individual expertise. For Giddens, these structures will only become manifest in technology through recurrent activity which becomes

[6] This theory defines structure "as the set of enacted rules and resources that mediate social action through three dimensions or modalities: facilities, norms, and interpretive schemes. In social life, actors do not enact structures in a vacuum. In their recurrent social practices, they draw on their (tacit and explicit) knowledge of their prior action and the situation at hand, the facilities available to them (e.g., land, buildings, technology), and the norms that inform their ongoing practices, and in this way, apply such knowledge, facilities, and habits of the mind and body to "structure" their current action. In doing so, they recursively instantiate and thus reconstitute the rules and resources that structure their social action" (Orlikowski, 2000: 409).

implicated in ongoing structuration. Simply put, from the structuration perspective, structures emerge through practice only and are not embodied in the technology.

Orlikowski's practice orientation successfully introduces the concept of external and internal structural influences, through her interpretation of Giddens' structuration theory, whilst also balancing that with the pragmatic experience of different technologies in action in different settings. Her extensive work in the field makes us sensitive to the risk of ascribing agency to a technology, while alerting us to the larger, structural influences that may nevertheless influence how a technology is designed, which in turn may have a common effect on practice.

2.2.1 Goffman and social interaction

This leads us to the influential work of Erving Goffman. Reading Goffman's writing presents us with a sociological understanding of what is going on when face-to-face with other people (Goffman, 1959). Working from 1950s on, his analysis is grounded in mundane, observable, recognisable human behaviour, lending a timelessness that might afford us an opportunity to think about the contemporary forms of everyday interaction. Goffman systematically analysed the organisation of focused and unfocused encounters between strangers in public places, for example on a crowded train. Rights to *civil inattention* are linked to proper behaviour: "Propriety… tends to ensure [one's] being accorded civil inattention" (Goffman, 1963: 87). So, when we are presented with images of people individually using their mobile phones en masse in public spaces like a busy train, this can be attributed to individuals affording others their private personal space. Goffman's 'civil inattention', then, provides a crucial practical resource in the management of everyday encounters with strangers in urban public places.

Figure 2 Goffman's 'civil inattention' provides a practical resource in the management of everyday encounters with strangers in public places. Engaging with a mobile phone enables the user to afford co-located others privacy. (image Adam Rifkin, via Flickr)

His later work, on Frame Analysis (Goffman, 1974) is a means to think about the organisation of social experience which operates in particular frames, such as displays of emotion and how they are managed for particular contexts; the way a poker player can control his or her emotion in a card game, or a singer can call on emotion within a song with instant effect. To understand that as it happens, it is required to view the person on stage as a singer in the frame, for the duration of the song. Goffman gives different titles to images which help us to see how our understandings of the world are more socially organised than we usually perceive–for example, he gives one image, three alternative titles: 'a man greeting his wife', or 'a couple kissing', or even 'John being careful with Mary's makeup'. All three titles give adequate descriptions of things happening in the world, each provides enough cues for them to be recognised in slightly different frames and highlighting the social element of our perception of them. In Presentation of Self in Everyday Life (Goffman, 1959), Goffman develops the metaphor of interactants as teams of actors performing a show, where the observable behaviour is all about 'framing', in which context the 'elephants in rooms' and 'skeletons in the closet' are not mentioned, otherwise *social order* would break down. This is the level of order which was Goffman's concern, everyday framing used in everyday interactions, constant concentration on small matters and micro-interactions.

His frame analysis can be used to discover the multitude of framings such as etiquette, productivity and civility as they operate in everyday life. However, a key criticism of Goffman is that his work does not attend to the large, structural subjects of sociology–

institutions, religion, law, state, gender and class. His interest remains faithful to the *interaction order*. Goffman says there is no straightforward relationship between the interaction order and larger social structures–in some instances the gender or ethnicity of an actor may be a relevant feature in interaction, but equally there will be other encounters where there is no impact of those factors in interaction. For Goffman, power is seated in the micro-interactions, rather than an abstract external force. Power operates through people's behaviour in interaction with each other, and the example in his studies of life in mental institutions (Goffman, 1961) illustrates this: in that institutional setting, the act of a member of staff instructing a patient to remove his or her own clothes and don anonymous hospital clothing demonstrates the power imbalance which exists and unfolds through mundane interaction. For Goffman, power manifests and is experienced in our interpersonal interactions. Study of how social order is constituted and operates should remain, then, at the mundane, everyday, local level rather than speculate upon grand unseen structures such as religion and politics.

Goffman's *furnished frame* (Goffman, 1974) encourages us to look more closely at interactions between people and things, such as the mantelpiece above the household fire and indeed, who owns the house and who is not able to own a house (Hurdley, 2006) reflecting the nexus of power in ordinary relationships between people and things, power which may be both materially and figuratively present and impactful.

Opening a perspective on the affective dimension of places that still orders human behaviour, Goffman encourages us to have a sociological imagination (Riggins, 1990). Can we imagine the mobile phone as a furnished frame? What are the social cues and etiquette which operate on mobile phone users, or those around the phone? This framing could be a strength in analysing the bigger picture surrounding technology use. A way to realise how powerful the cues and etiquette which govern social interaction are, is to contemplate what happens when they are violated–how mobile phone use is tolerated, or not, in certain settings, for example.

Through his observational studies of mobile phone use combined with interviews and statistics of phone use around the time of his studies, Ling suggests that the mobile phone favours the ritualised interaction of the 'ingroup' (Ling, 2010) at the expense of interactions with the weaker social ties. In simple terms, communicating through a mobile phone using all the channels it provides, including messaging, social media and audio visual calls, both encourages and strengthens repeated communication with one's known existing network of social contacts, while it discourages more diverse, random interactions with people who are

not in your established network. Moreover, it is understood that *new knowledge* arrives through those very same actors–the 'weaker' links who potentially have divergent views and experience of the world (Cowan & Jonard, 2004; Inkpen & Tsang, 2005; Wasko & Faraj, 2005). This may be of concern for some, as this strengthening of 'in-groups' may encourage less plurality, and more inward-looking communities. It is in this kind of broad observation that Ling has presented, that we can best utilise Goffman's approach–combining the observations made of close micro-interactions with mobile technology with a broader, sociologically-informed view of how those micro-interactions may unfold and impact future trends.

In particular, given the massive increase in both the ownership and functionality of mobile phones, we might reasonably ask ourselves if Simmel's 'will to connection' is being re-constituted and redirected increasingly to mediation by mobile technology (Simmel, 1950). Ling suggests that in mobile phone use, old rituals in sociality are mediated in new forms and the phone amplifies existing social links with like minds and voices. Ling's focus is the content being mediated on the phone, and perhaps particularly social media–and less so the practice of mobile phone use. Ling's approach is sociological, and takes a plural and non-psychological perspective, in that it does not attribute actions and behaviour to individual workings of the mind. It adopts the concept of 'hidden sociality' which has been developed over time within the community of sociology, which can lead to different accounts or explanations for why things happen the way they do.

Ling uses interview studies and personal observations of situation, time and emotions to access the broader relationships happening around mobile phone use. As a further indication of the continually changing communication practices evolving around mobile phone technology, Ling's early and influential research (R. Ling, 2004; R. Ling & Yttri, 1999) focused largely on voice calls made on mobile phones in public places. Yet, as the video corpus of research material in this thesis highlights, voice calls are a much diminished channel in mobile phone communications, which is increasingly message-based rather than spoken.

2.2.2 Conversation analysis

Inspired by Goffman's conception of the *interaction order*, and Garfinkel's *ethnomethodology*, conversation analysis (CA) is an approach developed by Harvey Sacks, Emanuel Schegloff and Gail Jefferson. It studies naturally-occurring talk to identify the orderly nature of social interaction. Face-to-face interaction is often overlooked

and trivialised as a source for research material, yet it is through conversational talk that we produce language and human action–making talk a medium for action. Social organisation and conversational talk are not two separate entities (Psathas, 1994) which operate in isolation of each other; they are entangled in ongoing talk and interaction. It is there that we can look to identify and begin to understand human phenomena like social order–in the everyday talk within which it occurs.

CA provides the tools and inductive methods to capture and represent different elements of this 'talk-in-action', by transcribing and then analysing naturally-occurring talk data collected in the form of audio or video recorded interactions. Providing transcriptions of the recordings aims to include as much detail of the interaction as possible, including information about overlapping talk, pauses in talk, prosody, gesture and even gaze and bodily comportment: "to get as much of the actual sound as possible into transcripts, while still making them accessible to linguistically unsophisticated reads" (Sacks et al., 1974, p. 734). After transcription, inductive analysis of the empirical data looks for recurring, sequentially implicative organisation of interaction; reporting themes which develop endogenously from the data. Analytically, CA is concerned with the production of interaction from the perspective of the participants' own reasoning and understanding: establishing what are their *taken-for-granted methods of producing order that constitute sense* (Rawls, 2008). In this way, using transcribed audio and video recordings of interaction, CA can be used to reveal the systematic ways that action is accomplished in and through talk (Jefferson, 1989), providing evidence of intricate coordination, action and recipient design.

```
1. Maude: I says well it's funny: Missi:z uh: ↑Schmidt ih you'd
2.        think she'd help :h:h:h Well (.) Missiz Schmidt was the
3.        one she: (0.2) assumed respo:nsibility for the three
4.        specials.
5.        (0.6)
6. Bea:   Oh↓*:: °°M-hm, °°=
```

Figure 3 Conversation analysis requires transcription of recordings of actual talk in interaction, rather than approximations of content remembered, imagined or experimentally produced. The level of complexity captured by transcription opens up the possibility of a range of phenomena that would otherwise be overlooked (Jefferson 1989, 171) [Line numbers added]

Of course, there is more than talk going on in face-to-face interaction. People look at one another, look at objects around them, point and gesture, smile, cry, walk away, listen, ignore and do other things besides, all of which contributes to the sense that each participant makes of and takes away from the interaction. On this basis, Goodwin argues that language should

not be viewed as primary and autonomous from all other interactive activity occurring alongside words being spoken–which may be considered separately as 'context'. Goodwin proposes that talk should not be studied in isolation, but instead that the *'theory of action must come to terms with both the details of language use and the way in which the social, cultural, material and sequential structure of the environment where actions occurs, figure into its organisation.'* (Goodwin, 2000, p. 1489). He proposes that any analysis of human action should consider the following aspects in unison: Language; Semiotic structure of the historically material world; Body as a display of meaning and action; Temporal sequencing of talk-in-interaction.

This section has introduced the CA approach briefly, and it will be discussed further in terms of its application in chapter 3, hybrid methods. CA has been an important element of my approach throughout the doctoral studies, first of all as the methods used to transcribe talk-in-action, which was the focus in the *in vivo* studies. In particular, the transcriptions of selected video recordings provided a shared rendering of talk which allowed video data to be textually reproduced. While it was important in the analysis to return to the original recordings repeatedly to refresh the memory of the situated action involved, transcripts provide an accessible, reproducible and easily shared research material. The printed transcripts become a fundamental resource for analysis, presentation and academic publications. CA methods were also central to my later research studies, including transcription of ad hoc video recordings of workplace interactions in Paper VII, as well as a resource for prototyping speech recognition technology, Paper V.

2.2.3 Bakhtin and reported speech

Bakhtin's discussion of *reported speech* goes beyond a definition of talk that simply quotes earlier conversation verbatim. Bakhtin refers to the socially consequential images of others that are built through the reporting of previous conversations in current co-located interactions–meaning the ways that speakers can "appropriate the words of others and populate them with one's own intention" (Bakhtin, 1982). This was part of Bakhtin's theory of how words and texts obtain their meaning through a dialogue with the past which develops both individually and collectively, for example, in the education setting, where children listen to and understand meaning and actions together as they learn. Bakhtin's Dialogical Imagination (Bakhtin, 1982) gives *primacy of context* over text, and highlights the hybrid nature of language and its meaning. Sharing concepts of the transformation of contextual resources to create shared meaning, Bakhtin's theoretical approach to ephemeral reported

speech foreshadows Goodwin's 'lamination', introduced earlier. Reporting is constructed using specific conversational mechanisms to convey the reporter's orientation towards the person and content of the earlier event (Labov, 1972), which then opens up the report to subsequent evaluation and comment by co-located others (Goodwin & Heritage, 1990; Holt & Clift, 2006). Bakhtin's account of reported speech highlights that language is ephemeral, porous in nature, and impressionable to context–and the analogy between reported speech and contemporary reported text (messages) is a productive way to look at practices around the use of messages in face-to-face conversation.

2.3 Other research into mobile phones in use

This review gives the reader the theoretical background to the thesis and my work. Before moving to the empirical chapters, it is worth reviewing briefly other work on mobile phone use. Research into the design and use of mobile phones has expanded alongside the explosion in their widespread adoption. Human–computer interaction (HCI) is one academic field which pulls together multiple approaches and perspectives on technology–a discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them (Hewett et al., 1992). Nevertheless, such is the significance of mobile technology in our lives that the research around it has extended beyond computing science, to diverse disciplinary directions including psychology, media and communications, social geography, economics, public policy–reflecting the ubiquitous nature of mobile technology. This section will outline further mobile phone research in order to situate the work of my doctoral thesis more fully in the wider, critical scholarship around mobile phone use.

2.3.1 Mobilities and mobile phone practice

The contemporary mobilities paradigm gathered pace at the turn of the 21st century in response to the ever-increasing global connection of infrastructures, objects and people. With theoretical foundations in Simmel's 'will to connection' (Simmel, 1950) and encompassing fundamental aspects of human life, mobility studies of how embodied actors communicate, interact and coordinate their activities in complex multimodal environments emanate from a variety of fields including sociology, human geography, computing science, and economics. Global organisation of physical materials requires control of information flows, and mobile technology can become a critical element of moving textual artefacts and multimodal aggregates. In contrast, the mobilities paradigm (Sheller & Urry, 2006) finds that

'occasioned' activities occur while on the move, expanding the concept of mobile phone mobility from one of mere portability to 'mobility in interaction' (Heath & Luff, 2000), referring to the myriad ways in which a particular device may or may not fit with situations of ordinary use because of how that device contributes to and constitutes interaction itself (for example, Arminen & Weilenmann, 2009; B. Brown, Green, & Harper, 2002; B. Brown & O'Hara, 2003; Hamill & Lasen, 2005; Katz & Aakhus, 2002b; Laurier & Philo, 2002; Ling, 2008; Ling & Pedersen, 2005; Weilenmann & Larsson, 2002). The "networked individual" (Wellman, 2002) using a mobile device becomes a *location-free contact point* (Sheller & Urry, 2006). While also mobile, studies of transport or logistics tend to distinguish getting there from activities done there. Developing this notion further, we can see that the form of mobility here goes beyond simple portability. Mobility is what allows information to be looked up as one walks past a landmark in a city for example, and immediately seeing electronic sources as one walks past the physical landmark.

The mobilities perspective undermines existing linear assumptions about temporality and timing, helping to reconfigure what we mean by 'just in time' information–and can help to explicate changes in use and practice around the mobile phone, for example when using maps on a mobile device. The mobile phone as an object itself has a mobility in relation to the talk, gestures and courses of action of its environment. Consequently, we have to deal with the contingent resources in a timely fashion if we want to draw on them, because the relevance of the resource in the here-and-now context is transient–and often unstable. Indeed, the here-ness of the 'here-and-now' has become unmoored in a mobile world, shaping way-finding practices that are now remediated by the mobile map app. With location-aware technology embedded in the mobile phone in hand, the movements of the body itself shape how map apps are then occasioned in particular ways within the pedestrian practices of way-finding.

While mobilities may operate at the global level by means of networked infrastructures, the mobile phone practices discussed in this thesis reveal that the same infrastructures are brought together with more 'local' concerns about everyday transportation, material cultures, and spatial relations of mobility and immobility (Laurier et al., 2016), concerns which are the stuff of 'local order'.

As mobile phone users move through the city, they draw upon their individual and *relative mobility* as a resource. For example, while moving, they may stop to consult the map on their phone, while at other moments they move forward by inspecting the surrounding environment for street names, information signs, or landmarks, and progress on a route drawing reflexively upon all resources available to them (Laurier & Brown, 2008). The

reflexive relationship between reading the map app and the journey is threaded through courses of action familiar from earlier studies of maps and way-finding (Haddington & Keisanen, 2009; Laurier & Brown, 2008; A. H. Weilenmann & Leuchovius, 2004), but digital map apps brings with them new mediated practices, not least walking-the-dot discussed in chapter 6, way-finding practices. Mobility also affects indexical expressions, as location of places and people becomes relationally more fluid.

There have been calls for new approaches and concepts (McIlvenny et al., 2009) to deal with this added complexity, as well as for more research on how mobility affects and constitutes our everyday practices when many of our communicative practices and other activities are now conducted using mobile technology while on the move. Mobility studies have been at the heart of combining established ethnographic approaches of observations and interviews with novel video methods (Heath, Hindmarsh, & Luff, 2010) to investigate the evolving impact of mobile technology on everyday interaction and practices. An early scholar of mobility and mobile phone sharing among teens, Weilenmann commented "In order to do a more detailed and comprehensive study of how the sharing was carried out, we would have needed video and audio recordings." (A. Weilenmann & Larsson, 2002, p. 102). The field of mobility has subsequently been active in exploiting the development of lightweight video cameras for extreme sports to develop recording techniques with mobile subjects (K. M. Brown et al., 2008; Spinney, 2011). Like the experimental work with multiple camera techniques developed by McIlvenny (2013) for recording cyclists and across varied settings, these methods have been concerned with how people coordinate and accomplish their mobility on a moment-by-moment basis. Often these methods deployed the video as a prompt for eliciting post-ride interviews only. In his exploration of the issues around using video cameras in mobility research, Spinney (2011) uses the term 'mobile video ethnography' to describe his study of cycling in the city, in which he used a single video camera to record a cycle trip, sometimes while present in a 'ride along'. The aim was simply to generate witnessable records of activity that could be played back to participants as the basis for a post-ride interview. However, the recorded video and audio materials gathered can additionally lend themselves to ethnomethodology and conversation analysis (EMCA), whereby the sequential analysis which conversation analysis can afford for analysing specific interactions can be combined with the strategic 'making plain' social order of ethnomethodology (G. Button & Sharrock, 2016).

The work of Christian Licoppe in the field of mobilities, has been highly influential to this thesis, both in terms of the theoretical underpinnings and the central methodological

reliance on video and audio recordings. Using a combination of interviews and video recording of phone use, he has identified new forms of sociality that mobile phones afford. An earlier study described the changes in close relational bonding (Licoppe, 2004) between couples, which involved increasingly shorter and more frequent messages exchanged to counter the loss of fixity in time and place previously afforded by traditional land line telephones. More recently, video has been used to document how interactional contingencies have changed as a result of the mobility of mobile phone users. They have become fleeting and temporary, opening possibilities for new locative forms (Licoppe et al., 2015) of communication between pseudonymous users of online dating apps, such as Grindr. Here, the language in messages is carefully constituted of stereo typed conversation (Hauser, 2019), drawn upon to avoid relational affordances of the location based dating app.

2.3.2 Controversies of co-located phone use

As with many new technologies, the advent and adoption of the mobile phone has generated concerns over its effect on sociality and interaction and its potential to cause distraction and social isolation for its users. While these debates are perhaps familiar and well-trodden, there remains something of a paucity of data (Ellis, 2019). How is our interaction with others influenced by mobile device use? While this thesis focuses on everyday practices which are used by people when engaged in mobile phone use in the company of others, the data can also inform the ongoing debates below.

For example, Slade writes of the mobile phone effects: “Human relationships are still in decline. We no longer have the time to take time even with those closest to us. [...] our focus on the tiny devices that fill the void left by social connection has surprising consequences.” (Slade, 2012, p. 9). On distraction, Turkle writes: “Our face-to-face conversations are routinely interrupted by incoming calls and text messages [...] When someone holds a phone, it can be hard to know if you have that person’s attention. A parent, partner, or child glances down and is lost to another place.” (Turkle, 2012, p. 161). Few seem to compliment the mobile phone’s impact on our lives. Further controversy regarding co-located device use has developed around a series of debates around the argument that this use of devices in the presence of others while driving (Hosking et al., 2009) or during university lectures (Tindell & Bohlander, 2012) is distracting or even alienating users (Kuss et al., 2013)–mobile devices being portrayed here as machines which are increasingly drawing us away from our valuable presence with others (Srivastava, 2005). As a contrasting view, Whittaker et al. discuss ‘Information Curation’ (Whittaker, 2011), which can be seen as a social use of mobile

computing where familiar information is used as a personal resource to be kept, managed, and exploited in everyday life, supporting claims that mobile phones can bring us closer to our families (Wajcman et al., 2008) and friends (Baren et al., 2003).

A survey was conducted of 25,142 children (9–16 year olds) in 24 European countries (Livingstone et al., 2012). The survey was conducted face-to-face with one child, one adult guardian and one researcher involved. The report is organised according to a hypothesised sequence of factors relating to internet use that may shape children's experiences of harm, and serves to trace how children's internet use and activities, being shaped by online factors, may have harmful as well as beneficial outcomes for children. Children's technology use is hypothesised to depend on the socioeconomic status (SES) of their household as well as on their age, gender and country. The findings are comparative in several ways: age and gender; national similarities and differences; and accounts of risks and safety practices as reported by children compared to their parents, to mention three. The report succeeds in mapping the online risk experiences of European children. It acknowledges the methodological challenges faced in measuring private or upsetting aspects of a child's experience, and there is a particularly helpful section within the report which gives an account of the methodological principles employed in the project, especially on the ethics of asking children questions about sensitive, private or 'adult' matters.

From this foundational survey mapping of the online risk experiences of European children, Livingstone has used a variety of methodological approaches to investigate and report the online practices of teenagers from 'quasi-ethnography' combined with focus group interviews (Livingstone, 2006), additional surveys (Livingstone & Bober, 2005), in-depth interview studies (Livingstone, 2008), through to journalistic think pieces (Livingstone, 2018). In analysis, Livingstone refers to Gidden's self-actualization increasingly involving a careful negotiation between the opportunities (for identity, intimacy, sociability) and risks (regarding privacy, misunderstanding, abuse) afforded by internet-mediated communication.

Research into the impact of mobile phone use on individuals, groups and society regularly addresses human behaviour and interactions around mobile phones, not the devices or the technology *per se*. The focus and perspective in the majority of this research is upon human behaviour, with the technology itself generally discussed only as a medium through which human behaviour is shaped.

2.4 Conclusion

This chapter has outlined the theoretical approaches underpinning my research approach throughout the doctoral studies. I have introduced the theories and approaches which have informed my perspective on practice as an analytic category, in addition to the role of material artefacts, and how a sociological frame might be used to conceptualise the practices of mobile phone use. The final sections of this chapter presented further research into mobile phone use to contextualise the thesis. All resources mentioned have been important in shaping how I have broadened the scope of analysis from our interactions with the mobile phone, to encompass the publicly available resources drawn upon in recurrent actions to form practices constitutive to social order and the practices of co-located mobile phone use.

3 Hybrid Research Methods

In the previous chapter, I introduced the theoretical resources underpinning the thesis and discussed different conceptual approaches to studying mobile phone use. In this chapter, I will account for the 'How did you do it?' question, by explaining the research methods adopted and adapted in the studies included in this thesis. Studying technology practices which are mobile and not fixed to a particular context or physical location is challenging, and calls for a variety of tools and approaches. Adapting and using a combination of methodological techniques has been key to the collection of rich research data of mobile technology use in situ. This chapter describes the research methods used and the settings in which they were deployed. I will also elaborate the thinking behind the approaches adopted and consider ethical issues.

The research design for each study had the overall aim of gaining access to the empirical world of ordinary, everyday mobile phone use and thereby gathering 'raw' research material. Collectively, the methods deployed to complete this three-stage approach were qualitative; beyond that, they could more accurately and precisely be described as ethnographic. While each study design was uniquely shaped by its setting and the research questions pursued, all shared a commonality in looking at a contextualised view of mobile phone use. As a result, methods were designed and adapted to get at the *situated use of mobile technology* in a way that introduces the least disruption possible to the ongoing use of the technology, while allowing the researcher to record research material for repeated analysis. Methods using *participant observation* and *situated interviews* were selected to ensure that the research material recorded something of the visceral and embodied experience of being in the place and, to some degree, the conditions of work, the setting, or the task being studied. The analytic approach relied upon empirical material, rather than prescribed theories and hypotheses.

Each study undertaken has informed those that followed, from the initial micro-focused analysis of face-to-face interactions occurring around mobile phones, to the broad ethnographic approach adopted for the study of large-scale organisational communication and the role of mobile chat apps within it. As the object of study changed, I have progressively adapted the research methods used and evolved accordingly. The distinctive approaches adopted across the five studies have included interactional analysis of *in vivo* video (as reported in papers I, II and VI) and situated interviews used to explore changing

work practices of taxi driving (reported in Paper III). Next, an adaptation of the 'ethno-mining' approach involving trace data and low-fidelity probes as prompts for interviews was deployed to understand the maintenance of the batteries which power mobile technologies (Paper IV), as well as the potential impact of speech agents on workplace meetings (Paper V). Finally, this doctoral thesis culminated in a longitudinal workplace ethnography (reported in Paper VII). Using a combination of adaptive methodological techniques has been central to overcoming the challenge of understanding mobile phone use. This chapter provides an overview of the key methods adopted for data collection and analysis of each publication.

Table 2 A summary of methods used in collection of data for each publication.

	Publication	*Methods Used*				
		in situ video filmed by lightweight cameras worn by participants	Recording app loaded on participant's phone	Situated interviews in participants' place of work	Trace data & probes used in interview	Ethnographic observations, photographs, video & field notes
I	**iPhone *in vivo***	✓	✓			
II	**Searchable object**	✓	✓			
III	**Disrupting the cab**			✓		✓
IV	**Caring for batteries**				✓	
V	**More to meetings**	✓		✓	✓	
VI	**Text in talk**		✓			
VII	**Chat at work in the Global South**			✓		✓

3.1 Research design in HCI

Getting access to mobile phone use for research purposes can be challenging for a number of reasons–the phone is small, discrete and used continually in very mundane ways which can make it difficult to either record or document the use, and equally it can be difficult for research participants to even recall the minutiae of all of their phone use. Researchers have deployed different approaches and methods which, in turn, shape what to study–the object of analysis–and how to study it.

In qualitative research, the predominant methods for studying mobile device use have been post hoc interviews (e.g., Barkhuus and Polichar 2011), diaries (e.g., Cambier, Derks, and Vlerick 2019), or a form of automated experience-sampling (e.g., Berkel, Ferreira, and Kostakos 2017). These methods have certain strengths–in particular, interviews can be used

to support a broader investigation of the values and feelings of the participants and their attitude towards the technology. With interview studies, however, there is a danger of interviewees reporting on the unusual or spectacular accounts of device use, while potentially overlooking or simply not remembering the humdrum use that constitutes the majority of their experience with mobile technology. Silverman's work on the "interview society" points out that interviews have become such an established part of the reproduction of news and information that interviews support a certain "artful and constructed character of lives and experiences" (Silverman, 2007). While revealing aspects of use, its reliance on interviews and diary reporting means that its *description of use is indirect*. There is a lack of description of actual cases of smartphone use in the self-reported data.

In contrast, logging methods can automatically collect data from the device for analysis on which applications are used, alongside an analysis of the time and length of use, for example (Böhmer et al., 2011; Henze et al., 2011; M. Kamvar & Baluja, 2006) Automatic logging studies involve instrumenting the device to provide a quantitative marker of every instance of phone use–including the forgotten and failed uses which elude the memory. As such, this approach can aggregate behaviour over large populations of participants, and the quantitative logs give relatively unfiltered and unmediated access to system use as designed and specified by the research team. Used in combination, large-scale logging studies can contribute to an understanding of the practices observed in small-scale qualitative studies, by giving a sense of the significance of particular practices within a broad community of users. Quantitative data of phone use can answer questions arising, such as how many people do this, or have a problem with this? This has proven particularly useful in the field of HCI in identifying problems of form in technology, be that in the hardware or the user interface, and then in evaluating fixes for these issues to optimise solutions for specific interaction issues.

While studies of mobile devices instrumented with sensors are able to capture data on aspects of the user's context, such as the time, location, movement, duration and sequence of app use and even audio, nevertheless, there remain challenges and limitations in analysing such phone use. In particular, one of the key challenges lies in fully understanding the situation of use. How do mobile phone practices unfold as they happen *in situ*? Observational and shadowing techniques offer certain insights, but they struggle in tackling the truly distributed and heterogeneous locations of mobile use. Even if a researcher were able to follow and capture use in all the array of situations where the phone can and does get used in everyday life, such techniques might be intrusive on the natural behaviour around these technologies. If observation and shadowing is to be preserved and recorded on film,

then the challenge is even greater. Video recordings of pedestrian practices have previously been collected from fixed perspectives because of the variability of pedestrian movement (Adey et al., 2014; Dollar et al., 2009). However, this would capture only fleeting instances of our participants as they progress through their everyday activities. Furthermore, it can be difficult to combine a researcher's observations of device use with adequate access to the actual content on the devices at the centre of the study–that is, to see what the participants being observed can see on their smartphone, due to the difficulties of being able to see and record the small, reflective glass screen of a mobile device externally.

Previous research thus leaves much about modern mobile device use unanswered. In particular, there is little in the way of understanding the details of the usage of particular applications and what shapes usage beyond simply what applications are used when. For example, what prompts the use of particular applications at particular times and locations? What purposes are different applications put to? How might application use be influenced by the setting, what role does a task have in use, and how might smartphone use influence action more broadly? These sorts of questions suggest that a different methodological approach may provide a fuller understanding of the technology use under scrutiny.

Moving the focus of study away from the technology, some studies have tried to categorise the user based on personal characteristics (Banerjee et al., 2007; Ferreira et al., 2013). However this approach overlooks how much a user behaviour or practice is influenced by contextual factors–what is happening in the situation of use. To address the lack of contextual understanding, other studies have conceptualised the user as engaging in situated awareness (Sellen et al., 2006), constantly reacting and adapting to the context, and the circumstances in which she or he finds themselves. These heavily frame and shape the ways in which they are able, or choose, to use their mobile device.

The point is not to dismiss any of these fundamental methods; indeed they are techniques that are combined to some degree to form the overall methods used here. Rather, it is to understand in what way different methods can reveal some aspects of use, yet obscure others.

3.2 Using video to study technology in HCI

Video recordings have been one longstanding method used in the HCI field for a range of different analytic purposes, but particularly to document interaction with and around objects and technical artefacts (Heath & Luff, 2000; Hindmarsh, Fraser, Heath, Benford, & Greenhalgh, 2000; Vom Lehn, Heath, & Hindmarsh, 2001). This research has extensively studied interaction around screens, capturing on-screen interactions as part of ongoing

complexes of work practice (Heath, Svensson, Hindmarsh, Luff, & Vom Lehn, 2002). Video has proven valuable in illuminating aspects of activities neglected by previous methods, particularly drawing on conversation analysis to understand technology in use.

Using video methods to study mobile use, however, presents considerable challenges. Since the users themselves are largely mobile, fixed cameras are of limited use. Small digital wearable cameras, while potentially portable, also have a number of limitations in battery life and flexibility. Camera angles can be vital in capturing the situation of use and mobile cameras are more difficult to aim, constrain or control. While fixed cameras can be pointed at desktop computer screens, this is not as easy with mobile devices, which may be held at any angle, in sunlight, and may have particular software limitations.

3.3 Ethnography and data collection

Developing initially out of the desire of colonial powers, like the British empire, to record and catalogue far-flung, foreign territories, ethnography is a qualitative research method which emerged from the disciplines of Anthropology and Sociology. An early example of ethnography is Mead's study, 'Coming of Age in Samoa', a renowned study investigating the experience of adolescence (Mead, 1928) in Samoan society. Charged with colonialism in the 1950s, ethnography moved its attention from the study of 'exotic cultures' to examine sub-cultures closer to home, including local sub-cultures like British punks (Fielding, 1981), as well as corporate organisations (Baritz, 1960; Barley, 1996; Burawoy, 1982). This represented a paradigm shift from objectivity to subjectivity, as the ethnographic researchers' view moved reflexively upon themselves and towards understanding their own community.

Since such beginnings, ethnographic methodology has been adapted and used for studies of working practices in commercial and governmental organisations, in addition to communities of cultural identity. In this way ethnography has been introduced to other research disciplines, in seeking to acquire the participant's perspective of everyday life, rather than by subjecting the same participant to laboratory experiments or decontextualised interviews. This distinctive ethnographic perspective (Geertz, 1983) was characterised as 'emic' by Clifford Geertz and refers to the 'insider analysis', which seeks not only to extract research data from participants but to learn about their pragmatic insights–their reasoning for doing what they do. An ethnographic study will draw upon both *emic understandings* of the participants themselves, and *etic conclusions* accumulated by the researcher across the duration of a study.

Direct engagement with subjects is emblematic of ethnographic fieldwork, with the contact found in an interview situation providing the minimum participant engagement required, although ideally contact would extend beyond the confines of an interview, and involve observing participants in different settings. In addition to direct engagement, the self-critical ethnographic discipline of reflexive observational practices is supported by continual recording of field notes. Without *participant observation* and *situated interviews*, data can lack the visceral and embodied experience of being in the place and, to some degree, experiencing the conditions of the work, setting or task being studied. Due to this central aspect of the approach, ethnographic research is predicated upon remaining in the field for a lengthy period, staying flexible in terms of what to study and how to study it, and avoiding prescriptive assumptions.

Table 3 Checklist ethnographic observation, to ensure relevant information is recorded in field notes. In particular, when approaching a new domain and everything is new and strange (Goetz & LeCompte, 1984)

- Who is present?
- What is their role?
- What is happening?
- When does the activity occur?
- Where is it happening?
- Why is it happening?
- How is the activity organised?

The data gathered in ethnographic research traditionally takes the form of written field notes, supported by audio and video recordings. The challenge remains in any new field site that what is happening is so rich that it is difficult to know from the beginning what to focus on and what to record. In order to become sensitised to as many aspects of the environment as possible, and to record as rich a view as possible, Goetz & LeCompte provide a systematic series of questions (Goetz & LeCompte, 1984) that the researcher can seek to answer to shape her or his perspective on what is happening in a scene an which will in turn help to ensure that information recorded in notes is significant and worth noting. Of course, these questions must be augmented to reflect the particular research interests and question; however, they provide a reliable structure when a study setting is unfamiliar and, indeed, the research questions are still evolving.

3.3.1.1 Ethnomethodologically informed ethnography

> *"The reported phenomena cannot be reduced by using the familiar reduction procedures… without losing those phenomena." (Garfinkel, 1991, p. 108).*

To gain a fuller understanding of the phenomenon of mobile phone use rather than using quantitative data, which abstracts use to numerical statistics, or resorting to imagining how mundane everyday phone use is produced, the study of mobile phone practice requires a pronounced ethnographic turn. Suchman's (1987) ground-breaking study of photocopier use was such an ethnographic endeavour, and it established fundamental intellectual foundations for the fields of HCI and CSCW and began a long tradition of studies of *technology in action* (Dourish & Bell, 2011; Gupta et al., 2014; Heath & Luff, 2000; O'Brien et al., 1999) It is worth noting, nevertheless, that while Suchman is closely associated with ethnography and fieldwork, the research is probably best known for the grainy black and white video analysis of early photocopier usability evaluation which was conducted in a laboratory setting (Rooksby, 2013). What was new in the context of Suchman's work at the time, was a turn away from the prevalent cognitive perspective on human input processing–the idea that all actions are preceded by mental operations, which are then executed in action, and that collaborative interaction with others, are the result of the inference of each other's mental models. Suchman drew on Garfinkel's documentary method–the concept that members themselves are continually engaged in treating the things that they encounter as *evidence*, as types of *indices*, which are used in contingent sense-making about what is occurring here-and-now in the ongoing constitution of social order.

Suchman's work (Suchman, 1987) was a significant catalyst in the turn towards social analysis of human practice in the computing science domain. Like her contemporaries working in the Lancaster School (Bowers et al., 1995; R. Harper et al., 1989; Hughes et al., 1992), Suchman drew upon ethnographic approaches to research technology use, in order to observe the practices and interactions as they happened in their situation of use. Prior to video recording the photocopier interactions, she had conducted 20 hours of fieldwork in the classic ethnographic style; that is, making written field notes and observing people trying to use the photocopying machines. In a footnote Suchman explains that these observations confirmed the complaints Xerox had received from users that their machines were too complicated to use. However, she acknowledged that the field notes and observations left her 'confused' on what were the issues, or how to resolve them.

Suchman was also one of the first to use interactional video analysis to study practice around technology. Indeed, she championed the use of video, having concluded that fieldwork had not helped her understand the issues with the failing photocopier: *"the methodological problem at that point was that I, as an observer, was equally confused … To understand the problem would require an appropriate i.e. videotaped, record"* (Suchman,

1987, p. 118). Suchman went on to describe how she adopted a kind of "uncontrolled experimentation", to render photocopier use into an accountable and observable activity using video recordings. She filmed two leading cognitivist scientists (Ron Kaplan and Allen Newell) attempting to make sense of, and use, a Xerox photocopier to copy various documents. The video was recorded from fixed cameras in a set-up photocopier room where they are seen collaborating on a practical problem. They interacted with each other and with the machine, resulting in the *observable-reportable* work required to get the technology to do what they both set out to achieve–namely to photocopy the pages of a book.

This configuration of two participants was by no means accidental. Participants working in pairs were given a set of tasks to perform, and asked to think-aloud as they went. Suchman describes how pairs were used to work together because, "each makes available to the other what she believes to be going on… [and] she provides that sense to the researcher as well" (Suchman, 1987, p. 123). This reasoning has been applied in the studies discussed in this thesis, where video data was being collected in order to help capture the observable-reportable accounts of our participants, alongside their visible interactions recorded on video.

Suchman worked with Garfinkel during her time at Xerox PARC, which is significant because, while the idea of *human-machine interaction* was already commonplace at that point, her take on it was distinctive in being attuned to the premise that this was interaction and therefore social. She brought the theoretical and methodological orientation of ethnomethodology (EM) and conversation analysis (CA) to examine the interface of the photocopier, thus bringing a focus on the sociality of the human–machine interaction which was both innovative and generative. Suchman's work has clearly been influential on the EMCA orientation brought to bear in the ethnographic approach adopted in this doctoral thesis.

An EM orientation seeks to understand the orderly ways that social interaction unfolds in ordinary life, while CA focuses on language-in-action; the latter provides the empirical method to investigate the sequential implicativeness of the organisation of social interaction's constituent elements, including turn-taking, the selection of speakers, the 'repair' of utterances in talk and the use of prosody. These two approaches are often combined (EMCA) and used in research which does not look for causal explanations for action. Rather, EMCA research provides the *emic perspective*, which articulates the methods that are used by individuals in organising their everyday affairs in the world–that is, how actions produced by members are done in ways that render them recognisable for other co-located members of the situation.

EMCA's analytic focus on the sequential implicativeness of interaction has been used as a lens to investigate online actions despite their heterogeneous material forms: text messages (Hutchby & Tanna, 2008) and online chat exchanges (Hutchby, 2001; O'Neill & Martin, 2003; Smith et al., 2000), and search engine use (Moore et al., 2011) share similarities in sequential organisation despite their different material forms. While social media use and text messaging are clearly different from talk, people can be observed drawing on existing methods of interaction for their mediation. Reeves & Brown discuss four sequential organisational forms found in social media actions: adjacency pairs, sequential context, turn allocation / speaker selection, and repair (Reeves & Brown, 2016).

The fields of ethnography, ethnomethodology (EM) and conversation analysis (CA) are closely interrelated epistemologically; all three are concerned with determining the methods and resources that the *interacting participants* use and rely on, to make sense of and contribute to their ongoing local interactions.

3.3.2 Use of interviews in research

Much of the analysis conducted in this thesis is based upon what participants say, for the reason that language is our key to understanding human action. The talk data was collected through different research techniques described below.

First, *talk-in-action* refers to talk observed particularly in video recordings collected via phones and wearable cameras, and during 'in the wild' participant observation of people at work. This talk is naturally occurring, and part of an ongoing system of action. This talk and language is most valuable for understanding lived experience, and is required for the moment-by-moment analysis of everyday routines and actions.

Second, *informal 'situated' interviewing* involves asking questions of participants while *in situ* as the action occurs. So, for example, a situated interview might occur while a researcher is observing a participant as she or he works. Like the observation of talk-in-action achieved in analysing video recorded research material above, situated interviewing is closely linked to real-time action and connected to issues that are relevant and understood by the participating interviewee. Rather than prescriptive questions, this kind of interview is driven by comments and observations as action unfolds: for example, queries like, "Was that the same message sent again? That email seems a bit random!", allow the participant to explain what is happening, which may otherwise make no sense to the observer, this can help to surface some of the 'taken-for-granted' shared knowledge that accumulates within groups who collaborate together in the work setting (but which could occur equally in non-work

collaboration). This is the kind of knowledge and understanding which would not easily be accessed in a retrospective interview, conducted out of context. A situated interview can also happen more spontaneously when the researcher finds her or himself with face-to-face access to someone who could inform a study. For example, in the final empirical study of the thesis, while shadowing an area manager during his work in a remote rural area of Andhra Pradesh, we mentioned that there was no data signal on our own mobile phones. We were then able to ask our driver more questions about the particular area and we were able to learn that the local telephone towers in this region were regularly sabotaged by anti-state activists and that this compounded the normal, natural troubles of connecting to the network in remote areas. As a result, field workers in the region were forced to return to local office hubs to upload weekly reports and information via a dial-up modem, rather than remaining in the field– conflicting with what management at headquarters wanted. Situated interviews like this allow the researcher to identify ways in which the immediate environment has an impact on how the work gets done and to explain why things happen in the way they do. While it is clearly not the same as doing the work, it provides a richer understanding of the conditions of work. Situating the interview in this way can allow the data collected to focus on a more visceral and granular understanding of the experience of technology use while also talking to the grand arc of the impact of top-down strategies of organisational communication.

Third, *intensive interviewing*, unlike the approaches mentioned above which are driven by real-time events and processes, is conducted from the perspective of the interviewer, and can be *formative* or *summative* in nature. As a result, the kind of talk data collected provides a response to questions, and it is therefore concerned with reporting and explaining external and past action. Intensive interviewing can be suitable for studies when the culture is either not understood or already well understood by researchers, through field work conducted by themselves or through previous work. Formative interviews to learn about the study setting can begin in advance of observational fieldwork, and allow the researcher to be better prepared to work in field observation mode. The formative interview might best be conducted with domain experts as interviewees, such as friends or acquaintances who work in the field to be studied. In the case of my ethnographic study conducted on the use of chat apps in large-scale organisations, the formative interviews were conducted on a separate day-long visit to the two main organisations. During those visits, four of the research team had face-to-face group meetings with different members of management in central headquarters (including the CEO, finance director and similar), during which the managers gave short presentations on their role, as well as their particular objectives within the organisational

mission. This informed our understanding of what the management's strategic, top-down aims and objectives were for the communications ecosystem of the organisation, and what they hoped the introduction of the beta chat app might achieve. This was an anchor point from which to gauge what was happening on the ground during our observations of what staff did to get the work done.

In contrast, the summative interviews provide additional cases by which to retrospectively confirm the ethnographic observational fieldwork or 'situated' interviews which have been conducted closer to the real-time perspective on the action being studied. Alternatively, they can provide divergent cases which point to future developments and research opportunities. In the case of my study of Uber ride-hailing services, the interview with a member of the regional management of Uber occurred after all the other stakeholders had been interviewed (including drivers, passengers and union personnel). The later interview was an opportunity to check some of the explanations put forward by drivers and passengers about the apparently arbitrary way some of the features of the Uber app operate.

In summary, while talk-in-action gives us the richest understanding of situated action, the recorded data can only reflect that particular moment in time. Intensive interviews allow the researcher to probe further to understand the meaning of a specific action or situation more deeply, and also to ask questions about alternative variants of the setting. So the talk harvested from such interviews takes a different perspective on the action: this is reported action, and provided by participants despite the difficulty of remembering mundane details of the setting, the unfolding action and other detail which would have been available through recording. Therefore it is the job of the interviewer to go with the participants' reporting and facilitate the best reporting of those participants.

Moreover, using prompts such as trace data of the interviewee's location in time, as used in Paper IV, can be helpful in co-creating an account of past action, allowing the interviewer to move closer to a real-time perspective on events, as they help the interviewee reconstruct a more detailed memory of events as they happened. The use of objects or environments as conversation pieces can be useful, especially in cases where artefacts or practice are connected to the research–so, for example, in Paper V, the low-fidelity prototype of a speech-based meeting agent created using real speech data from previous meetings was introduced during interviews in order to help participants imagine how the technology, which had not yet been developed, might perform, and to consider how they felt about the technology being introduced into their workplace meetings. These objects can be used to prompt participants to

think of specific scenarios that they have forgotten, and help to bring concrete specifics, rather than generalisations, into the discussions.

The decision about what kind of talk to gather–talk-in-action, situated or intensive interview–is dependent upon a variety of factors such as the research questions being pursued, or what understanding or data is already known about the topic under scrutiny. However, the shared objective of all the interview approaches discussed here is a desire to generate deeper insights about our object of study. There is little point in conducting an interview to hear what is already known and fully understood.

Another significant factor in deciding what kind of interview to conduct is the study setting. While it may be the preferred choice to gather talk-in-action to gain a rich understanding of context and experience of action, there are certainly situations where that is not an option. It may be hazardous for the participant or researcher, or both–or there may simply be no participants willing to take part in an observation study. In the case of the Uber study, the drivers were not willing or able to take time out of working to be interviewed, so we worked around their constraints and conducted the interviews while they drove us on trips which lasted around 30 minutes. In some settings, therefore, it is necessary to work with whatever research material is available, and then assess what can be done to augment, triangulate or counter any perceived weaknesses.

3.3.3 Trust and rapport in the field

Going into the field–whether to observe or interview participants–it is essential to gain access and the trust and respect of participants quickly and generally encourage a flow of information by assuming the role of one who is to be taught, or what Lofland et al. describe as the "socially accepted incompetent" (Lofland et al., 1995)–easier for some to adopt than others. Participants should not feel under pressure, and an interview should never begin with a phrase like; "Right, let's get this interview done." To have access to the time, knowledge and opinions of participants who are embedded in the domain of study is invaluable to a researcher–and should be accorded the respect it deserves. Taking some time before diving into an interview to demonstrate genuine interest and respect for an interviewee's perspective seldom fails to pay dividends in the long run. It is an opportunity to explain a little of the background to the research, to assure participants that they are not being tested, and to explain that they are contributing to the project by providing a window on very ordinary, everyday activity–what they do, and how they do it. It's even worth explaining that when they 'fail' to use technology perfectly are opportunities for designers and researchers to learn

more about the technology and its design. This pre-interview 'briefing' allows the researcher to set out some expectations and boundaries to what areas will be covered in the discussion, which can help to further put the participant at ease.

The work discussed in this thesis has often highlighted the need for sensitivity to the ethical and procedural questions at play, since, as in other domains such as transport and hospitality, problems have already arisen in examples of technology which entrench pre-existing discriminatory biases present in society. The point is not to avoid sensitive topics, but instead, to be prepared to address these issues reflectively and proactively as they might arise in the interview (or during situated observation) by understanding the existing regulatory pathways from central agencies and, as with any emerging technology, exercising caution against biases or magical thinking when it comes to what the technology is designed to help with. In a similar vein, with the introduction of any new workplace technology, there may be changes to practice and potentially to certain specialised roles (e.g., London black cab drivers), and therefore, ongoing care with communication within the interview should include sensitive consideration of the likely personal consequential impacts of introducing technologies for the interviewee. To this end, all data used in this thesis has been anonymised.

3.3.4 Ethical considerations of participant observation

In all but the final study, I have been deeply involved in the strategies adopted for ensuring that participation was well informed, and that no harm came from taking part in the research. In the final study, Microsoft (who were hosting the research) was responsible for notifying participant workers of the research being undertaken in their workplace and that their care was maintained throughout.

Observational research, and particularly research that involves the collection of video data, presents specific issues. Do the participants understand what they are sharing with us? Are they sharing data that they would prefer not to? What about others in the background who are caught in recordings? Three core ethical issues become apparent: *consent*, *compulsion* and *third-party consent*. In terms of consent, techniques were developed in the *in vivo* video projects: participants had to explicitly approve any data that they shared with us. Each participant was given a unique website address which they could log in to and review their personal video data. They had the option to hide their video data from researchers by selecting a 'check box' in a simple process. There was a small proportion

of video data that was hidden in the project. This meant that participants were involved in the data collection, and they were asked to reflect upon the data-sharing process.

In terms of compulsion, participants were gifted vouchers to reward their participation. There is the question of whether they might share data that they would rather not, but feel a compulsion due to the remuneration. As according to Swedish practice, there was no cash remuneration for participants involved–only vouchers, and this means that there is less chance of participants feeling obliged by compulsion to share data that they do not want to. Finally, video data by its nature captures the environment and thus potentially any third parties who are communicating with the participants. Participants were verbally asked to inform companions of their participation in the project. While not perfect, this approach goes some way toward gaining additional consent from third parties who might be included in the study. Thereafter, research material which is used in publications was anonymised.

More broadly, my approach to research methods is a collaborative one. The goal at all times is to operationalise the research questions in close collaboration between the project members and my scientific advisors. In order to ensure ethical, methodological and analytical standards, I interacted with advisors, network partners and international peers. There is a growing body of studies of mobile phone use within several disciplines, and ethical issues are becoming more actively discussed within HCI, regarding the challenges of ensuring anonymity in 'big data' datasets (B. Brown et al., 2016), as well as how to handle personal communication data (Segerstad & Weilenmann, 2013).

All of my research meets with the Swedish Research Council's Ethical Principles[7] in the humanities and social science research, requiring that research simultaneously satisfies; a) the research requirement, to carry out important, high-quality research, and b) the protection of the individual requirement, which means that the participants must not be harmed. The Individual Protection requirement clarifies rules requiring information on consent, confidentiality, and how research materials may be used.

3.4 Data analysis

As when selecting collection techniques, decisions about analysis are driven by the research questions, and the eventual focus of the study. For my studies based on the

[7] https://www.vr.se/english/analysis/reports/our-reports/2017-08-31-good-research-practice.html

collection of raw video data, our ability to observe and hear the moment-by-moment configuration of sequential interaction around the mobile phone was critical to understanding how collaboration was achieved. Therefore, the raw video recordings were meticulously combined in editing software to ensure synchronisation across all three sources; all talk was transcribed using protocols of Jefferson notation (G. Jefferson, 2004). The transcription process helped to concretise information about sequentiality of action, overlapping talk, pauses in talk, prosody, gesture, gaze and bodily comportment that could be observed in the video, and the resulting transcripts became an accessible, reproducible and easily shared research material. In this prepared form, the video research materials were then available for repeated viewing, replay and analysis in group data sessions, which allowed invited external researchers to take part, who had no prior understanding of the setting, and bringing fresh insights to the corpus.

In terms of creating archivable data of talk, the preferred approach was to record all the audio during the course of research as a minimum record of events–then to transcribe what was relevant, for subsequent analysis. All interview recordings were duplicated, labelled and archived. The Uber situated interview study was archived using software (NVivo); however, the other interview studies were stored as simple files, to help with transparency in accessing the content in the files. With a copy of the data carefully archived, the audio recordings were prepared by transcribing all talk, with the inclusion of relevant contextual information (demographic detail regarding the participant, date, location and any notable events occurring during the interview). Of course, there is a balance to be struck between processing all recordings collected and the practicalities in terms of the time and effort involved, and the information gained from doing so. For studies where the interview data is central, such as the Uber study, all interview recordings were transcribed. In the longitudinal ethnography of chat applications, only key interviews which were relevant for the whole research team to read and understand were transcribed.

3.4.1 Conversation analysis

Conversation analysis (CA) has been an important element of the research methods adopted throughout the thesis. In particular, it was relevant to the analysis of the practices observed in video recordings of co-located interaction around mobile phones. CA can inform analysis by highlighting the ‘resources’ which are available between speakers in interaction (Pomerantz & Fehr, 1997; Schegloff, 2007; Sidnell & Stivers, 2013) through with which actions are accomplished. The resources are ‘to hand’ and range from gesture and eye gaze, to objects

found in the immediate environment. As a frame for analysing sense-making in conversation, Goodwin argues that a sentence spoken may not be fully understood without considering the 'situated occasion of its production' (Goodwin, 1979, p. 97), and he transcribed short video recordings which had captured interactive phenomena.

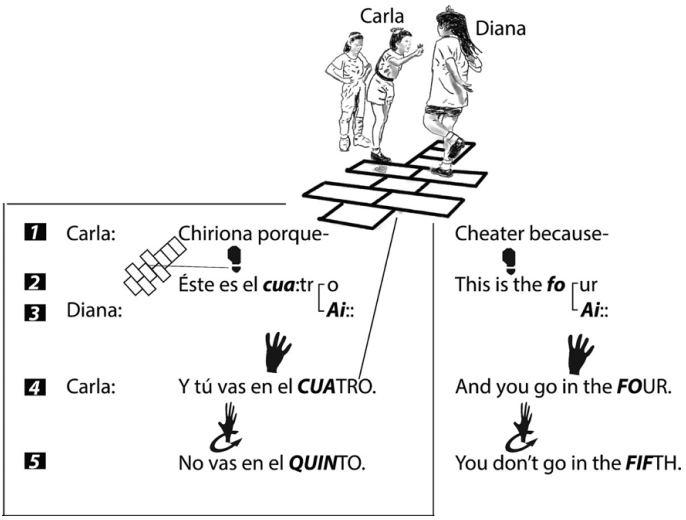


Figure 4 Conversation analysis (CA) of this short dispute in hopscotch documents how Carla builds her action by deploying a number of different semiotic fields simultaneously–including her choice of words, prosodic intonation of voice, and also gesturing by pointing her hand and stamping her foot (Goodwin, 2000, 2017).

In Figure 4, Goodwin uses transcription to document *double duty* gestures, meaning deictic actions which simultaneously present speech and gestural acts–such as the child who stamps her foot on square number five while shouting out the number five. Such 'double duty' gestures serve two purposes: to tell the recipient what box to jump to in the game of hopscotch, and the stamping foot physically indicates where the other player should be standing. Similarly, in the field of technology, Tse et al. have explored how speech and gestures form part of methodical, consequential communication and interaction with others (Tse et al., 2007). The study makes explicit how particular simultaneous speech and gesture acts over an interactive table top can be interpreted as *double duty* multimodal gestures, serving to both operate the interactive table, and also provide a visual cue of thought and intention to collaborators. Tse et al's conceptualisation was in thinking about how our

participants collaborated over and around the touchscreen of their smartphones, for example during map-reading with Google maps.

Papers I, II and VI adopted a similar approach by transcribing talk in interaction occurring during mobile phone use. Figure 5 provides a glossary of the notation and symbols which have been used in creating the transcriptions of this thesis.

Glossary of Transcript Symbols

`regular font`	Talk
`[overlap talk]`	Square brackets denote a point where overlapping speech occurs.
`(0.3)`	Numbers in parentheses indicate elapsed time in silence by tenths of seconds. For example, (0.3)is three-tenths seconds.
`(.)`	A full stop inside brackets denotes a micro pause, a notable pause but of no significant length.
`Underscore`	Indicates some form of stress through pitch or amplitude in voice.
`U::h`	Colons within one word represent elongated speech, a stretched sound.
↑	Upward arrow indicates it means there is a rise in pitch or intonation.
↓	Downward arrow indicates a drop in intonation.
`°low volume°`	Talk uttered on a lower volume than surrounding talk.
?	Rising, questioning intonation.
=	An equal sign at the end of one line and at the beginning of a next, indicates no gap between the two lines, they are 'latched'.
`:h:h:h`	A row of h's within a word indicates breathy laughter.
`[*]`	An image taken from video showing this utterance is included within transcript.
`(( ))`	Doubled parentheses contains the transcribers' descriptions rather than, or in addition to, transcribed talk and action.
`(word)`	Parenthesized words are those not understood or heard by transcriber, or identifications of speaker.

Figure 5 A guide to the symbols and notations used in this thesis, to transcribe the talk and interaction seen in the video recordings gathered. (G. Jefferson, 2004; Gail Jefferson et al., 2015).

3.4.2 Interactional video analysis

As a distinctive approach to studying technology-in-action, interactional video analysis has proven particularly popular within the field of computer-supported cooperative work (CSCW). In this research tradition, situated fixed cameras, in settings such as control rooms, surgeries, homes, offices and museums, are used to record technology in action (Christian Heath & Luff, 2000; Hindmarsh et al., 2002). The resulting video data support analysis of the details of interaction, allowing precise understanding of the sequence of how verbal, physical and technical resources are brought to bear in artful and complex ways. Interactional video analysis draws on CA and EM, already mentioned, with its focus on fine-grained analysis of sequential interaction and activity.

In interactional video analysis the visual, embodied and spatial organisation is foregrounded, perhaps more so than other approaches, where these aspects of interaction are often overlooked. Indeed, the video format facilitates in-depth exploration and recursive replaying of the audible and visible details of an interaction and, as research material, the repeated viewing allows the identification, recognition and establishment of phenomena which can otherwise be omitted.

One well-established application of interactional video analysis has been in workplace studies, looking at how the sequence of interaction with gaze, talk and interaction with objects is consequential. Luff & Heath use this approach to examine mobile interaction (Luff & Heath, 1998), developing the concept of 'micro mobility': the ways in which information–particularly paper documents–comes to be deployed in face-to-face workplace settings. Video data forces attention on the moment-by-moment production of technologically mediated action. Analytically, interactional video analysis pays close attention to a small number of incidents, rather than attempting to present general findings about use. Following CA, the focus is on trying to understand 'why that here': how sense is made of a situation through the use of talk, gesture and interaction. Within HCI, interaction video analysis has been further applied to study non-work settings such as research on driving with GPS using cameras mounted in cars to record drivers' navigation (B. Brown & Laurier, 2012).

3.4.2.1 Ethnographic video material

Video recordings can be used in building an ethnographic perspective on co-located interactions around mobile technology. The video gives us a record of talk and the precise detail of its sequential organisation, which can subsequently be transcribed and analysed. In terms of contributing to the ethnographic perspective of mobile phone use, the video gives us an embodied representation of what participants can see. Of course, video cannot replicate what the human eye sees, but interactional video analysis of recordings of phone use does highlight the embodied problematic cases, such as the difficulties of sharing and orienting to a small artefact in collaboration, for example. In video recordings of way-finding with mobile map apps, it is possible to see how participants deal with the ecological constraints of the material dimensions of the device. This form of participant observation (repeated viewing of video recordings of use) uncovers the work done to integrate bodies, artefacts, information and talk in interaction around the phone. This embodied and social view of mobile phone use–from the perspective of those co-located around the device–is not possible to achieve by means of logging or recall-prompted interviews alone, nor the classic ethnographic fieldwork method of participant observation (Lofland et al., 1995). This section has introduced the main methods used in gathering the research material that forms the basis of this thesis. In all five studies, the object of study has been the mobile phone and, precisely because of the diversity of use to which the device can be put, there has been a need for methodological pluralism; one which remains open to different methods and approaches, in order to contribute to the understanding of the continuously evolving role of mobile technology in our lives. The following section will describe how the methods were applied.

3.5 Application of hybrid methods

Over the doctoral studies, I have researched technology-in-action in diverse settings: personal mobile phone use in Sweden, the UK and US; speech recognition technology for workplace meetings in Silicon Valley, California; and the use of mobile chat apps in workplace communications among a distributed workforce in India. In addition, over the five years between the first and last empirical studies, mobile phone technology has also developed and evolved.

By necessarily switching between and iterating various research methods, to marshal empirical evidence of phone use ‘in the wild’, my fieldwork became a hybrid of time, place

and methods. Through the fieldwork, I have learned to listen to what people say and look at what they do with their phones, to analyse and understand the constituent parts and integrated whole of their situated practice of co-operative mobile phone use.

Rather than a passive, heterogeneous backdrop, place and setting have been found to be consequential to the practices of technology use (Adomavicius & Tuzhilin, 2011; Dourish, 2004; Forlizzi & Battarbee, 2004; Jiang & Yao, 2006). Places are both subjective and continually evolving (Pred, 1984), and the setting was an active factor influencing my methodological choices: from the difficulty in finding and recruiting participants who were willing to share video recordings of their mobile phone interactions in the highly privacy-aware setting of Sweden; to rural India where, by contrast, the scarcity of expensive hardware and the unreliability of infrastructure often resulted in collaborative sharing of mobile phones and reliance on local face-to-face communications.

3.5.1 Study settings

The research material discussed in Papers I, II, IV and VI was gathered by myself from Sweden, although the participants were recruited via social media and websites like Couchsurfing and Amazon Mechanical Turk. Consequently, the study setting might be characterised as *distributed* across Sweden, the UK and US. In contrast to the traditional model of single-sited ethnographic studies, a mobile or *distributed form of ethnography*, as described here, is a relatively new and emergent field site, which raises the challenge of establishing situational boundaries which are no longer geographic, but are instead bound by technology that is mobile, ubiquitous and integrated. The *in vivo* approach in particular aimed to capture this new multi-faceted setting of people, technology, activities, locations, objects, relations, gestures and talk by recording the environment 'on the go' from separate video devices. The video research materials which resulted revealed the conflation of work, non-work, shopping, education, and entertainment that everyday mobile phones now support. The stop-start nature of the collected video data, starting and stopping as it does with the use of the device, provides us with what Marcus calls '*ethnography through thick and thin*', by tracking the object of study 'horizontally' (Marcus, 1995). The research data creates a focused view of technology use, alongside its associated locations, activities, gestures and talk across the course of a participant's day, and presents this for analysis.

In the situated interview study of the ride hailing app Uber (Paper III), the setting was two cities–London and San Francisco. At the time of the study (2014), the two cities had very different histories with the Uber taxi service–it had only just launched in London, while San Francisco was the city in which it first began in 2009. This allowed for some comparative analysis across the two locations, and the temporal asymmetry was most telling in the case of the longer term Uber drivers in San Francisco, who were more sceptical than the new drivers in London of the business model that lies behind the sophistication of the ride despatch and payment functions of the app. Recruiting drivers in both locations was challenging, so we adopted a 'ride-along' approach, whereby we would book a taxi and ask permission to interview the driver when the ride got under way. This *situated* setting allowed for aspects of the driving job to be brought into the conversation, such as issues with traffic congestion and the route-finding in the ride hail app itself.

The study setting for Paper V, More to Meetings: Challenges in Using Speech-Based Technology to Support Meetings, was large software organisations in and around Silicon Valley, California. The first round of data collection gathered recordings and field notes of

everyday business meetings. All meetings observed and recorded were 'real', meaning they were already scheduled (Boden, 1994), and involved work teams in computing engineering, test engineering, product design, research, and human resources. The teams were recruited by emailing through organisation-wide mailing lists across the Bay Area, and the meetings recorded were typical of the business meetings that occur in medium to large-scale commercial organisations in the Western setting. Participation was at the discretion of meeting managers, and subsequent in-depth interviews were conducted with meetings attendees who responded to email requests.

In contrast, the final study (Paper VII) was conducted in the Global South[8] setting of India, with an additional number of summative interviews conducted via Skype with commercial organisations in Kenya after the main fieldwork in India was complete. The participants were all employees of six large-scale organisations which were taking part in long-term trials of a new chat app software which was supplied free of charge by Microsoft. The main ethnographic fieldwork was conducted in two of the six organisations, although some research interviews and research materials were collected from the remaining four. This study setting was complex for several reasons. Based in India, the scale of the main organisations being studied was massive: (i) a government agency with 5,000 employees across the state of Andhra Pradesh, (ii) a high street bank with 10,000 sales staff in the field. Any new technology in this setting needs to somehow comply with the challenge of ad hoc ownership of smartphones, sporadic availability of internet data, variable rates of literacy, as well as language variation. India has 22 official languages, and as a result, mobile text communication is often supplanted by heavy use of images and voice recordings.

3.5.1.1 Understanding the broader context of use

Many contemporary HCI studies concern themselves with the Western setting; indeed there is a preponderance of US-based study. However, for the emerging markets of the Global South, despite huge increases in mobile phone coverage and internet penetration in India and Africa, the costs of access, lack of high speeds and sometimes of electricity prevent access anytime anywhere (The Economist, 2018), meaning that a "vast grey area between the haves and have nots" (Qiu et al., 2009) remains. Wyche et al. described the constraints on

[8] The Global South is an emerging term used by the World Bank to refer to low and middle income countries located in Asia, Africa, Latin America and the Caribbean, in contrast to the high income nations of the Global North.

professionals living and working in Nairobi, Kenya (Wyche et al., 2010), yet there has been little research since on the ways in which this shapes workers' technology use. Indeed, while mobile devices have made the internet more widely available to those on low incomes, Donner argues (Donner, 2015) that "it may not be the same internet". While not focusing on mobile workers per se, an extensive diary study in South Africa by de Lanerolle et al. of people who access the internet primarily by mobile phone provides insights into the fragility of connections and the frugality of the mobile practices of under-connected people in the Global South (Lanerolle et al., 2017). For instance, diarists described many strategies to minimise the costs of their connectivity, and manage their cash flows, from leaving their data connections off except to check messages to restricting communications to close social networks. They rarely explore the broader landscapes of the World Wide Web to search for information or visit national news sites. These studies and more highlight the need to turn away from quantitative research approaches which abstract individual usage, and towards a clearer understanding of the broader context of use (Dhir et al., 2012) to assess any impact of existing tech, but also to better inform future developments.

3.5.2 Research *in vivo* and the use of video

The methodological approach developed to collect video recordings of mobile phone use in Papers I, II and VI under the nomenclature *research in vivo* alludes to research conducted 'within the living' and the obverse of research in the controlled laboratory setting. The method was designed and developed to address the difficulties involved in recording mobile device use in distributed locations–while still being able to see clearly what is occurring onscreen. First, screen recording software was developed that recorded all onscreen activity, while at the same time automatically logging the phone's GPS location and application use. By instrumenting the device itself in this way, the challenge of recording what was being displayed on the small glass screen of a mobile device while in use was overcome as the resulting video output allowed the researcher to see what the users could see on their phone screens.

In this first study, all but one of the recorded sessions involved two participants, each of whom had a unique perspective on the instrumented mobile device under scrutiny. The initial aim of the study was to explore the use of digital maps on mobile phones (see 1.2.5, publication summaries), and it seemed fundamental to our research to attempt to record each of the co-located visual perspectives in order to be able to analyse later what our participants could see and hear. To achieve a multi-perspective view of action on and around the mobile

phone concerned, lightweight cameras were worn by each participant. A camera was placed in a silicon map bag worn around the neck by participants, and so the camera effectively sat on their chest and filmed activity happening in the immediate environment of the participant. A drawback of this set-up was that the cameras captured video data filmed around chest height and therefore facial expressions and some other relevant contextual details were not reliably captured on video. Also, as the image below shows, what was included in the frame varied with the participants' bodily configurations.

Figure 6 Research in vivo set up: Screen recording app records all interaction with the device. Lightweight cameras worn by both participants records environmental activity, including local talk and bodily gestures occurring within range of the cameras

Other researchers have experimented with camera glasses and other recording devices in an attempt to better capture head movements, glances and other gestures happening at head height (Licoppe & Figeac, 2013). Nevertheless, although at the same position, camera glasses do not replicate what the eye sees. When using video recording technology 'in the wild', there are various trade-offs to be made between using equipment like somewhat discrete camera glasses which record at eye-level, and 'GoPro' type cameras which provide broadcast-quality wide-angled video output. In the first *in vivo* study, the recording set-up was extended to include an external microphone worn by one participant to facilitate enhanced audio recording of all talk-in-action occurring. The resulting video data from the

screen-recording app was combined with the output from the wearable cameras and external mic, to produce multi-perspective composite video research material.

This novel configuration of software and recording equipment was used to record a diverse set of everyday practices of smartphone use, during sessions which were framed as city 'day trips'. Participants were recruited through advertisements in local cafes, and adverts on visitor websites, resulting in a mix of locals and visitors in both Stockholm and London. All were iPhone users and 21 participants took part in the study. In total, 13 trips were recorded resulting in 24 hours of video data collected using the *in vivo* approach. This small corpus of video data provided the research material underpinning Papers I and II.

A follow-on study (*research in vivo* 2) was conducted the following year. The configuration was modified to facilitate the recording and analysis of longitudinal smartphone use. In this second iteration of the research design, the lightweight cameras were abandoned. Instead, the video data collection relied solely on the recording app from the first study loaded on to participants' own mobile phone. This time around, the participants were asked to run the recording app for 7 days, rather than the 2–4 hour sessions recorded the previous year. As before, the recording app (for iPhone only) ran in the background to record all onscreen activity on the device plus its location, and the apps used during each session. The app also recorded enhanced surrounding audio from the device microphone, so the external microphone could also be excluded from the research set-up. Working remotely with participants in the UK and US helped to reduce the involvement of the research team–and participants were recruited by this researcher by advertising on various social media platforms, as well as Mechanical Turk.

The mobility of the research methods was key to accessing where the technology is being used, to observe how use is configured, and understanding the experience of use, in both iterations of *research in vivo* 1 and 2. Having a recording app loaded onto the participants' personal device which was carried with them was therefore fundamental in achieving that.

The original *in vivo* study established the value of video recordings for moment-by-moment analysis of how mobile phone use unfolds within and alongside the face-to-face interactions of the co-located setting. However, the level of manual work involved–both in preparing and editing the video data for analysis, and additionally in reviewing and manually classifying the video research material–was onerous. In the follow-up iteration of the study, we set out to collect far more video data over a longer period of time from each participant, making working with the video data in the same, manually intense way as the first study,

quite unfeasible. The second corpus consisted of 1,695 video recordings of mobile phone use. Combined, these recordings represent over 70 video hours of iPhone use. The median recording was 38 seconds long, although 10% of recordings were over 277 seconds (4 minutes 37 seconds) long.

In addition to more data, we wanted to be able to automate the classification of the video data collected. The concept was to merge elements of two methods within one study to take advantage of the benefits of the video analysis methods, as well as to consolidate the corpus with systematic classification by automatically tagging all video data as it was uploaded from the participant's phone to our stored archive. To address this, the second iteration of the iPhone recording app was augmented to automatically log system information: app launch, duration of use, location, time and date, audio level. With these automated logging functions incorporated into the original *in vivo* recording app, we were then able to search the corpus of video material based upon the app used and the location, and we were able to search for video recordings which had audio levels that suggested social interaction with a co-located other may be occurring.

The quantitative tools in the recording app helped us to see broad patterns of use through the types of apps being used, and also gave us the ability to search for types of phone use. From that position, we were able to move into qualitative analysis, drawing upon both ethnomethodology and conversation analysis to explain what the material means. The hybridity in combining the quantitative logging of phone usage with the qualitative method of video analysis was essential for us to leverage what was available to us within the corpus.

The *in vivo* studies were limited by the relatively small numbers of participants. While this did not affect the ability to analyse everyday mobile phone practice using the EM and CA methods, and we were able to document the phenomena present, we were less able to describe the representativeness of those particular phenomena reported. Further, by its nature, the video data gathered is diverse and lacks a reasonable scale, sometimes meaning that only a limited understanding of rarely occurring phenomena can be obtained. With scale also comes rhetorical power, yet scale presents challenges in terms of data management and analysis.

3.5.3 Using 'probes' in interview

Creative probes have been used in two separate studies, in order to help support participants articulate and concretise the mundane details of technology use–first in a study of mobile battery maintenance, then in a study of a speculative speech-based technology for

workplace meetings. Paper IV presents qualitative user study of smartphone battery management. Here, we used device logging and behavioural tracking to support our inquiry. Prior work on battery care within the field of HCI had focused primarily on automated battery logging and quantitative analyses, with some having incorporated interviews and surveys to their methodological toolkit.

In our context-driven study, an *ethno-mining* approach was adopted (Anderson et al., 2009), using logged data to support participant recall in interviews, and we both provided deeper insights into some of the practices identified in prior work and uncovered additional others. All participants were asked to use a battery-logging app on their phone over the course of the week-long study. We set out to log data from the participants' phones, but we wanted to use that data, not for our own analysis, but for a co-construction of meaning, together with the participants in interviews at the end of the week.

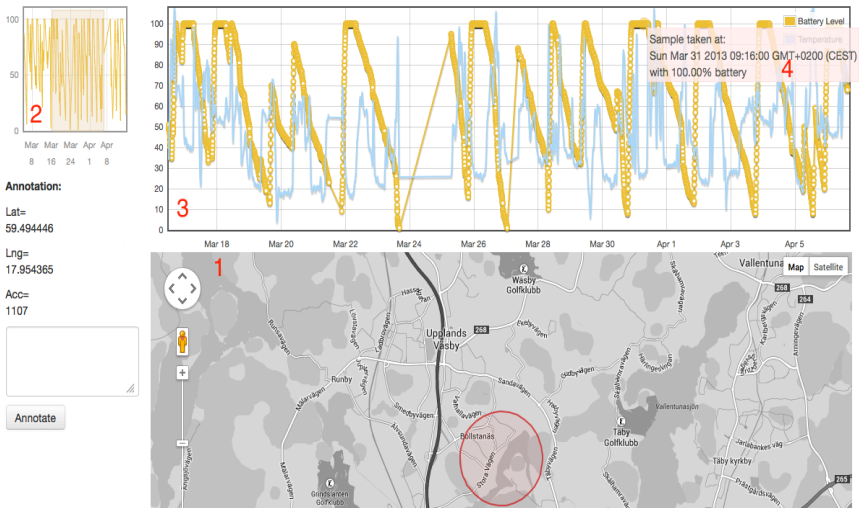


Figure 7 From Paper IV, the web interface shown was used during interviews to review and discuss each participant's battery maintenance data collected discretely over 7 days via a background phone app. An overview of the participant's data over time is shown above. The yellow line represents the battery level over time; upon selecting a particular data point in the yellow line, a red circle appears on the map below to show the phone location. This helped participants to retrospectively recall and reconstruct the details of their battery maintenance–for example, where were they when the battery was failing and what did they do to manage it.

Our purpose in logging behavioural data was to help spark deeper conversation with the participants about mundane, hard-to-recall moments. The logged data were neither intended nor used for quantitative analyses. The logs were collected purely to facilitate recall and

reflection in the interviews–and this was made explicit as part of the participant consent agreement, to help engender the participants' trust and comfort. These proved crucial in identifying and discussing participants' activities; the location information was especially helpful for participants to recall the events at a time when something significant (or unusual) had happened, such as a battery going flat.

Interviewing participants was a central part of our study. We began with formative pilot interviews that consisted of open-ended discussions about battery practices. These were conducted with participating colleagues, after they had used the logger for at least a week. Based on the pilot interviews, we then applied a more structured interview procedure for the main study, interviewing ten external participants both when we deployed the logger on their phones (set-up interview) and after they had used the app for at least a week (exit interview). The study presented in this paper is based exclusively on the data from the external participants. Each participant began the study with a set-up interview that was designed to elicit their initial thoughts on their batteries. The interview discussion was semi-structured around questions such as "How do you manage your battery power?", "Are there any tips and tricks that you use to save battery power?", or "What do you think causes your battery to run out of power?" The logging then ran for an average of two weeks, with the deployment ranging from one to three weeks depending on participant availability. Following at least one week of logging, we interviewed the participants again. In these exit interviews, we first revisited key issues discussed during the set-up interview.

To gain insight into everyday charging behaviours, we discussed the participants' experiences during the logging period assisted by the data visualisation on a web interface (Fig. above). The interface shown to the participants featured a yellow line chart, containing data pertaining to their *battery level* and the *time* at which the sample was taken: the *location*, where a sample was taken, was shown on the map below. As proposed by the ethno-mining approach, this visualisation helped us to work with the participants to "*surface that which we do not see for its familiarity, or more embodied, less discursive, forms of knowledge*." (Anderson et al., 2009).

In order to deepen the conversation and to uncover unanticipated or unnoticed behaviours, the interviews were purposely focused on different moments and trends that could be identified from the data visualisation. These included, for instance, unplugging the phone from the charger before it reached full charge, a series of consecutive charge/use cycles, a brief moment of charging the phone when it was close to running out of battery, and instances of running out of battery.

Incidents of reconstructing a memory occurred during interviews when the participants were trying to remember what they had been doing with their phones at a particular time or where they had been when they had run out of battery. For example, as we looked through data for moments where it seemed like the phone had run out of battery, the participants often started to slowly recall a memory of the situation under scrutiny, sometimes with the help of the location data or their digital calendars. These discussions, supported by the use of the participant's trace data, helped us to form a far richer depiction of battery management than would otherwise have been feasible. Moreover, the ability to go through data logs with participants, making sense of them together, freed us from making inferences from the data without confirming our interpretations directly with the participants themselves.

In Paper V, a hybrid combination of research techniques including a low-fidelity prototype as a technical probe was used to support an interview study on the potential use of a speech-based agent system in the workplace meeting setting. This study came in response to the success of personal assistants using a command-dialogue model of speech recognition, such as Siri and Cortana. I explored whether similar techniques could be used to create a speech-based agent system which, in a business meeting setting, would similarly monitor spoken dialogue, pro-actively detect useful actions, and carry out discrete actions without specific commands being spoken.

As both automated speech recognition and intelligent agents were relatively new to the workplace meeting domain, this study was *exploratory* using a combination of a prototype technical probe, observations, recordings, email survey and face-to-face interview techniques. The aim was to maximise the information gathered on the likely impact of these technologies in the workplace, rather than measuring specific variables such as recognition rates, which are often used in evaluating speech-based algorithms.

Using a low-fidelity prototype as a technical probe, I investigated how such a system might perform in the collaborative work setting and how users might respond to it. I recorded and transcribed a varied set of nine meetings from which we generated simulated lists of automated 'action items', which we then asked the meeting participants to review retrospectively. The low rankings given on these discovered items are suggestive of the difficulty in applying personal assistant technology to the group setting, and I documented the issues emerging from the study. Through ethnographic observations in workplace meetings from several organisations based in Silicon Valley, I explored the nature of meetings and the challenges they present for speech agents. What was clear from my observations of the varied set of collaborative workplace meetings was that items of value to

participants are endogenous to the interaction of the meeting, and as such are rarely neat, homogenised and separable entities. Instead meeting attendees rely upon the interpretive skill of the meeting facilitator or leader to summarise and communicate the important takeaway meeting items effectively. Meetings are complex, generative interactions between multiple participants, rather than passive acts of production of simple data for storage. Productive work is being done by the provider and recipient of information in a meeting, both unique and optimised to the moment and context of production. To design technology to support meetings, it is necessary to understand their complexity. This exploratory study hybridised a number of research techniques to provide an initial step towards that understanding here, first by exploring how a speech-based agent might perform by conducting a probe to extract action items from collaborative meeting transcripts. I then highlighted that these items represent only an extremely small part of workplace meeting interaction, and through ethnographic observation I have outlined the diversity in individual informational needs, the varying perspectives on meeting outcomes, as well as the importance of social interaction within meetings.

3.5.4 An ethnography of communications for distributed work

The early papers of this thesis are based upon a corpus of video recordings of mobile phone use. The video research material was key to providing a rich understanding of situated, collaborative technology use. However, the times in between phone use could not be analysed using this method. In the final study, the research challenge required me to analyse the use of mobile chat applications such as WhatsApp within the broad arc of organisational communications.

The data collection methods discussed thus far have been situated in the western setting–largely in Sweden, the UK and US–working with participants recruited through adverts placed on social media, physical notice boards, as well as Amazon Mechanical Turk. In contrast, the final study considered here was conducted in the Global South setting of India, with an additional number of summative interviews conducted via Skype with commercial organisations in Kenya after the main fieldwork in India was complete. The methodological techniques and analytic approaches adopted and deployed over the course of all the previous studies illustrate an accumulative progression towards this longitudinal ethnography of chat app use in large-scale organisational communications, conducted as part of a six-month internship in India.

One powerful aspect of the ethnographic approach is that researchers are able to be flexible in their research design to make their methods sensitive to the contexts being studied (Boellstorff et al., 2012)–and the tools and techniques used for gathering data in this study reflected the challenges of the setting. This project was complex for several reasons. Based in India, a country with 22 official languages, the scale of the main organisations concerned was massive: (i) a government agency with 5,000 employees across the state of Andhra Pradesh, (ii) a high street bank with 10,000 sales staff in the field. I worked with another intern who spoke two of the local languages, and we shadowed field staff throughout their working day to gather a corpus of ethnographic data, including field notes, photographs, video and in-depth interviews. We documented end-to-end processes of work, such as the daily sales reporting from banking sales staff to HQ and within teams, and the monthly distribution of 5 million cash pensions by field staff.

During the fieldwork, we wanted to learn about the ordinary everyday work of field staff in terms both of the targets and output by which they were managed and measured, and of the work practices and communication channels that they used in order to get the job done. I and one other intern were responsible for going out into the districts and shadowing personnel from both organisations. The work done by both the government organisation in Andhra Pradesh and the high street branch we worked with in Mumbai and Karnataka state involved staff going out into the districts and liaising with field staff, as well as their client base 'on the ground'. The client base for both organisations was often made up of so-called SHGs[9]. This workplace setting was a similar model of distribution used by both the government agencies who implemented a wide range of financial schemes to empower families by lending money to the women in impoverished communities–and the bank, who offer similarly structured lending schemes through SHGs, on a commercial basis.

This setting posed some challenges for our ethnographic study. A large proportion of the work on the ground was mediated through female staff and volunteers. The SHGs were made up of women, and the local field staff were very often women who, in turn, were often managed by male 'area project managers'. As a great deal of the communication and coordination at this local area level was where the mobile messaging –through either email, chat app or SMS–began to break down, and coordination reverted to voice calls or face-to-

[9] Self-Help Group (SHG) a financial intermediary committee, typically composed of 10–20 local women, operating across India. Members make regular monthly savings contributions. In India, networks of SHGs form are linked to government agencies and banks for the delivery of micro-credit and other financial schemes.

face meetings, it was important that we learned why that occurred. However, it was often difficult to have women's answers to our queries heard. This referred to both female field staff and SHG members, as men present were prone to jump in, even when not directly involved in the topic being discussed, and provide answers on behalf of the women who were more diffident and shy in responding. This required me and the other intern to acknowledge the issue, and adopt a careful approach of maintaining eye contact with the particular woman to whom a question was addressed, and gently ignoring the men eager to talk on her behalf.

On many occasions, situated interviews during our ongoing work observations could be conducted in English. However, particularly when shadowing personnel while they were interacting with their local client base, it was necessary for all questions to go through the other intern in either Hindi or Telugu, to allow the people we met to respond in their own language. It was also the case that the richness of language variation was such that communication was nigh on impossible–on one occasion we two research interns opted to sing songs with the local women because the translating became too challenging in that village! Recording these situated interviews was critical–ideally both audio and video recordings. At the end of each day, when we were able to, we typed up our daily field notes using both our handwritten notes–allowing more time to listen and translate what was being said and reflecting on what we had observed in relation to the bigger aims of the project. This process of reflection was supported by regular phone calls with the project leader, who was based in Bangalore throughout the fieldwork. Re-visiting the field notes between researchers on the ground and the project leader provided some perspective and helped to identify where gaps in our knowledge required more material. For example, when we were observing the work processes around the monthly distribution of 5 million cash pensions which takes place over a seven-day period at the beginning of every month, the project leader noted that, although we had recorded a number of the work practices that went into the process, we had not yet identified how the work of the staff we were shadowing was measured. With this in mind, the following day I conducted an in-depth interview with the team leader to clarify the overall aims and objectives of his team and his role within it, as well as the key performance indicators (KPI) which were used to report the success or otherwise of the pensions process–and these centred around preventing fraudulent pension payments, which had not previously emerged from the field notes and situated interviews with staff. With these specific and measurable details in place, we were better able to then account for the end-to-end process involved in the pensions distribution.

The field notes and recordings were then further revised back in the office to piece together the broader organisational perspective, which was afforded by spending a longer time at different locations and shadowing personnel working in different managerial roles within them. These final versions of the field notes can be described as 'thick descriptions' (Marcus, 1995), they were written in a narrative form, they contained as much knowledge and understanding as had been gleaned from the fieldwork, and included photographs of workplace activities, site locations, alongside screenshots of emails and mobile messages gathered from the field staff's phones, to provide visual clarity. Thick descriptions were written to document particular work processes, including the chronological sequence of events, the personnel and technology involved, and the communication practices used to coordinate and account for the work done.

In addition to the thick descriptions, all the screenshot images of messages taken were listed by date and by application used. There were several hundred images and the date and context of use for each was described briefly, which became a useful resource for analysis and reporting .

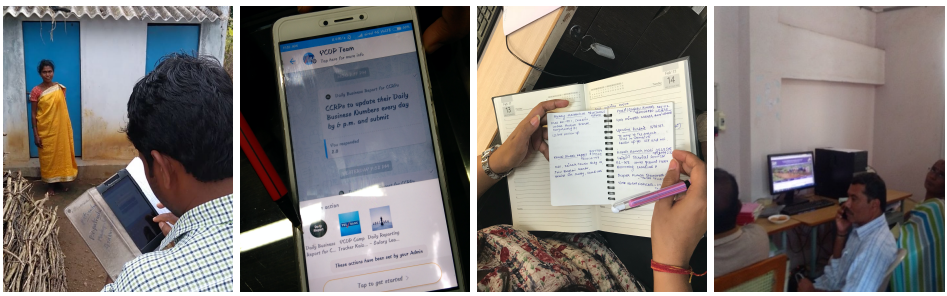


Figure 8 Ethnographic study of the role of chat apps in largescale organisational communications in the Global South: observational data included photographs of workers in the field, screenshots of chat messages, written field notes, video recordings of work processes and situated interviews.

3.6 Conclusion

The previous chapters of the thesis have introduced the challenge of investigating the impact of mobile phone technology on everyday interactions. The research questions call for (1) Empirical investigation of the practices of collaborative mobile phone use, (2) the development of appropriate research methods, and (3) an ethnomethodological conceptualisation of the practices of mobile phone use.

In this third chapter, I have addressed the second research question regarding the hybrid methods used to collect empirical data giving us access to the phenomena of mobile phone practice *in situ* which have been described in detail. Next, in chapters four, five and six, I will present empirical findings on the practices of search, messaging and way-finding with mobile phones in the co-located settings to address research question one. Each empirical chapter is structured to present the 'when, who, what and how' of each different type of device use: (1) the temporal ordering of the practice, (2) the participation roles adopted by those involved, and (3) description of the core practices used in each activity to achieve collaboration with others Finally. in chapters seven and eight (discussion and conclusion), I will address the third research question.

4 Search Practices

The history of online search runs alongside that of both the internet and mobile phones. The first search service, called Archie, was launched in 1990 and began by linking indexed electronic documents which could be accessed and searched via desktop computers (Samuel, 2017). The intervening years have seen an explosion in global smartphone functionality and adoption, and desktop search has subsequently been eclipsed by search conducted via mobile phones, which encompasses the search for images, maps, video, music, geolocation, climate and astronomical data and more; see, for example, (Church, Smyth, Cotter, & Bradley, 2007; Kamvar, Kellar, Patel, & Xu, 2009; Schalkwyk et al., 2010; Schedl, Gómez, & Urbano, 2014; van Aart, Wielinga, & van Hage, 2010). The mobility and functionality of the mobile phone can therefore address practically all of our ongoing requirements for information search at any time and place. Yet, how do we manage to do a search on our mobile phone within a face-to-face interaction; and what purpose does search serve in our everyday interactions? Over the course of its rapid development, numerous theoretical approaches (Belkin et al., 1982; Ingwersen & Järvelin, 2005; Kuhlthau, 1991; Marchionini, 1997; Saracevic, 1997; Sutcliffe & Ennis, 1998) have been used to characterise internet search use, including commonly discussed models of search: the standard model, cognitive model and dynamic model. These models reflect different configurations in the design of the technology and the stages at which a user would interact with the technology. They share a notion of search as single user behaviour engaged in information-seeking tasks. However, mobile search increasingly occurs in co-located social settings (Carrascal & Church, 2015; Salo & Frank, 2017; Teevan et al., 2011). Through the moment-by-moment analysis of video recordings of co-operative search, we shall observe how search is connected with, and used in, interaction with others. This chapter will discuss how search can be 'occasioned' by the surrounding talk or aspects of the environment. Searching at a particular point in a face-to-face conversation is seldom random, but rather dependent upon having something that can be searched for–a searchable object. These aspects are dealt with in Paper II, I revisit them and extend that publication further here, with an exploration of the practices adopted by people to achieve search in the co-located setting. I also discuss the motivations for collaborative search and consider the impact of social interaction on the technical practice of mobile search.

4.1 Participation

In reviewing the video material of co-located mobile phone use, we observed a familiar phenomenon–our participants were using their mobile phone, while at the same time explaining to co-located friends or colleagues what they were doing on the device. Accounting for their phone use in this way allowed for actions on the phone to be completed without excluding the other person. To simply use the phone without acknowledging and making its use accountable to companions could be considered rude and potentially threaten to disrupt the ongoing face-to-face interaction–and would be notable for that. I suspect we can probably all recognise this practice of accounting for an action which may momentarily take you away from the co-located interaction–it is a social etiquette, a part of polite behaviour that existed before mobile phones were introduced into our social milieu.

4.1.1 Goodwin's participation framework

In his paper, 'Forgetfulness as an interactive resource', Goodwin investigates the ways that conversation unfolds between co-located interlocutors and identifies aspects that make up a 'participation framework' through which the face-to-face social interaction is methodically mediated. The key elements include social and discourse identities, speakers' uncertainty, forgetfulness, knowing and unknowing recipients, actions and the local environment (Goodwin, 1987). During analysis of the video recorded research material, Goodwin's framework was particularly helpful in considering how participants managed their mobile device use within the context of conversation and interaction with co-located others. It highlighted the effort required and the division of labour involved in balancing mobile device use with the ongoing obligations of all parties present in the co-located social interaction. Goodwin describes how *forgetfulness* and *uncertainty* can be used in talk to *manage participation* in a social conversation. He uses the example of Mike, who 'holds the floor' during a conversation between friends at a party by asking questions and managing the participation of those co-located.

```
(1)     G. 86:490
        1. Mike:    I was watching Johnny Carson one night
        2.                      en there was a guy by the na- What was
        3.                      That guy's name. =[Blake?
        4. Curt:                                  [The Critic.
        5. Mike:    Blake?
        6. Mike:    [No.
        7. Pam:     [A no-
        8.                              (0.6)
        9. Mike:    Rob[ert Blake?
        10.   Pam:     [Reed?
        11.                               (0.2)
        12.   Mike: Er somp'n like 'at. [=He was-
        13.   Pam:                      [Robert Reed.
```

Figure 9 Goodwin's analysis highlights using word search in conversation, as Mike does above, is a source of trouble in interaction which can engender specific repair practice. Mike invites contributions in the form of candidate names from his co-located interlocutors. By displaying differential knowledge through forgetfulness and uncertainty, a word search is an interactional resource for managing participation from knowing others.

By being forgetful or uncertain of some detail of a story, a speaker can attempt to rearrange the structure of the current discussion, and bring someone who 'knows' the answer into the discussion by asking a question, as well as bringing their subject to prominence within the overall conversation. The figure above shows the transcript of a group conversation at a party. Mike and friends are talking about a guest on the Johnny Carson show. Mike asks "What was that guy's name" (Line 2–3). Through introducing this sequence of talk, Mike has brought his topic into prominent focus. He then offers a 'candidate option', a suggestion for the name, "Blake?" (Line 3) and he repeats his candidate option twice, the second time eliciting a negative response from his wife, Pam (Line 9), who supplies an alternative name (Line 10), which he acknowledges with "somp'n like that", and immediately continues with his story in Line 12, with his talk overlapping Pam's full account of the name, Robert Reed in Line 11, (Square parenthesis [ ] used in transcription indicates overlapping speech (G. Jefferson, 2004)). Goodwin proposes that by being forgetful of the TV guest's name, the *speaker*, Mike, is able to *manage the participation* of his audience; by requesting the *listeners*, who are the recipients of his talk, to produce an answer to his question, he is able to 'hold the floor' in discussion, and promote his line of conversation about the guest on the Johnny Carson show. Pursuing this fragment of conversation further, Goodwin points to a

number of social identities invoked by introducing a conversational question like "What was that guy's name?". His wife is one of the 'listeners' and it is assumed that she also saw the TV show being referred to. As such, she is a '*knowing*' recipient of Mike's story, and, as such, she can be involved in the conversation by contributing to the discussion with additional information, while the others are potentially '*not knowing*', and Goodwin goes on to identify broader social identities introduced by relationship-inferences in talk, such as using '*we*' to signal mutually assumed knowledge about relationship status.

The framework was key in identifying what role was being adopted by different actors around mobile search as it happened in the video research material. Moreover, the role types, such as 'knowing' and 'not knowing', were observably contingent on the particular setting involved, and were relevant to how mutual intelligibility was constituted through talk and interaction around mobile search. In this chapter I will now go on to describe participation in collaborative mobile search. The other empirical chapters will include similar analysis concerning mobile messaging and way-finding.

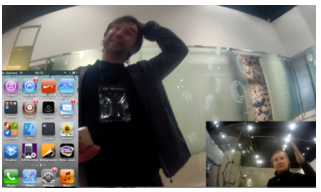
4.1.2 Managing participation in the co-located setting

Goodwin's work shows how the use of *forgetfulness* and *non-knowing* can be used in social interaction to manage the participation of those with whom we are talking–by asking questions and sharing knowledge back and forth. This gives us a lead on how to think about how the participants in the video recordings of search via mobile phones were using uncertainty and ambiguity as a means of both accounting for their phone use, and also a social device for managing the participation of co-located others, by inviting their input into the search terms, for example. Search has been extensively studied as a human–computer interaction, yet there has been much less work on search as a social practice, in what might be more accurately described as a human–human–computer interaction. This perspective highlights mobile search less as a method for acquiring information, and more as a way of generating conversation.

In the first video recording included here, we can begin to see how search might play this role. In Figure 10, two friends, Jeff and Ann, are spending the afternoon together in London. They had planned to visit a very popular travelling exhibit at one gallery, but it was sold out by the time they arrived. After checking online for alternatives, they have opted to wander round the nearby free Museum of London, which has many traditional historical artefacts on display. One glass exhibit case contains various archaeological remains of mammoths and other creatures discovered in the River Thames, and attached to the glass there is an

exhibition note which includes an illustration to provide a comparative indication of a mammoth's size in relation to human beings. As the two participants walk past, Ann points to and comments on the illustration on the sign. His attention now drawn to the illustration of the man alongside the mammoth, Jeff quips "He does like to stand behind. He's gonna get pooped on if he's not careful." This comment reminds Ann of a YouTube video she has seen, and she asks "Have you seen that footage of the guy in the zoo…" The proceeding close analysis of how this collaborative search-within-conversation is accomplished will provide insights on how mobile phone interaction operates within social settings.

1. JEFF: He's (.) he does like to stand
2. behind. He's gonna get pooped on 2.if he's
3. not careful
4.((Ann points to an exhibition sign,
5. which illustrates the relative size of a
6. mammoth by using a diagram of the mammoth
7. standing beside a human form. It looks
8. like the human is standing directly behind
9. the animal in the diagram))
10. ANN: Have you se:e:en that footage of
11. the guy in the zoo and he's cleaning
12. out the elephant pen (.)and he's
13. sweeping and the elephant reverses and
14. his head goes up the elephant's ass↑
15. JEFF: Heh heh ha ha
16. JEFF: Is that online?
17. ANN: It's on YouTube.
18. JEFF: That we have to find.
19. JEFF: Right eh. Search (.) What do-what do we search for?
20. JEFF: Elephant arse man.
21. ANN: Uh yeh. Elephant head (.) elephant ass head [Hhh heh heh]
22. JEFF: [Hhh heh heh] (9s)
23. JEFF: Elephant man head arse
24. ((Jeff types search to YouTube))
25. JEFF: Hey hey there you (.)is that the one?
26. ((Ann points to item in results))
27. ANN: Yep that'll be it [*]- - - - - -
28. ((YouTube video runs with continued narration
29. for 40secs till video shows a keeper's head
30. accidentally going up an elephant's rear))
31. JEFF: oh:h:h:h ma:ate heh heh heh heh
32. that is s:o:o wrong [:h:h:heh:h:h:heh]
33. ANN: [sh:e:h:h:heh]



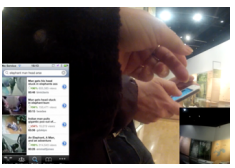


Figure 10 Collaborative mobile search for an online video becomes a resource for social interaction during a museum visit. The phone use is made accountable by requests for help in creating search terms, and then for selecting the correct video from the results

Ann's question "Have you seen?" (Line 10) and her description of the online video makes Jeff laugh, who responds by proposing an internet search; "Is that online? … That we have to find." (Line 18). One of the things that seems to 'occasion' a search here is the question and answer sequence. We might therefore suppose that questions could occasion a search. Yet, questions and answers are an exceedingly common part of conversation and many of them seem to do little to encourage or occasion an internet search. More specifically in this video, the question actually produces something that is essential for a search–a 'searchable object'. We can start to define such an object as something which can be found

via a search. For a conversation to occasion a search of some sort, it needs to provide such an object; however, the presence of a searchable object is just one ingredient in occasioning this search. Prompted as it is by the scale drawing in the museum signage, this is an 'occasioned' use of mobile phone search–and since there are two people involved, it can be further described as an occasioned, collaborative search. The research material allows us to view the preamble to phone use here and answers the "Why that search now?" question.

Having set out the objective, "That we have to find", Jeff proceeds to manage the work of conducting a collaborative mobile search. The screen capture data shows him unlocking the phone, and opening the YouTube app onscreen. Meanwhile, the contextual video from the two wearable cameras shows him looking round and finding an edge of a wall to lean against while conducting the search. Recalling Goodwin's participation framework, Jeff initiates the collaborative search by asking immediately for help in creating the search terms, "What do-What do we search for?" (Line 19) and he offers some candidate options: "Elephant arse man." (Line 20) Jeff's query prompts Ann to respond as a *knowing recipient* as inferred by Jeff's question. The different types of participatory roles are not externally assigned, nor are they descriptive, but rather they refer to a contingent and contextual attribute of the participant–and, as such, the role can transform quickly; for example, as information is shared, a 'non-knowing' participant can quickly become 'knowing'. As the person who first introduced the topic of the elephant video, Ann is particularly qualified to confirm or dismiss Jeff's candidate search terms. She responds "Uh, yeh", then proceeds to provide an alternative list of search terms, including one additional word option, 'head', which Jeff incorporates into his search on the phone.

Despite the evident humour involved, there is collaborative work being done here. There is analogy between the participation around this collaborative mobile search and the collaboration between the *driver* of a car and a *passenger* who is doing the navigation: the division of labour rests between the *non-knowing* 'driver' who holds and operates the phone, and the co-located, *knowing* 'passenger' who provides assistance (Heritage, 2012). The collaborative action described here can also be seen through the lens of *managing participation*: the driver is directing the activity by asking questions and narrating what's happening on the phone, while the passenger has less access to both the input and the output of the collaborative search, both in terms of what is typed in and also what is visible on the screen. Nevertheless, the passenger can influence both aspects of the collaborative search, through talk, gesture and interaction around the driver and the mobile phone.

As the driver formulates the four-worded search, he provides a spoken commentary of what is being typed: “Elephant. Arse. Head. Man”, which they both laugh about, providing toilet humour as a common resource or activity during this visit to the museum. We might conceptualise this as a *ludic encounter*: there is playfulness in the interaction and we can see this by the laughter that bubbles through the talk, shown in the transcription (Glenn, 2003; Gail Jefferson et al., 1987).

While they wait for the search results to appear onscreen, the two participants physically arrange themselves side by side, so that the screen of the device becomes available to them both to see. When the results populate the screen, the driver looks through the options and asks “Is that the one?” (Line 25). Simultaneously, the ‘knowing’ passenger reaches across and points at the same video, and confirms “Yep that’ll be it.” (Line 27). The challenging ecology of sharing the small mobile phone screen is relevant in this case; because the onlooking passenger originally mentioned the video, it can be assumed that she knows what it looks like and how it pans out and, as such, she doesn’t need to get a perfect view of the video. In other videos, the passenger’s disadvantaged view of the shared screen is compensated for by explications from the driver who has the privileged view of the screen, as they are holding and able to position the screen in alignment–a phenomenon which recurs in the practices of way-finding, with more consequential effect.

4.2 When does search occur?

Online search has expanded to provide users with almost inexhaustibly detailed results to search queries typed in via a mobile device. In the past, researching what to do when out for a day trip was something that had to be done in advance, reading books and brochures to glean as much information about a place before going there. Previously then, this pre-planning might have taken place in collaboration with travel companions, or perhaps more likely, travel research might have been done alone in advance, and then shared to some extent with one’s companions. Now, with the mobile phone to hand, the matter of exactly where to wander, eat or shop during the visit itself can be researched and decided upon in real time and *in situ*. The video research material involving participants taking a daytrip and using their mobile phones as they went along dispels notions of delineated search tasks and actions. These video recordings reveal an *emerging assemblage* (Licoppe, 2017; Marcus & Saka, 2006) of everyday phone use, as mobile devices were pulled out and used amidst an array of ad hoc conversations occurring while participants moved together through time and place.

Viewing the video research material raised initial questions of causality: why that map or internet search now? Prompts and triggers for mobile search were myriad; including a search for the singer Joni Mitchell arising from conversation while walking, getting lost and searching for a new walking route, checking for train times–all were 'occasions' which required or merited using the mobile device to run an internet search. Given the participants' brief to explore the city, there were many instances of search–on Google maps, websites, a museum app, as well as other offline maps and posters found. Indeed, much of the mobile phone activity recorded could be broadly termed search. Some searches were conducted in advance, including searches to find a restaurant, ideas for things to do when it's raining, journey planning on public transport. Other searches were prompted by things in the immediate environment of the participant; in the following figure, the participant searches on Google for the landmark building he is walking towards. During his Google search he has trouble finding English language information as requested and the sequence of repair made by this tourist is observable in the video recordings.

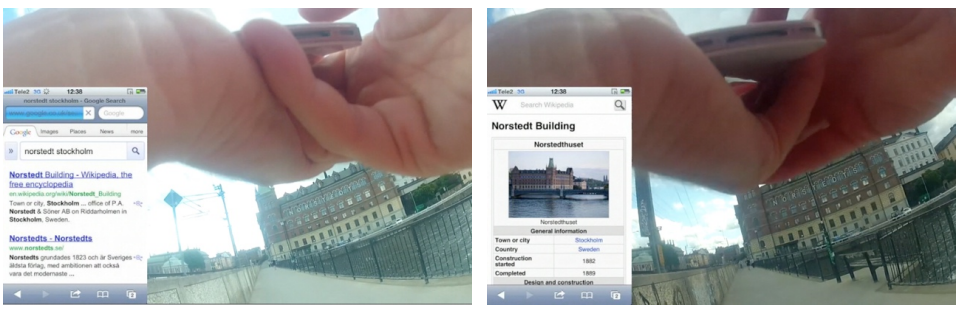


Figure 11 Prompts for search were often found directly within the immediate environment: here a participant is searching online for information about the Norstedt building seen straight ahead of him in the video recorded.

In the example above, the prompt for the search is only understood through inference from the participant's location and proximity to the landmark building. The contextual video research materials offer the possibility of watching co-located mobile search unfold; listening to discussions happening around and during the search activity to learn about the rationale behind actions happening on the device. The research material above gave me pause to reflect during the data collection; it was the one session when a participant was recorded taking a day trip alone, meaning that in analysis, we did not have the benefit of any local talk between the phone driver and a co-located passenger, by which to explicate our understanding of any

of the activity captured in the video recordings. It was straightforward to surmise that he is searching online for 'Norstedt' because the building is in his line of vision. However, this inference would not always be available in video recordings of individual participants. This example demonstrates the value of local talk captured in the video recordings for the research. Talk between the participants was an essential element to help elaborate our understanding of the mobile phone use observed in the video research materials–and this was discussed more fully in the Hybrid methods chapter.

4.3 Practices of search

As already highlighted in the introduction, practice is formed in recurrent action which becomes repeatable due to its recognisable intelligibility.

The understanding of what constitutes a practice is not fixed, but there are common themes which are pertinent to the analysis of practice made in this thesis. Gherardi characterises a practice-orientation approach as an 'in-between' concept (Gherardi, 2008), since practice falls in between habit and action in the sense that a practice has habitual features because it is based on the repetition of activities, and it also has the character of a purposeful action. But it is neither a habit nor an action. The practice-oriented perspective on technology for work (Orlikowski, 2007) emerged from organisational studies. Coming from an interpretivist standpoint, it stood in contrast to the prevalent positivist conception of organisations as rational, strategic, top-down entities in which workers operated through individual planning, decision-making processes, and cognitivist rationality (Tsukas & Knudsen, 2005). In reality, as revealed by ethnographic studies which spent time observing how work gets done in organisations, the reasoning and knowledge used in the workplace is far more collaborative and social. People need to coordinate and communicate together to accomplish tasks on an ongoing basis. Indeed, organisational knowledge proceeds by trial and error, and builds on its own experience and that of others (Gherardi, 2008). Knowledge develops as people learn through recurrent and situated action how to accomplish tasks and how, ultimately, to produce 'local order' that is relevant to them. Social action and social knowledge are mundane activities which are inseparably woven together in situated, ongoing practices. Giving primacy to practices over the cognitive mind, contributes to the concept of social distribution of knowledge, which is mediated by interactions between people, material objects and their environment.

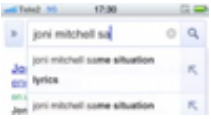
Practice is therefore conceived here as a recurrent situated action for making sense of the world, contingent on people, action, time, place, and objects or artefacts. In Gibson's theory

of perception and affordance (Gibson, 1979), he argues that the organisation of situated action is shaped by aspects of the environment and human interaction with it–the role of affordance in the practices of mobile phone use will be expanded in the discussion chapter. Suchman focuses on the interaction mediated by language in practice (Suchman, 1987), while Goodwin's study of practitioners who learn to see and to sustain a 'professional vision' (Goodwin, 1994) as a situated activity directs the analytic focus to the importance of observably seeing a practice. His interest was in how language develops, and Goodwin describes interactions involving talk and objects repeated over time, that allows a community (he was looking at archaeologists) of shared knowledge and practice to be sustained.

4.3.1 Knowing as a social practice

There were instances in the video corpus when a mobile search was run as a result of a topical item raised in conversation. In the next video recording, two participants were taking a long walk into the city centre together, following a circuitous route of around 8km in order to collect a bicycle en route. Consequently the conversation is long and moves slowly from one topic to another over the course of the journey. Katja, the phone *driver*, is a documentary filmmaker. At one point, mention is made of a film about Sami people (the indigenous people of Scandinavia). In response, the topic the Sami diaspora around the world becomes the focus of conversation. The co-located other, Sue, mentions that she had recently read that the singer Joni Mitchell is of Sami descent, a detail that Katja found surprising. From this revelation, the *driver* formulates an internet search on her mobile phone while the two walk along. As we have already observed in other searches, she asks for help with the search terms, which prove difficult to spell–and again, the search terms give cause for some laughter and mirth between the two walkers, over how to spell the word 'Sami'. The search results returned confirm that Joni Mitchell does have Sami ancestry. Moreover, the topic is not dropped after the Google search results are read. The search for Sami people evolved endogenously from the ongoing conversation between two co-located interlocutors, which has 'occasioned' the web search, and in turn the web search also influenced how the ongoing local talk unfolded *in situ*. The co-operative mobile search was produced accumulatively, by first creating search terms, 'famous Sami people', and then collectively reading and interpreting the search results which then became constituent parts of the ongoing sociality of a long walk into town.

1. SUE: But artists like Joni Mitchell
2. KATJA: Uuuh
3. SUE: Are Sammy
4. KATJA: I:s she Sa:mi
5. SUE: According to Wikipedia
6. KATJA: No (.1) ahll use the phone
7. ((brings out iPhone))
8. SUE: Who's the other one
9. SUE: The other actress the one who used
10. to go out with Jack White
11. ((KATJA types Joni m [*], then selects Joni
12. Mitchell from dropdown suggestions))
13. SUE: The blonde girl
14. ((KATJA starts new search editing the previous
15. search term, adds 'sa' to the end))
16. KATJA: How do you write sami [*]- - - - -
17. SUE: Is it two a:s
18. ((types extra a))
19. SUE: S a m i - - - - - - - - - - - -
20. ((saami suggested by google search))
21. KATJA: S a:m i I think
22. ((types mi))
23. SUE: It's just how you say it Sami
24. KATJA: Funny record for your research
25. KATJA: Okkhhhhha [6.0]
26. ((reads search results))
27. KATJA: Lapland people lappy - - - - - - - - - - -
28. SUE: Ahha
29. SUE: Is this are you on Wi:wiikipedia (.1) Sammi people



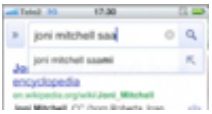


Figure 12 Local talk often prompts a mobile search. In turn, the content of search results, then influences the local talk.

In the example above, the phone screen is not directly available to the second conversationalist, and the *driver* reads out aspects of the search ("Sami", "Lapland people"). In this way, although her focus of attention, in that moment of narrating the onscreen content, is on the results shown on the device, her involvement in the face-to-face conversation continues.

The use of the device is a constituent part of ongoing conversation. Through these video transcriptions it is possible to observe the recurrent iterations of talk and mobile phone use, through which the participants have achieved mutual intelligibility about some aspects of elephants in zoos and the Sami diaspora. This was achieved not by reading each other's minds or mapping each other's mental models, but through ongoing negotiations of forms of shared understanding which were contingent and good enough "for all practical purposes" (Garfinkel, 1967, p. vii). The participants were not acting in situations that are predefined, but rather the situations were being reflexively dealt with in an ongoing way–with the addition of mobile technology. The random nature of the searches examined here indicates both the ad hoc nature of human interaction, and equally the profound challenge for the design of any form of intelligent interactive machines that might attempt to reproduce or predict it.

4.3.2 Reflecting online content in local talk

We have so far discussed how mobile search may be prompted or occasioned by features in the physical environment surrounding the participants, as well as by topics in ongoing conversation. The video research material also provides empirical examples of occasions when participants were, in contrast, influenced by features of the interface design seen on the device itself. In another video recording of the two participants who went to London Museum, the driver participant types aloud new search terms; he enunciates as he types, "Rainy Day Activities". When the results fill the screen he reads the first option, which is a headline from the Time Out website: "What to do in London when it's raining.". Using prosody and voice intonation, he reads the headline to transform it to respond directly to the passenger participant's question: "Is there such a thing online?", which was uttered as the results arrived onscreen. By reading out the first result, the content seen on the mobile interface shapes what is said, making the interface sequentially implicative in the surrounding stream of activity. When the link takes a long time to connect and download, the driver recognises this as a relevant transition point (Licoppe & Figeac, 2013) and takes it as a cue to turn away from the device and speak directly to a co-located other.

So the face-to-face talk occurring around the phone is contingent on the environment, including the material interface of the phone: local talk and the interface itself have combined here to constitute the search interaction. The interpenetration of influence, from the search occasioned by something in the environment, to the local talk shaped by the sequential ordering of the results shown in the material onscreen interface, reflects Dagonet's concept of the interface as a 'fertile nexus', and an enabler of general social practices (Galloway, 2012). The video research materials provide empirical evidence at a fine-grained level of the ways in which the navigation in a 'rugged' interface can project pauses and pragmatic opportunities to shift the gaze in the course of mobile search activity (Licoppe & Figeac, 2013).

Finally, sharing a small mobile phone screen with another person is challenging. Nevertheless, participants worked together to optimise the setting for shared viewing of the mobile phone screen to enhance enjoyment of the content. For the friends watching the YouTube video, the screen becomes an 'emergent interactional frame' (Goodwin, 2017; Licoppe, 2017). The phone both constrains and facilitates the interaction, through the ecological limitations of the size of the screen certainly, but also through the participants' body comportment, their talk and volume, all of which need to be modulated accordingly to ensure they can both 'achieve', or get the joke inherent in the video (Sacks, 1989).

4.4 Humour

Returning to the search for the YouTube video of the elephant keeper's misfortune while cleaning out the elephant cage, the search was occasioned by a sign in the museum. The search differs slightly from other situated searches discussed, which were more functional or 'instrumental' (searches for practical information about transport or places to visit and so on). The elephant video being sought was just for laughs. Sacks comments on some 'technical considerations' regarding similarities and differences between stories, jokes, dirty jokes and their role within broader conversation–noting that each is a type of story, but that the three forms of story-telling operate increasingly independently of the rest of the talk. This means that telling a regular story is constrained by the need to fit in with the rest of the conversation happening around it, and the connection is regularly made through some relationship between the teller and a character within the story. Meanwhile, a joke is something of a 'standalone item', which can be called upon to fill an available slot, without requiring a connection between the teller and characters of the joke; the teller merely needs to show understanding of the joke. Describing the structure of a joke further, Sacks highlights the importance of temporal and sequential organisation for telling a joke successfully. He also describes the

ongoing work for listeners to a joke; to be fully engaged in understanding the build-up of the puzzle, piece by piece, without ever being able to 'assess the complex of its components' in the process, and importantly, not spelling out the solution to the ongoing accumulation of the puzzle in the punchline. Instead, it relies on the listener to 'get' the meaning of the joke, by interpreting the final punchline and therefore demonstrating by laughing their shared humour and enjoyment.

The 'stand-alone' nature of a joke is reflected in the work done by the driver in the search for the elephant video. In preparing to run a YouTube search, he turns around and finds a low wall to lean against, and he holds the phone out slightly to share the screen. Meanwhile, the passenger moves to stand side-by-side, in order to get a view of the small mobile phone screen. Aligned this way, the search gets under way–the discussion around search terms ensues, the search results are reviewed, and the passenger confirms which video to watch. The video runs, and both driver and passenger laugh heartily. Then they move on and continue their museum visit, having consumed this self-contained, short video-joke.

This enjoyment seems worth investigation; ludification and gamification are concepts which have often been used in analysis of video gaming. Games range from simple point-based games used to fill in time (Candy Crush game playing during a work commute was one of the few games recorded in the video corpus), to role-playing worlds like Grand Theft Auto (Chesher, 2012), where players move freely through the dynamic landscapes created by the game. Huizenga's 'magic circle' has been used to further depict gaming as quite separate from ordinary life (Pargman & Jakobsson, 2008). However, Glas (Glas, 2012) laments the dichotomy set up by this exclusivity, highlighting that ludic motives underlie many ordinary mobile phone interactions and practices. 'Ludification' of mobile phone interaction is revealed in the enjoyment of a social interaction or joke achieved via the phone, as the examples here reveal.

Many of the collaborative searches observed were conducted in the moment and just for fun, reminding us that in an age of media consumption, the mobile phone has become much more than a portable communication device, or a tool for finding information. These 'occasioned' searches were far more nuanced–seeking as they were both information and entertainment.

4.5 Concluding thoughts on the practices of search

The preceding examples of collaborative search show a practice that is thoroughly interwoven into the ongoing work of how people make sense of things together; search

happens not only before planning for activities, but also *in situ* during them, and prompted by the physical environment and local talk. Goodwin's concepts of *'occasioned use'* and *'managing participation'* serve to illuminate both when mobile search occurs and how it is brought into and managed alongside social interaction taking place with co-located others. Search in these co-located settings can be fruitfully conceptualised as *co-operative action*: a process of building something new through decomposition and reuse with transformation of resources placed in the public environment by an earlier actor (Goodwin, 2017). The video research materials provide empirical evidence, at a fine-grained level, of the sequential implicativeness of the resources that are used. These include conversational talk, objects and signs in the environment, friendship networks, and existing knowledge. The co-operative action began by first identifying and articulating a 'searchable object'–the item that would be searched for via the phone. The search process involved a division of labour; the 'driver' was the person operating the mobile device, who made his work on the phone mutually accountable by involving the co-located 'passenger'. He asked the passenger for search terms, while narrating their activity on the device. By carefully managing the participation, the ongoing social interaction between driver and passenger was maintained throughout the web search. Moreover, the search itself was enhanced by the additional input on search terms, in addition to the interpretation and enjoyment of the results. The collaborative mobile search activity here exploits the potential to extend and enhance the social interaction of co-located participants, becoming a constituent part of the social interaction, rather than a standalone single user interaction with the phone.

When it presented itself, the opportunity for fun with collaborative search was taken. Sociality and ludic conceptualisations (Graham, 1995; Meyer, 2000) can help to explicate the ongoing, further entanglement between search, smartphones, and social interaction with co-located others. However, the occasions which arose to pursue internet search were not deterministic and participants were not compelled to use their phone by any of the prompts which arose. Furthermore, many other similar searches that were recorded in the data resulted in failure of some sort, such as not finding the desired cafe, or failing to find the information required, and in those instances participants fell back on simply waiting to see if they chanced upon what they were looking for (such as a good restaurant, or a bag store), or giving up on the particular search to pursue something else. Clearly, search is not performing a solely utilitarian function in the social interactions we have looked at here–for if it was, the participants would pursue the information more ardently. It is used to provide humour and friendly bonding between the participants. This goes against the common sense

understanding of search as an individual activity which aims at fulfilling a clear task or problem. In each part of the search process participants have contributed in different ways which reflect their knowledge of the topic being searched on, the phone is operated by the 'driver', who manages the participation of the 'passenger' by asking for help in selecting search terms. The passenger in this search is the 'knowing' participant, having already watched the video, so particularly well qualified to contribute search terms, and also to review the search results to confirm which video the driver should now select. By watching the video, the driver transforms his 'non-knowing' status, while his laughter and comments confirms he finds it amusing. Search in these settings is observably constitutive of co-located sociality and order.

5 Messaging

Many forms of communication, in particular the humble text message, have acquired new-found significance and functionality. New text-based apps have made text chat more widely available and they have also changed the media itself–messages may now contain images, audio, stickers and videos. Along with the text, these can be exchanged between distributed groups and presented in threaded conversations. In different applications, these conversations are persistent and have developed over time; in others they are transitory or even anonymous. Here, in considering practices related to messaging, I focus in particular on the role of messaging in and around interaction and talk with co-located others–a topic that has so far attracted scarce attention.

Studies have focused their investigations on the new forms of messaging becoming available (Church & de Oliveira, 2013; K. P. O'Hara et al., 2014) and the associated practices and motivation surrounding them. One notable re-conceptualisation is to see these technologies and their use as part of the constitution of our ongoing relationships over time (Church & de Oliveira, 2013), whereby our ongoing sociality is mediated over a wide range of media and contexts, both face-to-face and remote.

In this chapter, I draw largely upon the findings of two publications (Papers VI and VII) to identify practices of collaborative mobile messaging. Paper VI examined the use of mobile messages in co-located social interactions, finding that while text chat is often considered a distraction, it can also contribute positively to ongoing face-to-face interaction and talk. In Paper VII, chat app messages are seen to contribute to a network of encounters which accumulate to produce an enhanced awareness of the situation of others. The study found that in the organisational workplace setting, the chat app provides a medium of distribution rather than communication.

5.1.1 Role of context

Various approaches have emerged for understanding how context and audience become manifested in written text, in order that it meets the needs of the recipient. Hyland reminds us that communication often involves more than the simple exchange of information (Hyland, 2005), but rather it reflects the personality, attitudes and assumptions of the parties involved and goes on to propose metadiscourse as a framework for understanding communication as social engagement.

Most non-verbal cues of oral interactions are not available (Baym, 1996) in written media. There can be no body movements, vocal tone, rate, or volume: the "single greatest difference between writing and oral interaction, especially face-to-face conversation, is that participants do not share a common physical or temporal context. As a result, writing is generally more explicit than oral language, as it must make manifest all that would be apparent from the context."

Messaging apps and chat apps, while they can be very immediate in the delivery of messages back and forth, are nevertheless an asynchronous mode of communication that places certain demands and constraints on both sender and user. Spoken interaction is multimodal, making use of several channels simultaneously for sending information. Written interaction has to rely on the single, linear channel of vision for communicating textual messages. Previous studies have shown that strategies such as the use of emoticons or abbreviations have been developed to overcome the difficulties of the written medium in order to avoid misunderstandings and ambiguities (Hsieh & Tseng, 2017; Tagg, 2015).

5.2 Mobile messaging and evolving language

Mobile text messaging is now a thoroughly ubiquitous practice, so much so that the older communicative modality of the voice call is now regularly supplanted by mobile messaging in all its forms. Text-based messaging services encompass a broad array of applications ranging from short message service (SMS) to chat applications (for example, WhatsApp, Snapchat), as well as social media messaging (FB messenger). Chat apps are lightweight messaging applications typically targeting mobile phones primarily. Exploiting the widespread adoption of smartphones, today's chat apps enable increasingly sophisticated interactions. These new apps have transformed the basic text-based mobile messaging technology, which originally became available on feature phones, into a richly interactive multimedia communication channel on which text, audio, photos, video and geolocation may be captured, edited, exchanged and archived. Alongside this plethora of different messaging service apps jostling to maintain and grow their share of the worldwide market, have come a wide range of additional features which are introduced to try to create a distinctive use or style for each new app–resulting in substantial differences to the newly emerging forms of chat apps.

The mobility of the device allows discrete messaging activities like composing, writing and sending a message to be taken into increasingly varied settings, in the company of other people. Messaging is no longer constrained by a requirement for literacy skills; speech

interaction with assistive agents like Siri and Cortana, alongside the increasing quality and adaptability of visual attachments which can constitute the message content, combine to diminish the need to include written content to be able to communicate successfully with remote others. What is still largely neglected are the interactional, praxeological, situated and embodied details (Mondada & Svinhufvud, 2016) of messaging and its practices.

While receiving and responding to mobile messages might be conceived of as a single-user activity, the research material revealed how pervasively those practices were enacted in the face-to-face, collaborative setting. The organisation of the process of message composition as a collaborative rather than solitary action, is a neglected practice (Prior & Thorne, 2014). This gap could partially be attributed to the methodological challenge of how to observe writing 'in the wild'. The video recordings discussed here are presented to help contextualise the activity of co-located messaging, presented as the outcome of accumulative, co-operative action. Observing participants weaving together text writing with other co-located activity such as talk, and other work practices, highlights the sensitivities of asynchronous temporal ordering, with message production and consumption embedded in surrounding sequential organisation and multi-activity for its constitution, meaning and understanding.

The asynchronous nature of mobile messaging allows messages to be written, sent, received and read in a time and place that is convenient to all parties. So a message can be read as soon as it arrives, or left unread until later if the recipient is already engaged in a face-to-face meeting, for example. However, a notable feature of the research material was how frequently mobile messages were addressed while in the company of others. Before investigating the practices of mobile messaging, let us first consider the two broad activities involved in messaging, namely reading and writing text.

5.2.1 Reading

Before contemplating the specific activity of reading and responding to messages sent and received on mobile phones, it is worth first outlining the range of reading situations and goals that has been previously identified (O'Hara & Sellen, 1997) within traditional paper-based format and characterised in terms of the different reading strategies employed. Lunzer and Gardner outline four broad characterisations: *receptive* reading involves a continuous piece of text, like a novel, and approximates with listening; *reflective* reading involves as the name suggests, the reader interrupted by moments of reflection and learning from the text; *skim* reading refers to rapid reading to gain an overview of the content of a text to assess its

relevance, but not the detail; *scanning* is related to skimming, but involves purposefully scanning the text to find specific information (Lunzer & Gardner, 1979).

Different reading practices for enjoyment can be characterised by concentration and high emotional involvement in the text. Such reading may involve trying to anticipate what is ahead in the text and finding relationships among specific ideas and events. This kind of reading will be in a linear fashion and require a high investment of time. However, in other situations, reading for enjoyment can be much lighter, such as reading letters from friends, or comics, or magazine articles. This is the least cognitively involving type of reading, often used *just to kill time* (Lorch et al., 1993). Reading speed is high and there is little accompanying thought or criticism of the text. Reading is likely to be done in a linear fashion and there is generally no need for re-reading (R. H. R. Harper, 2015).

5.3 Participation

Conversational talk, when examined, can reveal a variety of sequences through which participant identities are made available to the hearer–ranging from 'instrumental' details of a speaker's current biographical details including age, health, education and the like. The participatory role of a speaker can be mediated with further nuance, through additional resources such as appearance, carriage and gesture, but also the kind of humour tendered, the style of authenticity enacted, and the degree of interactional grace commanded (Sacks, 1978, p. 62). The aspects of identity that are picked up on are, in turn, dependent upon the participant 'identity' of the recipient hearer.

In his study (Sacks, 1995, vol. II) of recorded landline telephone calls, Sacks identified three basic structural forms of social roles involved in analogue telephone talk, specifically; the *caller*, the *answerer* and the *called*. These are categorical characteristics that relate specifically to the person's respective participant role in the specific instance of a landline telephone call only, and are unrelated to other skills or characteristics. These particular participant roles have since been disrupted by intervening technological developments, such as answering machines and then mobile caller identification, which allow the called to screen incoming calls and ignore unwanted calls–greatly dissipating the asymmetry of traditional landline phone calls whereby the caller was in a position of dominance over the topical agenda of a call, by placing the answerer in a position of obligation to answer the opening query of a caller in what Hopper referred to as '*caller hegemony'* (Hutchby, 2001). Despite the changes in telephone technologies, Sacks' observations on the distinct participatory roles associated with telephone communications are still relevant and do now prompt enquiry to

look for relevant characteristics in the talk and interaction surrounding mobile technology and the different forms of communication it supports. Indeed, can we extend this enquiry to look for participant roles related to mobile messaging.

The situated interactions found in the research material here, when examined, suggest Sacks' threefold roles for analogue telephone voice calls have been reconfigured; for mobile messaging exchanges, participation involves a message *sender* and message *recipient*, with a third social role in the message *listener* who may hear about or see the message content by proxy (Sacks, 1995, vol. II). These participant roles add to those identified in the other two empirical chapters for mutual interactions around mobile phones for non-communicative practices, mobile search and way-finding; 'driver' and 'passenger'. To the *driver* is attributed the role of holding, inputting and controlling the mobile device, while co-located participants involved in some capacity such as contributing to the driver's interaction with the mobile device fulfil the role of *passenger*.

5.4 When does messaging occur?

As I reviewed all video research material uploaded by participants, it was striking how often messages were brought into face-to-face conversation around the phone. Messages were introduced in a variety of ways: they were readily brought into conversation as they were received, often giving account of an audible notification on the phone heard by those co-located. At other times, messages retrieved from the participant's phone storage were used to maintain complex multi-party collaborations, and messages were often composed and co-created with the help of co-located friends. Messages have a temporal order in how they are brought into face-to-face social interaction, and the resources used to make sharing a mobile message a relevant next action.

5.4.1 Messaging and local talk

Engaging in reading and replying to text chat on a mobile phone allows for interaction that is additional to co-located face-to-face conversational activity–as well as other activities. Indeed, due to the nature of mobile technology, responding to messages can often constitute *multiactivity* (Heath, Knoblauch, & Luff, 2000). The study of multiactivity emerged originally through workplace studies, facilitated through the close analysis of video recordings of flight control rooms (Suchman, 1997), hospital operating theatres (Mondada, 2011) and other specific work domains. Subsequently, multiactivity has been the topic of further study in specified settings (Mondada, 2012) and involving mobile technology

(Licoppe & Figeac, 2015) and its relation with social interaction (Mondada, 2008), rather than the original concern with work in organisational environments. Mondada describes multi-activity as "*not just two successive independent actions, but one multiactivity constituted by two or more parallel streams of action*". The implication is that parallel courses of action are attended to at the same time by their participants in ways that can change over time, and that action can be distributed in a dynamic way between a *main* and a *secondary* activity. In the conversational setting, the main activity may be the foregrounded face-to-face talk–although as we shall see in some of the research material presented in this chapter, the communication being mediated via the mobile message can be prioritised.

Face-to-face interaction can be described as 'real-time' and synchronous–where one utterance begets a response before proceeding. In contrast, text message correspondence with a remote other is asynchronous and therefore the interaction occurs at different times, allowing both sender and recipient to respond to messages at a time which suits them, making their responses 'situated'. Asynchronous interaction affords both parties time to reflect, as well as opportunities for anonymity and pseudonymity which are lacking in face-to-face interactions. Mobile messaging provides an opportunity to conflate these two temporal organisations by reading and replying to an incoming remote mobile message while simultaneously participating in local face-to-face interaction, producing a quasi-synchronous phenomenon that rests on a different participation framework of communication via the mobile phone and a different communication mode of writing as opposed to talking. Therefore the mobile communication or information-sharing with a remote other has the potential to remain invisible on the *front stage*, if the co-located other only has access to the face-to-face talk–while the remote sender is unaware of who may ultimately read their message once sent. Alternatively, the action of composing and writing messages can be made accountable and publicly understandable by various means. Therefore, if we focus on the other activities that occur simultaneously with the face-to-face talk, we can begin to understand how talking and messaging in co-operative accumulation are temporally organised. This requires analysis of not only the shifting from one activity to the other, but the situated interdependence between these activities, and how participants organise the complex array of social, temporal, technical and interactional resources to make their activity observably accountable–or not. Indeed, the complexity of synchronous and asynchronous interaction presented by introducing mobile messages into face-to-face conversation provides opportunities to enhance, as well as risks of disturbing, the local order.

5.4.2 Notifications

Mobile phone notifications have become a recognised part of the co-located setting, and perhaps the most obvious time that messaging occurred in the research material was when a participant responded to an incoming notification on her or his phone. With notifications playing as they do a key role in our communication through mobile devices, Tolmie et al. refer to the complex ways in which audible and visible notifications make their recipient in some way accountable to others (Tolmie et al., 2008). The video recordings gave us access to some of the interactional resources used by participants to deal with notifications while in the company of others, specifically their gaze, body orientation and pauses in talk. The recordings collected gave us a more in-depth understanding of how mobile messages are then discussed and dealt with–or not–while the recipient is in the co-located setting. In the recordings analysed below, notifications are a contingent element of the ongoing co-located interaction which were routinely ignored, read privately or shared within concurrent action, depending upon the relevance of the message to the ongoing interaction.

5.5 Practices of messaging

"…that's an absolutely fabulous machinery"(Sacks, 1995, p. 720)

The corpus of video recordings discussed shows a predominance of mobile communication mediated through written text and media rather than voice, shifting mobile telephony from an aural to a visual experience (Fortunati, 2002) and providing a valuable research site for understanding the evolving practices of mobile phone use. Mobile messages can be easily read and written in the presence of others–additionally, the mobility and form of the mobile phone is such that messages can be dealt with both privately or publicly in that setting. Moment-by-moment video analysis reveals the ways that messages are threaded into concurrent interactions, with the surrounding talk and action giving insights on how people make sense of the phenomenon of collaborative text messaging. What was evident were messages becoming more nuanced both socially and technically. Mobile messages were seen as an integral part of practices for the ongoing co-production of relationships: a resource for topical cohesion in face-to-face conversation; the focus of collaborative composition of messages to remote others. In addition to providing a perspective on mobile messages from that of the sender, and the recipient, the ethnographic research material from the final publication provides a perspective on the message chat stream as a permanent material archive which can provide ongoing awareness of the activities of others, including work

colleagues. Through these observations, the everyday practices around messaging may be identified and articulated and understood in terms of their contribution to local order.

5.5.1 Topical cohesion

It was surprisingly common for the mobile phone to be brought into co-located interaction in some way, and in the video recording transcribed below, it was social media consumption (checking the Facebook timeline) that led to a short conversation between the participant and his co-located partner, with a short question and explanation, followed by discussion about a Facebook message received from Aunt Darlene.

In Figure 13, the video recording begins with Sam noticing a new Facebook post made by his partner, Jim who can be heard typing in the background. Sam asks Jim what the post means and his explanation provides some humour. Sam then receives a Facebook message from an aunt: eight seconds pass as he reads the message, before he summarises it aloud as "Aunt Dar-leen wants us to move to Bakersfield" (Line 19-20). In terms of 'reported text', this interpretation of the message is not supported by the actual content of Darlene's message, since "Wish you were closer" is the relevant text from the original message. There is no audible response from Jim who is the only recipient of Sam's utterances, who goes on to have an imaginary dialogue with his Aunt Darlene, adopting a sardonic tone which suggests the message from Darlene is insincere: "You're too far away"–"You haven't seen me in […] thirty eight years".

((Sam opens Facebook app on phone and scrolls through
New updates))
SAM: We? [*]- - - - - - - - - - - - - - - - -
JIM: °What's that↑°
((Jim responds from the other side of the
room-from where he can be heard typing on a
keyboard))
SAM: Whe:e:e↑ ((Repeating the question
about Jim's status update))
JIM: We wha:at?
SAM: You said WE
JIM: Oh (.) Whee↑eee
SAM: Oh my gawd
((muffled groans as Sam gets the joke))
(3 seconds silence)
((A opens a Facebook message from his
aunt))
(8 seconds silence)
SAM: Aunt Dar-leen wants us to move to
Bakersfield [*]-- - - - - - - - - -
((While telling Jim about the message,
Sam closes Facebook,opens Mail and
begins to review and delete, without
opening, a number of emails in the
inbox))
SAM: You're too far away
((adopts an 'Auntie' accent while
continuing to elaborate on the Facebook
message received))
SAM: To which I would have to say, something to the
effect of, we:e:ell you haven't seen me in fortee (.) no,
thirty eight years

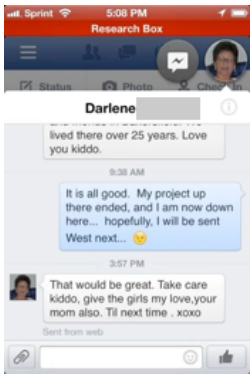


Figure 13 An incoming social media message becomes an interactional resource for topical cohesion in face-to-face conversation. The remote sender is unaware of the multiparty nature of the correspondence.

Aunt Darlene's Facebook message has become a resource for *topical cohesion* (Laver, 1975) in conversation between the message recipient and a co-located other. While the persistence of saved messages in social relations presents the potential to change somewhat how reporting past events is done, since messages may be opened and re-read for accuracy, nevertheless the reporter is able to control and adapt the text to fit the story being told, and past messages are not reviewed in entirety or verbatim. Rather, as found in all of the recording transcripts presented in this section, archived message streams were often scanned,

with candidate quotes being pulled out of the stream, as an account of previous communications was constructed using the archived messages.

The device then acts as something that can naturally be brought into conversation or discarded and, in this instance, Sam has appropriated the topic of Darlene's message about her move back to Bakersfield, to tell another story about family bonds, and the relationship between the couple present. The message then becomes a resource by which Sam can construct a further story more closely relevant to the co-located interlocutors.

In another video recording, two co-located friends discuss an incoming message, which is about the message sender's new online date, including a photograph of the online date. The message recipient is a cousin of the sender and she shares the image with her co-located friend. The two talk about whether the photograph is genuine, or if the online dating profile is fake. The co-located friend has some understanding of the risks of this, having previously experienced a number of online dates where the photographs posted online were fake, resulting in romantic disappointment, and this led some discussion of the pitfalls and vulnerabilities of online dating; "I hope he doesn't get catfished", and she proceeds to recount some details of her personal experiences. The friend topicalises this first story to construct a second story, using what Sacks refers to as a *tying mechanism* through which the speaker can tie her utterance to a previous turn of talk–showing how movement from one topic to another in conversation is managed gracefully by participants in 'stepwise transitions'. The tying mechanism demonstrates the speaker's orientation to the original topic of conversation–it might be characterised as appreciation for or empathy with the preceding story. Indeed, when a new turn goes off topic, this is typically accounted for by the speaker as a change of topic, using phrases like "by the way", "changing the subject completely" and so on. If that accounting does not take place, it is notable by its absence, and the conversation can seem disjointed as a result, serving to potentially disrupt the local order of the social interaction.

The face-to-face conversation about the message was sequentially organised and the context was locally produced: the incoming message detailing the new online date is raised as a topic by the first speaker, which in turn creates a context for the second topic, the telling of the second speaker's personal experience of being 'catfished' and this projects a meaning for the next speaker's turn about the risks inherent in online dating. While there is order in the sequential organisation of talk, the result is nevertheless a complex, "indefinite nesting of a conversation". All utterances are monitored to find how they tie, or do not tie, with the previous, in order to understand what is the speaker's stance or position on the previous utterance. This monitoring for 'ties' between utterances is something that is done by both

speaker and hearer, showing how people attend to 'order at all points'–inspiring Sacks to comment "that's an absolutely fabulous machinery" (Sacks, 1995, p. 720), and this metaphor will be revisited later in the discussion.

Topical cohesion is a practical problem of social organisation in face-to-face conversation (Laver, 1975). The improvisational nature of ordinary conversation requires the ready availability of commonplace topics as formulaic themes around which conversational interlocutors can improvise relevant and situated variations. Topics for ordinary conversation can be classified in three ways as local, local once removed, and non-local; incoming messages can fulfil these categories in local conversation in a number of ways. The messages which have been brought into the face-to-face conversation here could be described as *local once removed*, since they were received from a person remote but known to the participants in the face-to-face conversation examined.

Another notable characteristic of the mobile messages transcribed above was the way they were referred to in the manner of ephemeral speech. The spoken utterances of a remote other–what someone who is not present said–is less fixed over time than a message. Both examples above demonstrate the importance of local talk for sense-making–neither message was recounted verbatim in either instance, and the message recipient shaped their telling of the message to suit her local conversation. Instead, message content was referenced obliquely, and was instead taken as an opportunity for the revelation and discussion of personal relational details between face-to-face interlocutors. Nonetheless, the permanence of mobile messages received does afford a new visible and shareable resource to the message recipient. This means that the message can be searched for, or shared with a co-located other, with the implication that the sender is not in control of who can see or read his sent message.

5.5.2 Multi-party messaging

In the following transcript, two colleagues are chatting while at work. It transpires from the conversation that they had been out socialising with a third colleague the previous night. In the recording, they are killing time by reflecting on the night before and also looking at social media together. One of the two colleagues shares her phone with the other in order to discuss a particular Instagram image, when a message comes in from the third colleague, who is not at work. The colleague holding the phone when the message comes in proceeds to compose and send a WhatsApp message on behalf of the phone's owner, who is overlooking the message-writing on her own phone.

The setting is a spa clinic where our participant works, and when the video recording begins our participant is sitting in reception awaiting the arrival of a client, and she is chatting with another member of staff. The transcription here represents 1 minute 12 seconds of an overall browsing session of 10 minutes 24 seconds. Our participant is an enthusiastic tattoo Instagrammer and she is browsing others like herself. From the audio of the video, she seems to turn away from her phone, leaving one image onscreen which catches the eye of her colleague, who asks "Who's that?" The image is of her husband and Liz instructs her to "click on his thing" to open up his images for inspection. Fay does this, and the Instagram images are the focus of a humorous conversation between the two women. While they joke about the images onscreen, the notification of a WhatsApp message appears across the top of the screen. The message opens on screen (it is not clear from the video who tapped to open the message) and there is a slight pause, presumably while the message is being read silently, and then Liz, the phone owner, begins to read the key phrase, beginning softly reading quickly as if scanning, before slowing down to announce more loudly the final sentence of the message "We were definitely the party though." It appears from the content of the message that Liz (the message recipient), Fay (the listener), and Renique (the message sender) had been out together socially the evening before. Liz responds verbally to the final comment by saying loudly "Yes we were", and laughing loudly with Fay. Her colleague agrees and asks if Liz wants her to reply to the message. Between them, they proceed to compose a quick response, with Liz dictating what to say in the reply to their mutual friend. The response is very brief and proposing a future visit to Dave and Buster's, a chain sports bar, which, given the brevity of detail in the message sent, we might speculate is known and understood between this group of colleagues.

1. FAY: Maybe (.) what does it say in them↑
2. ((Fay and Liz work together and they are killing time while browsing images of a random Brazilian Instagrammer. They are looking at the photos on Liz's iPhone and Fay suggests Liz provides a humorous commentary on the images.))
3. LIZ: Uhh:m:m
4. ((4 seconds looking at the Instagram image of four posing guys))
5. LIZ: This guy forgot his glasses [*]- - - - - - -
6. FAY: Mmnh mmnh mmnheh heh
7. LIZ: This guy=
8. ((an incoming message notification appears at the top of the screen))
9. FAY: =ting
10. ((the incoming message is opened on the phone and Liz reads key phrases aloud))
11. LIZ: >I'm glad you could handle everyone °I know what you mean about feeling out of place°< we were definitely the party though he:he:he
12. FAY: Huh huh hah ha
13. LIZ: Yes (.) >We were<
14. FAY: Wan me to say that↑
15. LIZ: Yes
16. ((Fay types message on Liz's iPhone: Yes we were :))) [*]- - - - - - - - - - - - - - - - -
17. LIZ: Oh h:h:hheh heh, this might be too much
18. FAY: What=
19. LIZ: I-be-like=
20. LIZ: =So. ((4 secs pause)) When are we going to Dave and Buster's
21. sessions hah hah hah
22. FAY: >Oh my gosh yes< I'm saying that
23. FAY: So. Renique=
24. ((Fay types, So. Renique))
25. LIZ: =No you have to do like spaces too
26. FAY: Okay. So.
27. LIZ: So. And then
28. FAY: [Period.]
29. LIZ: [yeah] and then do Renique=
30. FAY: That's what I was doing he:he:he
31. LIZ: =And then do you, like retu:urn three or four times go right down make it that big.
32. LIZ: There you go
33. FAY: When are we going=
34. LIZ: Do winky face after [too] [*]- - - - -
35. FAY: =[To) Dave (.) and busters he:he:he
36. FAY: I luv it
37. FAY: Good↑
38. LIZ: Yes
39. FAY: I hope so cos I sent it he:he:he heh heh

Figure 14 Two work colleagues read an incoming message from a remote mutual friend, and together they compose a response. The message is a mediating aspect of their friendship together, and in the response they talk about when they will go out together again.

It is striking, perhaps, how intimate this interaction seems, and perhaps the open use of her colleague's mobile phone is a token to their mutual trust; these two women work together, party together, share friends and even share their mobile phone together. Licoppe has identified new forms of close relational bonding (Licoppe, 2004) between couples which mobile phones afford, whereby increasingly shorter and more frequent messages were exchanged between couples to counter the loss of fixity in time and place which was traditionally associated with fixed landline telephone calls. Despite the remote nature of WhatsApp group messaging, Dixon argues that group membership affords an embodied sense of community through feelings of collective presence (Dixon, 2018) and *being in this together*, engendered in the to and fro of messages of a gated community neighbourhood watch group studied in South Africa. Dixon notes that mobile phone practice is not a disembodied practice, and highlights the nuance in defining *embodied experience*, which she describes as including every sensation outside of 'only cognition'. The direct perception of mobile messages becomes an embodied experience; "when we perceive something we also feel it" (Walkerdine, 2010); and the message chat stream becomes a place to *do friendship* (K. P. O'Hara et al., 2014) rather than simply communicate information.

Returning to the transcript above, the topic of the message exchange is a party the night before. All three have access to the exchange, but only two of them are directly addressed– Liz and Renique (message receiver and message sender). So, while the technical configuration of this message is one-to-one, in terms of the social interaction it is one-to-many–it has been assumed that Fay, the third recipient of this message, is 'listening in' via Liz's phone.

No-one is identified by name in the account of the night before written in the text, there are assumptions being made about who the message relates to, which perhaps indicates friendship assumed by the use of 'we'. Even though we know from the talk around the phone that she is included by the phrase "we were definitely the party", and even though Fay types in the reply "Yes, we were" on Liz's phone, she does not identify herself within the message as the author. That the nature of friendship between the group is somewhat fledgling becomes available in the research material collected later that evening, when Liz reviews the message thread while recounting the interaction to her husband. In the preceding messages between Liz and Renique, there is mention that they will be 'BFFS' and another comment states in a joking way "PS I now officially love you", which further suggests that this is a new friendship. This message exchange contributes to the developing friendship by confirming

that they all had fun the night before, and also alluding to future nights out together (Renique later responded positively to the suggestion of a future trip to Dave and Buster's, albeit in somewhat measured terms).

The co-located interaction transcribed here is part of a longer recording which lasted over 10 minutes. It began with Liz browsing her own phone and commenting on Instagram when, next, her colleague Fay picked up the phone and also browsed Instagram, while discussing Liz's husband's physique in intimate terms–based on a photograph of him posted on Instagram. Next, Fay replied to a WhatsApp message sent to Liz. After sending the reply, Fay was called away to respond to the reception at work, and Liz continued browsing Instagram in silence except for briefly sharing two images from her husband's Instagram profile with Fay. It seems Fay has returned to work after the 2–3 minute interlude with her colleague, as she can be heard talking in the background.

Using mobile technology to grab a quick micro-break from work is recognised, and follows ongoing debate over the compulsion of 'checking behaviour' (Oulasvirta et al., 2012), which still seems to be prevalent in our data despite the use of push notifications. There are videos in which participants show a pattern of intermittent, 'self-initiated' checks on a favoured website, news applications, social media or messaging app. These micro-breaks on the mobile device have been described as 'self-interruptions' (Jin & Dabbish, 2009), and can be viewed as either aiding concentration or potentially damaging for productivity (Ariga & Lleras, 2011).

The interaction above reminds us that a 'one-to-one' message can become a 'one-to-many' message, since the message recipient may refer to or share a message socially with co-located others. The mobility of the device allows messages to be consumed in increasingly distributed locations and, subsequently, as a part of more diverse social interactions. The clip also highlights that the participant roles adopted (e.g., driver and passenger) around mobile messaging do not necessarily correspond to either phone ownership or even the intended message recipient. Instead, in this instance, the mobile device has been shared between colleagues and the distribution of labour of reading and writing messages becomes part of the mediating practice of 'doing friendship'.

5.5.3 Collaborative composition

So far, the transcripts presented have explored sharing mobile messages in interaction from the perspective of the message recipient, revealing how face-to-face conversations can unfold in an orderly, stepwise fashion in which both speaker and hearer monitor each other's

utterances in order to maintain topical cohesion, by carrying forward details from one topical story to construct the next story, using a *tying mechanism* showing how movement from one topic to another in conversation is managed gracefully by participants in 'stepwise transitions'. We saw how text or photographs from previous mobile messages could be used to generate a next relevant conversational item, as could the sequential nature of the chat application's interface. Both of the transcripts above involved fairly brief message one-to-one exchanges (which were subsequently shared in the co-located setting). The following transcript features an involved and consequential messaging exchange from the perspective of one participant composing in-depth collaborative text messages. In the following recording, text composition can be seen to be an important site for co-located interaction and mutual assistance. Additionally, the sequential, observable, and recoverable nature of text chat (O'Neill & Martin, 2003) is seen to aid the 'message sender' in the composition and dissemination of messages with co-located others.

Helen has recently received the news that her best friend in Hong Kong has died and, after having gone to work during the day, she has now returned home, watching television with her partner and recovering from the news. At the beginning of the recording, Helen has been interacting with her phone, checking through various messages in a variety of messaging applications; email, Facebook, iMessage and WhatsApp. We hear her mumble quietly "*Huuuuuh. I'm, I'm gonna send to Andi and Jack*". Andi and Jack are her work colleagues whom she needs to contact to make arrangements to cover for her at work the following evening.

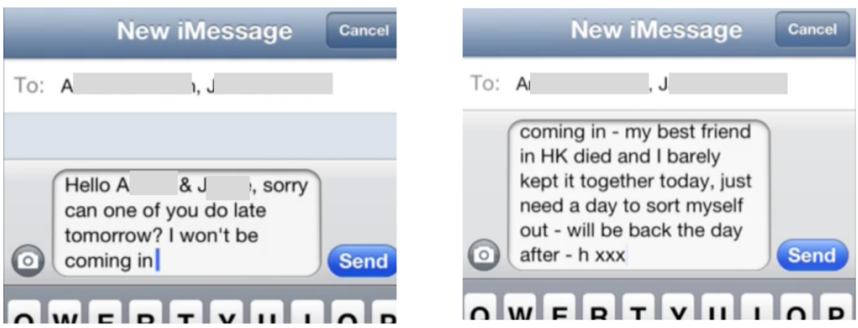


Figure 15 Messaging with multiple remote others can increase explication required as face-to-face cues and signals are absent. Local talk and help is drawn upon here to interpret and compose responses to sensitive correspondence between work colleagues.

She opens iMessage and begins to compose a message to them (Figure 15). Understandably in these circumstances, Helen is in some considerable emotional distress. She needs to ask for one of them to cover her shift at work, and also appropriately inform them of her personal circumstances to help them understand why she is asking for this favour. What is evident in the recording is the difficulty that she has with the composition of the message, in its wording but also in the decisions bound up in the message about how long she will be absent from work.

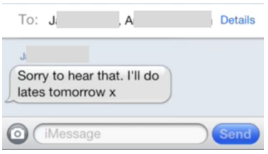
There is also a seriousness to the message and content that requires considerable deliberation to achieve the right kind of tone that explains events without making requests for moral support beyond that of friendly work colleagues. Her personal issue intervenes with work and there is obviously some sensitiveness towards how much grief can be shown. We get some indication of these difficulties and tensions in the five minutes it takes to compose and send the message, the many pauses as she types, the deleting of sections and in the re-reading and rewording of the message.

Having sent the first message to her work colleagues, Helen then starts to compose another message to cancel dinner the following evening with a personal friend. While she is composing this, a response from Andi appears in the notification bar of the phone: "Looks like Jack can have another bottle of wine?". This message from Andi seems like an odd response–a non-sequitur that is inappropriately joking in response to the news she has just sent.

A second message comes immediately after, on the notification bar. This one is a reply from Jack: "Sorry to hear that. I'll do lates tomorrow x." She continues typing the dinner cancellation message for about 20 seconds when a second message from Andi arrives in the notification bar: "That's awful to hear." This is a more appropriate response suggesting that he had more fully read the message she had sent through earlier. Helen finishes the text to cancel dinner. She then opens up the chat thread with Andi and Jack. She begins to compose and type a response (Figure 17), but the difficulties she is experiencing become apparent as she stops, deletes and verbalises to her co-located partner, questioning whether she needs to reply. Again, there are social obligations at play here. While it is a difficult response to deal with, leaving things here would render the awkwardness of Andi's first mistaken response lingering. As such, there is a need to not only communicate about her emotional state with regard to the bereavement but also somehow express in the tone of the message her recognition of the awkward, mis-timed response and that she is fine with it. That is, she needs to deal both with herself and with the potential embarrassment of Andi.

1. Helen types then deletes: "I am in shock"
2. HELEN: I don't have to reply can I? [1.2]
3. ((Helen scrolls up to reveal the earlier part of the thread,"Looks
4. like Jack can have another bottle of wine?"))
5. HELEN: then they just say
6. HELEN: tsh:h:h >I think he didn't
7. read my text< [*]- - - - - - - - - -
8. HELEN: and then Andi said
9. HELEN: Then we can have another
10. bottle of wine

11. HELEN: and then Jack says ((she
12. scrolls down to reveal Jack's reply))[*]
13. HELEN: Sorry to hear that. I'll do
14. the night and then
15. ((scrolls down to next message in thread
16. from Andi))[*]- - - - - - - - - - - - -



17. HELEN: That's awful to hear hh:h:H:H
18. and then just h:h:H
19. ((Helen becomes audibly upset, maybe in tears))
20. HELEN: I don't need to reply do I? (.) Should I say something?
21. BOB: Just (.) just say thanks for the ((sentiments)) and see you
22. Helen starts typing: Thanks for
23. BOB: See you on um (.) Wednesday
24. HELEN: mmm ((sniffs))
25. ((Helen goes back and deletes "for"))
26. Helen types: "Thanks" [6 second pause] "I am in shock"
27. ((Helen scrolls up to re-read the original message, to perhaps check
28. its content and tone))
29. ((Helen deletes: "I am in shock,"))
30. HELEN: I don't know what to say "Thanks for"?
31. BOB: ((yea-uh))
32. HELEN: No don't be (.) don't want to
33. be soo fo:r:mal
34. HELEN: "Thanks for that,"
35. ((Helen types: that,))
36. HELEN: in shock
37. ((Helen types: in shock
38. HELEN: mmm
39. ((Helen types: but will be in
40. HELEN: but will be in tomorrow. Will
41. be in
42. BOB: Wednesday
43. ((Bob heard standing up and walking over to
44. kitchen))
45. ((Helen types: We))

46. ((Helen stops typing Wednesday, goes back to edit the opening of the
47. message))
48. ((Helen types: Wednesday))
49. BOB: ((as Helen types)) Would you like some noodles?
50. BOB: C'mon come and make these noodles
51. Helen types and sends message: "Thank you, am in shock but will be
    back in Wednesday xxx" [*]

Figure 16 Managing collaborative composition in face-to-face setting, requires accounting for action on the phone while responding to messages incoming from remote others.

From the audio, it is apparent that her partner is sitting next to her. From her comment "I don't have to reply can I?", it can be inferred that her partner can see the screen of her phone and can read the earlier message from Andi. To elaborate on her request to him about how she should respond to the messages which have come in from her work colleagues, she scrolls through the message thread in sequential order, timing their appearance on the phone screen as she reads them out, partially verbatim, partially paraphrasing them.

Revisiting the thread here makes the sequence story-able in its own right; it clarifies that the request for work cover has been granted by Jack, but also highlights the social awkwardness introduced by Andi's mistaken initial response–something which they share with humour in spite of the difficulty of the broader situation, which can be heard in the bubbling expression she makes when she explains the problematic message from Andi: *Helen: tsh:h:h >I think he didn't read my text<* (Line 6-7).

Re-visiting the thread explains the difficulty and uncertainty that Helen is experiencing–does she need to respond at all, and if so, what should she say? Her partner offers her a suggestion as to what to say (Line 21), to which she responds by typing his suggestion. As she is typing, it seems she realises that the tone is not quite what she is trying to achieve and deletes the word "for" and then adds "I am in shock". Her uncertainty continues here when she deletes "I am in shock" (Line 22). Of interest here is that she is now becoming accountable to her partner, who can see that she may not be following his suggestion. In making a second request, she invokes some of his original wording but stops short of using his words verbatim. When he offers the word again, she has to be more definite, rejecting his suggestion as too formal. At this point, she begins to verbalise out loud what she is writing. This verbalising becomes a way of keeping her partner included in the composition process, making it open rather than reverting back into a silent private composition. Indeed, as she verbalises, "Will be in tomorrow. Will be in…", he takes this as an opportunity to offer the suggestion of Wednesday, making it acceptable and reasonable for her to take an extra day without concern for any other obligations she may be feeling about the commitment. She offers her agreement by verbalising Wednesday.

Clearly, the death is an intensely distressing experience for Helen and the emotional extremes are evident in the recorded material, as she moves from laughter to tears in the course of one sentence. The research material directs our focus to *how* rather than *what* is written. Reviewing the messages sent and received alone would give no indication of the mutual assistance that was involved in both interpreting the messages and then responding to them. The video allows us to understand the productive practice of mutual assistance in this

setting–how help is requested, and the participant's account of using or not using the help offered. Nevertheless, she is attentive to the need to manage the communication with her friendly work colleagues with care. Had her colleague's 'gaffe' been made in a face-to-face setting, she would have had to respond in the moment, but as it was mediated by a mobile device, she is able to 'compose' herself and choose her words carefully. Indeed, the simple ability to share the screen physically with another here allows for advice to be sought in a way that could have been more difficult and distressing without the threaded message exchange being available onscreen to share with a co-located other.

As with the earlier transcripts, at the beginning of the recording the participant provides a narration of the previously received messages, as well as giving an explanation for the anomalous response from Andi. Reading messages, and a message in mid-composition, is clearly part of the process of writing a message and the messaging app affords this reflection. More than any of the other recordings, there is repeated reflection on the previous replies while the message is being composed, as well as a threading of activity, in that she receives and reads the messages while she is simultaneously composing a message cancelling her dinner appointment. When she sends this message and returns to the group message thread, she does not re-read the previous messages but rather jumps directly into typing her reply "I am still in shock". While there is a multi-party aspect to this composition, it is not quite a joint enterprise; the *passenger* (her partner) makes some suggestions on text she might write, but the *driver* (our participant, Helen) uses only some of the suggestions given, and through several experimental iterations with different words and registers, creates a written message to better reflect her meaning, in a transformational process closer to Goodwin's 'lamination' (Goodwin, 2017).

One worry about the advent of notifications and the possible distractions that telephones provide is that they could provide a distraction from important face-to-face interactions. Yet here we have something quite different–we have an important message being sent by Helen, with the phone supporting this important communication activity, rather than distracting from one. It is worth reflecting on how messages and communication via the phone might at times be as important as those made with those who are face-to-face. Indeed, in this case the co-located interaction acts as support for the important job at hand: sending the text message.

One last remark to make about this recording concerns the nature of the group conversation. In the group conversation, Jack meets the request for cover, and although this message is directly in response to Helen, it is visible and 'overheard' by Andi, the third group member. In this case, rather practically, this means that Helen need not reply again to Andi,

and both her work colleagues now know that the work is being covered and they need not do any more. Indeed, the mutual awareness of the messages is perhaps behind Andi's original inappropriate joke message which names the other conversationalist by name. Yet while this mutual receipt is visible to those who are in the message header, any face-to-face sharing that might go on around the message (with Helen's partner, for example) is not visible to the remote conversational partners–which was also evident in the previous videos.

In addition to the awareness afforded by the visibility of everyone's ongoing messaging in the group chat in this recording, there is an embodied orientation towards writing observable in the recorded data. The movement between the co-located participants is audible; as the clip begins, they are sitting close together, which facilitates the sharing of the mobile screen during message composition. The participant's mobile screen is visible while she narrates the incoming message content, while the co-located partner looks over to the messages on her screen. Then she finalises the composition alone, as we can hear him move to the kitchen.

5.6 Using chat apps at work

The practices of messaging discussed so far have been attentive to the mediation of sociality, both through the communicative action of messages sent and received by participants, and also in the ways that messages have become a resource for producing co-operative action with co-located others. From very basic beginnings, messaging services have evolved technically into a sophisticated tool which has generally been associated with casual and non-work communications (R. Ling, 2008). Could lightweight messaging apps running on mobile phones help to bypass the hierarchical networks of management in large-scale work organisations, to foster more direct communication and awareness between workers in the field, and between field workers and central management? This was an underlying theme in Paper VII. This was a six-month ethnographic study of chat apps being used in workplace communications in the Global South. The objective of this study was to evaluate the pre-launch version of a chat application developed for workplace communication. The application, Kaizala, had been used in a number of large organisations for some 18 months prior to the launch of our study. The methodological approach adopted involved longitudinal observation of sales and administrative field staff who were required to use their mobile phones to coordinate and meet with new clients every day, while making accountable to central management all of their daily work activities, contacts and ongoing business achievements. The careful inspection of everyday work in the distributed workplace was

focused on the work practices of those involved. Those practices, in turn, were massively preoccupied with large-scale coordination and communication. The research challenge became to identify the role of chat apps within the *communication ecology* used in each organisation, which was constituted by multiple modes of communication including face-to-face talk, voice calling, email, online chat, and video conferencing.

Methodologically, the research goals involved seeking to understand the broad work objectives at organisation-wide level through situated interviews with workers from different organisational levels. Equally, we focused on the moment-by-moment analysis of how the coordination and communication of work objectives was mediated at the local, individual level. That was achieved by shadowing personnel as they worked, to observe their work practices using similar research tools and methods used in the earlier studies, including video recording work activities, and subsequently transcribing and analysing later to reconstruct and thoroughly understand the end-to-end processes involved, and the practices of technology use including mobile phones.

Each organisation had multiple work-based chat groups, each having a set of members (and permissions in the case of Kaizala), and a chat stream[10] for messages and content. Surprisingly, only a small amount of the chat stream observed involved what we might commonly think of as chat involving conversational turns. Instead, different chat groups were characterised by different content and interaction patterns, which fulfilled different organisational functions.

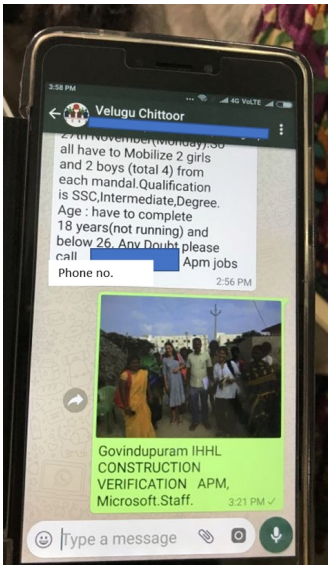
Whilst the centralised headquarters (HQ) managers we interviewed wanted to use chat streams to communicate directly with, and create awareness amongst, fieldworkers, this did not mean that workers actually attended to the messages there. Instead, work often cascaded down the hierarchy in the traditional manner–with local managers allocating, coordinating, then monitoring work done. For example, during an *in situ* interview, a GovernmentOrg fieldworker scanned past a message "renewal of contract agreement for FTEs" as he showed us the most recent chat messages on his phone (Figure 18, left). When asked, he could not clearly articulate what it was about, and said he did not think it was for him and would not take any action on it. In fact, he only attends to messages he knows are important because his local manager tells him, or colleagues talk about them. In fact, the renewal-of-contract message was important, as staff would not get their five-year contracts renewed without

[10] The thread of messages generated in a chat app group (WhatsApp, Kaizala) is referred to as a 'chat stream' in this thesis.

completing the form. The next day we saw his manager urging staff to complete the form, by printing it from email and helping them fill it in. As this task was time-sensitive and important, it was conveyed through multiple channels, including chat, email, and in management's regular teleconference, and was passed down the hierarchy from HQ to district-level and then to mandal-level managers. Thus, although all relevant staff received it through Kaizala, it did not become actionable by fieldworkers until directed by their manager. Thus, chat does not always perform its function as HQ's direct channel with fieldworkers, who continued to rely on other people, particularly their direct manager, to identify what was relevant to them. Messages in the chat stream are undifferentiated, meaning that the relevance and urgency of posts in these large broadcast groups are indistinguishable, meaning also that fieldworkers must work out themselves what is important and relevant to them.

From the perspective of management and administrative staff then, one of the most alluring aspects of chat is the opportunity for more direct information-sharing, and the organisations observed were keen to use Kaizala's broadcast functionality in direct-to-worker communication strategies. Yet chat did not transform organisational communication and, typically, workers relied on established local practices of knowledge-sharing and coordination work. That is, chat was 'made at home in the world' (Sacks, 1995) in each organisation's existing practices–its use shaped by the hierarchy and division of labour of the organisation in which it was embedded. When trying to understand why chat apps are not engendering the hoped-for conversational 'turns' in workplace setting, it became apparent that organisations and workers have different perspectives on what is important. Organisations are concerned with how to get company information such as policies, work documentation out to fieldworkers, and to gather information back from them. In contrast, workers are concerned with getting the information they require to do their job, with as little effort as possible.

Message above was overlooked by fieldworker, it reads:
Please find attached letter on Renewal of Contract Agreements of FTEs and Form for renewals. all the ACs are requested to communicate the enclosed format to all the FTES under their control and submit the filled in proposals along with recommendations to DPMU on or before 1st December 2017.
This may be treated as URGENT



Unrelated messages in chatstream:
The message above gives important instructions on how to apply for sponsorship for college education. The message below is a photograph of a visit we made as researchers to a village. Relevance is situated, and messages become undifferentiated from less relevant materials found in the same threaded chatstream.

Figure 17 Chat messages are socially embedded, and local managers are often the filter for how to identify and find what's relevant to individual fieldworkers.

Where the chat apps were brought into everyday work practice, they provided an enhancing channel within the overall complex communication ecology, and the success–or otherwise–of the app for workplace collaboration, depended very much upon the chat stream performing as a situated and glanceable source of familiar information. The workplace group chat stream was used as part of the understood work processes, as it can provide a persistent and continually updated resource for checking and monitoring reported activity in the field, which affords group members an awareness and an account of work done in the multi-activity setting of distributed work.

Examining the interplay of existing local practice and chat helped us to understand the role of chat in large organisations. The empirical research involving observation of the whole communication ecosystem deployed to get the job done (rather than focusing on how the chat app is being used in work) highlighted types of chat groups that are not typically discussed in research about chat apps, but which are actually more prevalent (in both WhatsApp and

Kaizala) in the organisations that were studied, namely, chat groups where there is little conversation. Instead of fostering *social chat* at work, the chat groups were used by staff as valuable shared spaces, enabling them to monitor ongoing work with less disruption (Khanna et al., 2015) for office staff–mobile and to-hand for field workers. Awareness was created in-and-through the content shared, and when supporting routinised activities like pensions, this creates familiarity with the rhythms of others' work. As Pettersson et al. note about landing strips used in air traffic control, the materiality of the chat stream, as a collection of content types viewable at-a-glance, provides a publicly available "representation of both the current and the prospective state of play" (Pettersson et al., 2004).

Organisations are concerned with how to get company information such as policies and work documentation out to fieldworkers, and to gather information back from them. By contrast, workers are concerned with getting the information they require to do their job, with as little effort as possible. Workers certainly need to know about changes in processes and new documentation, but getting, grasping and remembering this is extra work that sits outside the doing of their day-to-day work. The organisational dilemma lies in aligning these perspectives or, as a minimum, in communicating to each person what they need to know to follow due process and procedure. On the surface, chat seems like an effective way to do this, providing a direct channel to workers wherever they are and sharing all sorts of content in a lightweight way. Yet each layer of hierarchy that chat attempts to bypass is doing vital communication work. Broadcast channels (one-to-many) in chat apps tend to contain a variety of organisational communication resulting in a *chat data deluge*, only some of which is relevant for fieldworkers, making sifting through such channels extra work.

Staff relied on existing (local) practices of knowledge-sharing and coordination work since undifferentiated messages do not convey their situated relevancy. At each level of the hierarchy, managers filter, curate and make relevant what should be done by their people, and verbal communication (phone calls, group and one-to-one meetings) is preferred for coordinating work and judging comprehension. The problem with large organisation-wide group chat remains how the individual worker should know what to do. Each organisation did, however, have a few conversational groups, which were active and deemed successful by field staff and management. These arose when there was a need for remote communication between HQ and the workers to *get the work done.* Team work was managed in HQ by both sharing phones and successively building on one another's posts. In this way, as other work has found, chat is highly valuable for these single-purpose groups, providing a *shared space* supporting mutual awareness and ad hoc interactions. Thus, where remote interaction

is needed *to get the work done*, chat is a powerful addition to the communication ecosystem. The materiality of the chat stream facilitates a shared awareness within the team, reminding us of the embodied quality of collective community and reassurance previously identified in the chat streams of a WhatsApp neighbourhood watch group (Dixon, 2018).

In terms of creating more direct communication, chat was only moderately successful, proving better for lightweight reporting, and information dissemination to small targeted teams. Unlike previous studies of chat app messaging in the workplace setting (Johnston et al., 2015; Quan-Haase et al., 2005), our study did not provide evidence for less hierarchical communication, and despite hoping for more direct information-sharing with workers, most organisations created chat groups which reinforced existing hierarchies. For large-scale organisational communication, then, workers still rely on local practices, because getting, grasping and remembering company information such as policy and process documents from large group chat streams represents extra work. Chat is not as effective at disseminating information *en masse*, and middle managers are still required to filter, curate and customise information. Thus chat apps in the workplace setting become more of a medium of distribution than of social communication.

5.7 Concluding thoughts on the practices of messaging

Perhaps one of the clearest social aspects of co-located mobile device use was the ongoing reconceptualisation of how we view text messages and their contribution to co-located talk. This chapter has introduced some foundational concepts of written and spoken language as a means of explicating the forms of text-based messaging that mobile phones make available. Consideration is also given to the temporal complexity arising from the interweaving of the synchronous and asynchronous interaction that occurs when bringing mobile messages sent from remote others into face-to-face conversation–with opportunities to enhance, as well as disturb, the local order. The immediacy of messaging apps has fostered different levels of informality and levels of anonymity in the written language of messages. Indeed, there is an ongoing debate that laments the evolving forms and quality of mobile message communication and its harmful impact on the state of human interactions. However, it seems that the distinctive characteristic of mobile messaging captured in the research materials was the massive increase in activity, communication and interaction now mediated through messages, and facilitated by the speed and mobility of mobile messaging.

From this increased messaging activity emerged recurrent actions which constitute the four practices of mobile messaging in co-located settings discussed in this chapter. Along

with the familiar uses for communication, the video research materials show that incoming and archived messages are readily used and adapted to provide topics for in face-to-face conversation. Messaging apps are used in communication with those who are co-located. We observed incoming messages shared with co-located others in the production of social relationships, and the collaborative composition of messages was practised to both manage participation in the writing process and account for device use.

Finally, the use of chat app messages by field workers in large scale, distributed workplace settings was discussed. The absence of sociability in work-related chat groups was notable. Instead chat messages in the workplace setting are socially embedded, with workers often relying upon face-to-face interaction with local manager to interpret and act upon messages received–with implications for distribution in hierarchical organisational communications.

6 Way-finding Practices

In order to find one's way in a city with the help of a paper map, the first step is to figure out at least approximately, where you are located within the map, in an activity that can be defined as gaining spatial orientation. The process of achieving spatial orientation is complex, and calls for the use of different information drawn from the environment–such as road crossings and landmarks. Paper maps provide a source of spatial knowledge that requires map-reading skills for a user to access; the spatial cues and knowledge visualised in maps need to be matched at the ground level perspective in what can be described as way-finding practices. Taking an EMCA approach to analyse this process in its moment-by-moment constitution makes accountable the visible work done to acquire knowledge from disparate, multiple resources in the environment, and to transform the knowledge to achieve spatial orientation in the here-and-now.

Map-reading activity can be thought of as the interaction between the visual descriptions shown in maps and our existing knowledge of the area in question, which results in how we 'see' and interpret maps. MacEachren presents an information-processing approach to map reading (MacEachren, 1995) and discusses the low-level visual perceptual processes used and drawn from a variety of disciplines: Gestalt grouping principles; selective attention theory; visual search models; perceptual categorisation; and depth perception. Many of these interests are shared by the study of human–computer interaction (HCI), and more specifically interaction design. He describes how cartographic visualisation is designed to support the map reader's visual thinking in pattern matching, looking comparatively at relationships in space and time, and assessing distance across multiple features in space, orientation, colour, time, focus and sound. These are all richly important resources for the abbreviated domain of both cartography and mobile phone interface design. However, MacEachren does not look at map use in situ, Brown and Laurier provide an ethnomethodological critique of the "cognitive map" in their study of shared co-located and collaborative practices (Laurier & Brown, 2008). Rather than ascribe the accomplishment of way-finding to the mysteries of the unseen cognitive mind of the individual, they report on the conversations, gestures, negotiations, disputes and other situated actions, through which users achieve alignment and orientation in way-finding–including the role of co-located others who can provide additional knowledge, as well as different perspectives on the surrounding environment. They identify

the resources required to accomplish collaborative way-finding: a description of the thing being looked for in words and imagery; other maps; the help of others; what can be seen in the environment.

6.1 Participation

Way-finding in groups, whether large and formal or informal like friends on a day out, involves distributing labour and accountability. Taking charge of the map–paper or a mobile mapping application–confers upon the holder the responsibilities of being the 'driver' and becoming accountable for map-reading duties, and to some extent, managing the way-finding of the group. However, way-finding as an activity is often not the primary task in hand–especially in the context of a city daytrip, as was the case in Study 1. Walking in the city has a permeable quality, which allows other activities to intervene such as conversation, dining, sight-seeing and shopping. Nevertheless, the two key participant roles involved in collaborative way-finding are those of the 'driver' who holds the mapping technology, and the 'passenger' who does not–while dynamic features of maps on mobile phones can quickly facilitate the *individual* sense-making and orientation of the driver, in relation to the environmental surroundings. However, what is much less understood is the experience of those co-located collaborative way-finders. The co-located 'passenger' may contribute to way-finding by looking out for landmarks as relayed by the driver, providing local knowledge of the immediate environment, as well as reporting ongoing changes in the landscape which they can glean from their different visual perspective, such as walking ahead and scouting for street signs, and other inscribed objects which may help in orientation to the route ahead.

6.1.1 Participation and orientation

Thinking specifically, then, of how someone gets spatially oriented when using a map, a user typically must first identify some sort of landmark within her or his immediate physical environment that matches a representative point in the map they are using. In the urban setting, this is often achieved by identifying a point where one street intersects with another, or a sequence of streets turning to the left or right which allow the user to believe 'this is where I am on the map'. Turning a paper map around till what appears in the landscape matches what appears in front of the person holding the map helps to facilitate orientation, since the paper representation can now be more quickly viewed and matched with the

landscape ahead and then monitored for breakdowns in the matching, which might constitute a misalignment with the way ahead.

Other approaches to achieving spatial orientation involve cardinal points, whereby the map reader can use a compass to monitor movement from one established point in the map to another, ensuring that the route being followed matches the route required. This approach requires specific skills in managing the compass and map appropriately. However, in an urban landscape where many of the environmental landmarks have already been extensively documented by cartographers and included in maps and mapping applications, this level of navigation is rarely necessary.

There are four key features of mobile maps which rely upon the distinct affordances of mapping information being mediated via the internet on mobile devices in real time–and which contribute to new way-finding practices. The first is the 'you-are-here' locative point on the interface (often shown as a vibrant blue dot) and second are the suggested routes for travel between points. Both features update dynamically in real time and reflect the user's current location. Thirdly, the map scale can be manipulated manually on the touchscreen, to reveal different levels of information within the interface–allowing the user to dynamically zoom in from a global scale, down to miniscule ground-level detail. Finally, a compass feature is incorporated in the map app which, if invoked, rotates the map interface to reflect the orientation of the device in relation to the position of compass north, and can be used in conjunction with the 'you-are-here' dot to help users quickly orient to their position within the environment as represented in the map interface. There are many additional features or tools that work with these key affordances to aid way-finding by providing extra contextual detail of the physical environment; the 'satellite view' replaces the traditional cartographic interface with images from above, the 'street view' perspective shows images of buildings at street level, and the 'drop pin' provides markers in the map for navigating towards or sharing information with others. In addition to these tools and features of map applications, the applications themselves have become increasingly deeply integrated with online search engines and other external applications to extend search about a place.

There are distinct challenges in using mobile maps, and any configuration of way-finding is dependent to a large extent on overcoming 'normal natural troubles' (B. Brown & Laurier, 2012), such as inaccurate positions shown in the dynamic blue dot due to a poor signal, incorrect mapping information shown, unclear map illustrations, miscalculated routes, and issues in specifying the destination and locations accurately and so on.

The images below are taken from a video recording in which a couple are trying to find their way to Haga Park, a royal park in Stockholm. The recording demonstrates how the person holding the map, the driver, is in the best position to get oriented to the landscape. The couple were newcomers to the city, so neither was familiar with the location of the park. The images focus on the 'driver' participant who is holding and operating the mobile phone. The screen capture shows what he can see on the phone that he can be seen holding in the images and, from the images and the transcript of the talk in the recording, he has successfully oriented himself to the suggested 'blue route' and is preparing to continue following the 'blue route' traversing a busy highway on a pedestrian footbridge. The driver has turned the phone in order that the onscreen map aligns perfectly with the landscape ahead. From this aligned arrangement of body, mobile map and landscape emerges a *gestalt of spatially embodied properties*, meaning that the driver has aligned the various elements into an organised whole which, in turn, affords him spatial orientation. With this aligned view he can visually perform a look-up from the map interface on the phone, to check for the physical landmarks in the local environment. Moreover, he can audibly verify the location of the busy road marked in yellow on the map, and which they are about to cross–multiple available resources are pulled into the gestalt before him. The co-located 'passenger' is walking alongside. The passenger is not yet sure of the best way to proceed towards the park, and suggests they check some public signage a little further ahead for directions. We can surmise that the co-located person is only able to view the map on the phone from a distance, and is unable to appreciate the spatial orientation that the driver has achieved, meaning that she requires more time and effort to orient to the route ahead being proposed. Since their ultimate destination is an elegant royal park, walking towards the noise of the motorway may seem like the wrong direction to take without the benefit of seeing the onscreen map clearly. The phone 'driver' explains that the path ahead is "just going to take us to the other side–I am following this", while gesturing with the phone still held horizontally ahead of his body compartment in a deliberate fashion; this further confirms that he has aligned to the motorway which can be heard running to his left (shown dark yellow in images below).

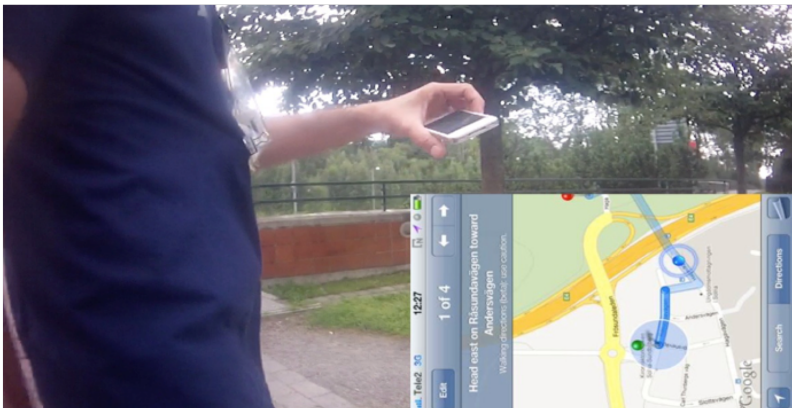


Figure 18 Way-finding with mobile maps reminds us of the embodied nature of mobile phone practices. Achieving the optimal 'gestalt of spatially embodied properties' with top of the map 'up' ahead of the body, the participant has oriented to the busy highway to his left which can be heard, as well as the footbridge ahead which will lead across the motorway

Capturing as it does the embodied nature of alignment, the image above typifies how an individual can achieve alignment when using digital maps. It also highlights the ecological limitations of the mobile touchscreen. Standing as he is, this participant gains the optimal alignment with the landscape because he is physically holding the phone. In general, an onlooker here may experience difficulty, or at least delay, in achieving alignment because of not being physically able to see the *'gestalt of spatial, embodied properties'* (Laurier & Brown, 2008), and is further hindered by the restricted view of the map on the small screen. This may lead to frustration and some interactional discord between the co-located way-finding collaborators–however, the issue would hardly be solved by re-introducing paper maps to the fragmented ecology. While the dynamic features of the map shown on the mobile phone here help the 'driver' to achieve orientation in a way which would not have been possible with a paper map, it is nevertheless difficult for co-located others to be able to see the map on the small mobile screen. So, while some way-finding issues are resolved for the 'driver', other issues arise and it is apparent that collaborative way-finding still requires considerable work to both maintain harmonious social interaction with all parties involved and successfully navigate to the desired destination.

Figure 19 Achieving 'quarter alignment' by turning the map interface to partially align with the landscape visibly available ahead.

Figure 19 shows how the mobile phone is used to achieve a *'quarter alignment'*, whereby the phone 'driver' has oriented himself–and the phone–towards the first landmark on the route they want to take, even though it is not yet visible. They want to walk to the forest (the forest mentioned in the earlier clip), but the forest cannot yet be seen in the landscape because of the built-up housing area where the participant is currently located. At this point, alignment between the visible map and the surrounding landscape is not completely certain and, in this state, the map reader can be described as exercising an *'economy of navigation'*, meaning he finds just enough information to let them move forward in their journey, then will need to reassess and seek more environmental information to fine-tune it as they go along. The best spatial orientation for map reading happens when the 'up' on the map in front of the user is perfectly aligned with the front of the body comportment and the centre of the landscape ahead.

This chapter will now go on to explore the practices being deployed in collaborative way-finding with maps on mobile phones. The video research material allows us to listen to the talk, and see gestures and bodily comportment, as well as the situation and sequence of the interactions which are used in achieving orientation and alignment in way-finding with digital maps. In this, the work of Goodwin proved particularly helpful in teasing out the different threads of activity involved in the accumulative co-operative action (Goodwin, 2017) of building alignment and orientation required for collaborative way-finding.

6.2 When does way-finding occur?

Along with the increasingly powerful functionality of mobile phones–as well as the increasing sophistication of location-based products, games and services that can be mediated through them–has come an increased requirement for successful navigation and way-finding.

Amongst the participants observed in this research, the level of engagement with mobile maps was on a broad continuum; from a local resident who accessed the app intermittently and only briefly as a reference guide to check on progress on her own known walking route, to two visitors who were self-confessed paper map fans and who rarely used mobile maps. Another couple had practically no knowledge of the city, and so were heavily reliant upon the map app for way-finding information and fully embraced the gamut of Google maps features to explore their surroundings–getting lost and found in the process.

The video recordings selected are empirical examples of co-located way-finding in groups (couples) for several important analytic considerations: within the corpus of video recordings, the interactions with mobile maps almost invariably involved some talk, which gives us access to the participants' understanding of the interaction as it unfolds. While there are some examples of single user mobile map use which have been recorded and analysed, the extent to which we can account for participant action while using the mobile device in those solo user settings is constrained by the lack of explanatory talk. Fortunately for our analytic purposes, co-located navigation with mobile maps was a common activity in the research material–due in some part to the nature of the sessions in the first study. Nevertheless, Google maps remains one of the most used mobile applications every year, so the prevalence of mediated map use is not untypical of mobile phone use in general, and was reflected in the data gathered in the follow-up study one year later. Moreover, viewing video recordings of participants using a map on a mobile device while moving within the environment shown in the map, and while interacting with co-located others, provides a most thoroughly embodied perspective from which to contemplate the use of a way-finding application in a social setting, allowing us close inspection of the shared practices that are essential to the production of local order.

6.2.1 Pre-visiting and planning

Maps are a visual representation of myriad information about an area, which readers can view and interpret for more than just navigational purposes. When combined with internet browsing, maps on mobiles can become an even richer way of learning about an area *in situ*. In Figure 20, the participant turns her attention to the map of Gamla Stan (Old Town), where she is currently seated and waiting for lunch. Gamla Stan is a small, picturesque island in the centre of Stockholm, which the participant is visiting for the first time, and her comment, "It's just like a small li'l place, so it's like I'm already in the middle", lets her companion know what she's doing while she's engrossed on the phone. It also provides a sense of the

scale of the area they are there to explore, as well as placing them “in the middle of it”. This sets the context for activities to follow lunch, when they are going try to see as many of the sights of the area as possible, before the participant leaves on a train later.

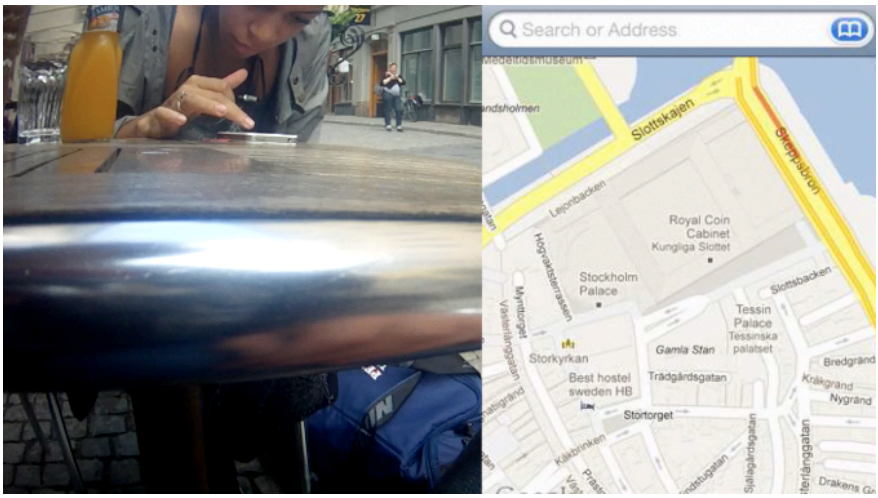


Figure 20 Using mobile maps to consolidate accumulating knowledge of an area.

The image is taken from a 60 second video recording which shows the participant scrolling round the map of Gamla Stan; as she scrolls she reads aloud some names of landmarks in a practice of both gathering knowledge about the place and simultaneously keeping her companion updated on what she’s looking at. She answers aloud her own question from earlier, regarding the whereabouts of the Royal Palace; “Oh the Stockholm Palace is on here”, and she zooms in more closely to the Skeppsbro Row twice. We had observed her in earlier video data reading about this row of merchants’ houses on a website during her journey into town, and she heads to the landmark after lunch, putting this new knowledge into action as she tries to identify the different merchants’ homes.

In less than 60 seconds, the participant has scanned many of the key landmarks of the area; we know this by her reading aloud the names of buildings and streets, and zooming in closely to the layout of the small island. The onscreen mobile map allows her to visually pan around the outer edges of the island, zoom in to read details, scale back out to gain the broader contextual overview–while continually orienting to the blue dot of their current location. In addition, the resources of the smartphone allow any missing information to be addressed by switching to internet browsing or other apps on the device, in an application

chain (Böhmer et al., 2011). In this recurrent activity, the participant was matching the visual map before her on her phone to earlier knowledge already acquired during an internet search about the Stockholm Palace and Skeppsbro Row which was observed in earlier video data. From the earlier internet search to the narration of the map view of their destination, she is 'pre-visiting' the island and preparing both herself and her companion for sightseeing activities to follow, through an *accumulation of knowledge and alignment* achieved through maps, search and talking with her companion.

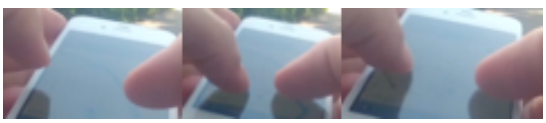
Pre-visiting and planning with maps was a practice frequently found in the research material, as people collaborated to make plans for dinner, visit museums, specialist shops and so on. This kind of pre-visiting and planning was previously done, and of course still is done, with the use of paper maps, guide books, transport timetables and the like. However, it is clear that the tight integration of internet search and mobile maps on the single device allows for information to be accessed through a single, 'oriented-to' device, in almost any place, and with 'just-in-time' temporality. Nevertheless, the nature of the screen is such that the driver has the larger division of labour, and also then has a privileged view of the map on the screen when looking at the map–which makes it more difficult for the co-located other, the 'passenger', to be equally involved, or informed, by the pre-visit research activity. The shortening temporality of research raises the challenge of ensuring shareable materials are shared at the right time to allow co-located others involved to understand what is happening and to contribute effectively if possible. Way-finding information for collaboration will be picked up if brought into practice appropriately–so, the mobile map does not automate collaborative navigation, it facilitates the practices of way-finding if it has been assembled coherently.

6.2.2 Walking and checking the route

The timing of mobile maps use during way-finding was organized in various ad hoc and contingent ways. For example, it was brought out during a face-to-face job interview to help the participant judge how far she would be prepared to travel for a job with that particular company, or to give directions over the phone to someone lost and driving. During co-operative way-finding, the map app was regularly brought out to check location–in relation both to the suggested route and other features in the map interface, and also to checking the overall temporal progress of the journey made so far to judge arrival times, for example. In the Figure 21 below, the driver is checking progress on a walking route she knows well; she can see the blue route, but she is leading a diversion away from the recommended route, to

take a detour through the forest. In another transcript the two participants overshoot the street they needed to turn into; the driver realises this when she identifies that another landmark from the map, a metro station, is up ahead to her left, and that they should already have crossed and taken the street immediately on their right. She, the phone driver, stops 'unilaterally', and her companion takes a few steps forward before also stopping. Due to the asymmetric access to the map on the phone, only the driver is really able to see where they are on the map. The two participants turn around and retrace their steps and prepare to cross the road. The driver comments "so we're close", which prepares both participants for the more detailed checking and approach-work that will be required to find their final destination address. The walking has shifted from walking past one landmark after another on their planned route, to now walking toward the final segment of their journey–finding the specific location, in this case a restaurant. The passenger is still not able to contribute because she does not know what she is looking for. The driver holding and operating the phone is, once again, relied upon for this information.

1. LUCY: I just check (2.0) which road do we take
2. JO: Yes
3. LUCY: Eh yes we will see I think we actually where is it where are
4. weh:h:h h:h:h h:h:h [*]



5. ((Lucy pinches to zoom in on the blue dot))
6. JO: Ah ha
7. ((Lucy moves map over to the right, revealing the forest and hiding
8. the blue suggested route))
9. LUCY: because I want to go through the forest [*]

Figure 21 The work of ad hoc checking progress falls to the mobile phone driver.

6.3 Practices of way-finding

As has been mentioned, mobile maps were seldom used in isolation in the research material–and they were frequently used in combination with other people, due to the situated nature of the need for way-finding information, such as travelling with others to an event in an unfamiliar location, and the increasing ubiquity of geo-located products, games and services. Way-finding involves more than a shared map app to be successful; it is a

collaborative activity that requires ongoing negotiation to agree where to go, and how to get there. In addition to face-to-face discussion, collaborative way-finding combines multiple informational sources–not only the map, and the moment-by-moment coordination work of way-finding might easily be overlooked in favour of the instrumental analysis of the destination being successfully reached or not. The following sections will unpack the work done to get from A to B. Several video recordings are presented with transcription and analysis of the interaction including dialogue, gesture and other resources and their sequential order, to understand the practices of collaborative way-finding.

6.3.1 The mobile phone as an aligning object

For collaborative way-finding, as with any interaction, to begin, its participants assemble the social setting as a collaborative process (Graham Button & Sharrock, 1998) in the opening stages of the interaction. As an integral part of way-finding, the focus here was to see how route planning was managed while using mobile maps on the phone. When a destination is tapped in to a mobile map app, such as Google maps, the app offers up options for directions how to get there in the form of 'recommended routes', which, when selected, are highlighted in the map interface to take users from one point to another. These recommended routes are generated for a variety of transport modes–by car, public transit, on foot and by bicycle. Nevertheless, they all tend to focus on the efficiency of the route, that is, how to get from the start to the journey's end as quickly as possible in a car. The recommended routes generated for pedestrians are often just a variation of the car drivers' most efficient driving route through town, and can therefore lead pedestrians down busy thoroughfares, missing more pleasant side streets and landmarks. In Figure 22, the participants reject Google's recommended pedestrian route in favour of a route of their own devising, and the recording transcribed below shows how they reach this decision together while using mobile maps on their iPhone.

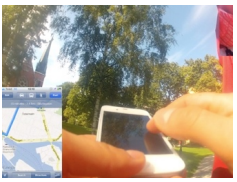
The dance museum had been mentioned earlier in the video data as a potential destination for their explorations, and the recording begins when Nina silently types a search into Google maps for Stockholm's dance museum and we see her tilting the phone round to share the screen with her partner, Paul. There are then a few moments of silence, while the recommended route appears on screen for inspection. The appearance to both of them of the recommended route in the map interface in this way can be understood as a 'first position', an early candidate resource for the accomplishment of a larger goal. After a few moments of silence, Nina offers a suggestion that they "try a different route", before articulating the

larger goal (Line 1) and she specifies the alternative routing with a diagonal pointing gesture above the screen. She finishes her suggestion with a 'verification request': "No?" a summons-answer request inviting a response from her partner, designed to 'mobilize, secure, or establish the availability, attention, and align [the] recipiency of its addressed target' (Schegloff, 2007). Paul responds positively (Line 7) and Paul's response suggests he has seen and understood the alternative route that Nina has gestured towards over the iPhone screen. Having both now aligned to the newly proposed route, Nina zooms in to view the finer detail of their current position on the map. There is a pause while both participants look at the onscreen map, then they simultaneously start to propose ideas. There is a brief overlap of speech[11] as Nina starts to suggest they 'get away', but she stops on hearing Paul suggest a place name, 'Strandvägen'–a scenic marina walkway. This is another candidate route proposed by Paul for evaluation and Nina quickly pulls the map down to view Strandvägen on the map. She dismisses the suggestion with the rationale, "But we've <u>been</u> there before" (Line 17), reflecting her her earlier suggestion to see more of the city, and Paul immediately agrees. Nina now zooms in on the first half of the new route in more detail still–the section of the walk that they will complete first. She is looking at the route, and is uttering fragmented details, including an 'anchor' position (Schegloff, 1986), "mmm, (.) to half of Karlaplan" (Line 26). Nina gestures and verbally suggests they go back to Karlaplan where they've just come from, and then they should "take a left". She concretises this direction by making a hooking gesture to her left with her index finger above the area of the map onscreen. Once again, Nina completes her route suggestion with a summons-answer request: "you know↑"–the rising tone at the end denoting a question (Line 32). Paul confirms he understands and agrees with the route suggested both verbally and also by mirroring the pointing gesture over the screen (Line 34) in a gesture which indicates that his understanding is collectively aligned with Nina's understanding of the route being proposed.

[11] Overlapping speech indicated in Jefferson Notation by use of square brackets […]. An important elemental concept about interaction is the concept of 'turn taking'. Overwhelmingly, people speak one at a time and interlocutors collaborate to gracefully achieve minimisation of gaps and overlaps in talk.

(Sacks et al., 1974)

1. Nina: Maybe we should try another route [*]
2. ((Nina traces an alternative route diagonally
3. across the screen while she speaks, which
4. takes them from the green to red dot in a
5. shorter, straight line))
6. Nina: Or something through here to see no↑
7. Paul: Yes let's (.2) take a short cut, (.3)
8. let's take a short cut
9. ((Nina pinches screen to zoom in))
10. Nina: So we should uh (.)
11. Nina: get [away]
12. Paul: [Let's (.) let's go to Strandvägan]
13. Paul: (.3) let's go back
14. ((Nina drags the map up to reveal the road called
15. 'Strandvägan' which has been proposed by B, and then
16. pulls it back down - in one movement)) [*]- -
17. Nina: (.1) But we've been there before
18. ((Nina looks at Paul))
19. Paul: We have been (.1) okay
20. Nina: Maybe we should uh (.5)
21. ((Nina punches and zooms in closer to their
22. current location and the blue dot))
23. Nina: We should go to um (.1) go back
24. ((Indicates direction of new route above the map with
25. index finger))
26. Nina: Mmm, (.) to half of Karlaplan
27. ((Nina uses thumb to point to the round, green
28. circle of Karlaplan plaza shown on the map))
29. Nina: Then take, uh (.) a left here [*]- -
30. ((Nina indicates left turn after Karlaplan with
31. Index finger))
32. Nina: You know↑
33. Paul: Yeh yeh yeh
34. ((Paul mirrors gesture over the map)) [*]
35. Nina: Huh ↑
36. Paul: And then on these streets here
37. ((Nina pulls the screen up to view the streets
38. Beyond Karlaplan and makes general gesture
39. across the screen to the left))
40. Nina: Yeah (.) okay↑
41. Paul: Yeah
42. Nina: OK

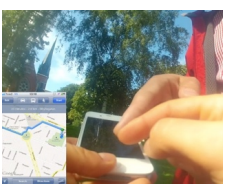


Figure 22 The embodied confines of the small, visible touchscreen provides the 'oriented-to' object around which the participants are able to align themselves in terms of both directional gestures and also spoken details of their route planning.

Through this brief interaction, the screen of the device has become the emergent interactional frame (Licoppe, 2017) for this couple's route planning. The phone did not

determine the route and the route finally agreed upon could not be found in any one part of the interaction–the outcome resulted from the accumulation of map interaction, talk while looking at screen, gesture, face-to-face talk, and fragmented narration. The mobile maps onscreen certainly supported a number of the actions which constituted the route planning interaction; while the recommended route suggested by the app on this occasion was not suitable, the mobile map app provided a 'resource for repair' in their search for a route more relevant to their objective. The couple's discussion about the route, switching quickly as it did from Strandvägen to Karlaplan, was supported and mirrored seamlessly by the gestures on and around the mobile map on the iPhone screen, which was dragged around, pointed at, pinched, panned and zoomed as they worked together to research and plan a new route. Much of the interaction within the emergent interactional frame was reliant upon the affordances of maps mediated on a mobile phone and not available on traditional paper maps–an automated recommended route for consideration, the 'you are here' dot marking their current location, and the ability to drag the map around smoothly on screen so that a degree of orientation could be preserved when panning across an area. Less technological and more embodied, the physical confines of the small, visible touchscreen provided the 'oriented-to' object around which the participants were able to align themselves, in terms of both directional gestures and also spoken details of their route planning–the places to go, and the reasons for going there.

6.3.2 Accounting for way-finding

As mentioned above, collaborative way-finding is an activity that requires a good deal of negotiation involving interpersonal communication, information-sharing and coordination in order to proceed. Heritage describes practices as patterns of action involving "normative structures of reasoning which are involved in understanding and producing courses of intelligible interaction" (Heritage, 1988), and so practices themselves become accountable to others. In way-finding, the intelligibility of collaborative action is made challenging by the complexity of the task to be accomplished and the ongoing nature of achieving alignment between the map to hand and a changing environment. Moreover, a group of collaborative way-finders requires practices that make next-relevant action mutually intelligible for progress to be produced.

If way-finding alone, as a single user, might seem to rely largely upon an individual's skill in map reading, then in collaborative way-finding the primary constituent might be accountability. Woolgar and Neyland tell us that relations and practices of accountability are central to how information is produced, circulated, disputed, and/or agreed upon (Woolgar &

Neyland, 2013). If so, then accountability and sociality in the form of questions, commentary, responses, choices and decisions are constitutive to the outcome of way-finding with mobile maps. As with other collaborative activities, way-finding requires verbal coordination and negotiation for it to go well, as evidenced in the steady stream of questioning and commenting as participants progressed in their journeys: "We went too far?", "Which way do we go?", "Where are we now?", "Where we will go?".

As observed in the transcript above, there are specific interface events or gestures which operate on two levels: a tap on the screen can operate the device, while the same gesture can converge to a meaningful interaction in the face-to-face setting. Below is an example of a gesture with the touch interface of the device which manipulates the map interface, while also acting as a gesture to those around, in this case a form of directional pointing. The participant is talking about an area of the map and as she does this, the participant puts two fingers at each side of the area referred to, and pinches outwards to zoom in. The pinch enlarges the

Figure 23 'Double Duty' gestures over the screen both operate the system and indicate the route for co-located others.

area of the map where the referred to point is, as well as highlighting the point between the fingers. While the finger movement is away from the desired destination, it does prevent the fingers from obscuring the gestured target.

This gesture can be described as a form of *double duty* (Tse et al., 2007). It underlines how interface actions frequently come to have a role to play in the conversation. While instrumental interaction to operate the mobile device was often managed by the driver alone in isolation of other co-located engagement, the video recording show the devices were also very frequently shared and seen by others as 'oriented-to phenomena' (Greiffenhagen & Watson, 2009). For example, in Figure 23 above, the participant scrolls the map to the right,

revealing the forest as she does so. Her reference to the forest is then easily understandable as 'this forest' (she also points later at the forest).

In other studies of interaction around fixed displays, 'awareness' of what is going on amongst co-located interactionists extends to co-located objects and devices–in this case, the screen and map which is being manipulated (Greiffenhagen & Watson, 2009). Using the device, when it is visible to someone else, produces actions on the device as 'oriented-to' phenomena–those who see the screen can be expected to have seen the action and to understand what that action means. Indeed, in many of the videos of collaborative way-finding, co-located others were often observed to comment on, correct or repair the screen actions of the main device user (the driver). That much mobile device usage shares this 'double duty' quality reminds us of Garfinkel on accountability: "Any setting organizes its activities to make its properties as an organized environment of practical activities detectable, countable recordable, reportable, tell-a-story-about-able, analysable–in short *accountable*" (Garfinkel, 1967b, p. 33).

6.3.3 Accumulating alignment

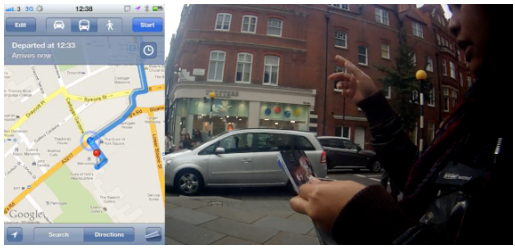
The action of achieving spatial orientation involves drawing on a number of different resources to achieve alignment between the individual's perception of their position on the map and her or his actual position in the physical environment. This involves working with the mapping technology, the physical environment, and talk in interaction with co-located others to reach an adequate accumulation of knowledge to achieve a transformation of the individual state from not-knowing to knowing. This alignment of resources is referred to as a 'gestalt of alignment', and the accumulated and co-operative nature of the building up of knowledge stands in contrast with more cognitive approaches to spatial orientation which rely upon the mental models concept, versus the various practical actions which participants actually do to manipulate the map to produce spatial alignment between themselves and the landscape.

In Figure 24, two participants–Bob and Jill–are trying to find the Saatchi gallery, which is located off the Kings Road, London. They have been talking about something unrelated, but as they approach a 4-way junction in the road, that thread of conversation is suspended and Bob asked, "Did we get lost?". There is some confusion between the couple, Jill is holding the phone and has adopted the role of *driver* and Bob the *passenger* is overlooking the onscreen map while they try to figure out where they are. Amidst the confusion, Jill does some work to align what appears on the map interface with the street names around her, and

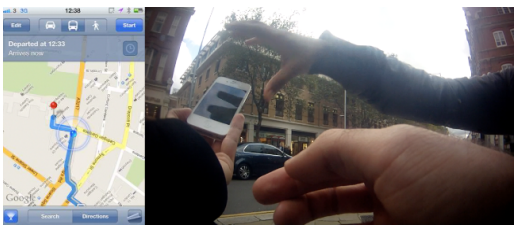
she identifies Cadogan Gardens to her right (the street name is visible in the video). She makes gives an account of where they are, “Wait, it’s here” (Line 1). From this point of reference, Jill figures out that they should take the road opposite. She requests confirmation: “Should we go here?” she asks, while pointing to the road ahead. Bob takes the question as an opportunity to get more involved in the alignment work, and takes hold of the handset. The video shows that they each use different modes to orient themselves: Jill, the original driver, looked for information in the environment; specifically she mentions the street sign for Cadogan Gardens to her right.

Figure 24 shows her companion, Bob, trying to use the compass feature on the iPhone. He looks at the screen and expresses the problem–the fact that the map doesn’t tell them what direction they are looking in. Bob taps the dynamic compass feature, which moves the map shown onscreen to align with the view ahead of the driver holding the phone. With the map aligned to the view ahead of him, he is able to work out that the direction they should take is the road directly opposite–and the ‘Oh-prefaced response’ (Heritage, 1998), indicating that this is new information for him. The two participants have achieved spatial orientation, that is the same alignment in this video, but they achieved it in different ways. Jill aligned the visual iconography of the onscreen map with objects in the landscape using traditional map-reading skills of finding the street sign and then turning the onscreen map in her hand into the ‘quarter alignment’ that we saw earlier. This is a more embodied process, whereby she combines what she can see on the map but then melds her physical body into alignment with her surroundings. Meanwhile, Bob takes control of the phone and invokes the dynamic compass feature, which is a tool facilitated by maps on mobile technology that automatically rotates the onscreen map to align to the forward perspective of the phone. This has the effect of subjugating the features of the mobile map to Bob’s perspective, or making the world revolve around him, so to speak. Surprisingly, perhaps, given that it provided a quick and successful resolution in this situation, this compass feature was only used very briefly again by Bob, and not at all by Jill–not even when they became quite lost during a search for a particular store later in the trip.

1. Jill: Wait, it's there
2. ((Jill looks and points diagonally across road, toward street sign on the right, then back to maps on phone))
3. [*]- - - - - - -- - - - -



4. JILL: Should we go here?
5. ((Jill points to road straight ahead))
6. BOB: Lemesee
7. ((B takes the phone and begins to align the screen to his view))
8. BOB: Y'see the funny thing is it doesn't show you the direction, right? [*]- - - - - - --



9. BOB: Which way are we looking?
10. JILL: We're h, we're here
11. BOB: Oh [We're here looking this way]
12. JILL: [We're here, yeah, we're Cadogan, there's Cadogan Gardens]

Figure 24 Two participants use different ways to achieve spatial orientation. One moves her body to align the map to the environment, the other rotates the map to align it to his bodily position.

Perhaps this inconsistency can be accounted for by the contingent temporally unfolding organisation of map-reading in way-finding practices–it is often the secondary activity, serving the functional role of getting the participants from A to B, and as such it may receive only partial attention, as those involved pick up other concurrent tasks and actions such as local conversation or other work practices, in-between slots of way-finding activity and action. Added to this, there is such a high degree of variability in both the physical

environment and temporal patterning that form the way-finding setting, that any hearing and seeing being done by the user for the purpose of orientation and alignment can be easily disrupted by failure in the technology–which may account for the user preference here to remain in the fixed perspective of the onscreen map, rather than use the affordance of the revolving compass-aligned view (with the risk of it not working properly and pointing the user in the wrong direction). This is an elaborate explanation for keeping it simple, and stabilising the way-finding cues available in the maps interface. As seen in Figure 22 where the mobile map onscreen became an 'oriented-to' object around which two participants aligned their face-to-face planning of a walking trip, this video shows the ways that our actions are embedded in the environment–in terms of the production, as well as how we produce mutual intelligibility of our actions. Both videos highlight that the resources, including maps on mobile phones, that people use to establish common frames of reference or common standpoints need to be direct and transparent. In the case of maps, this may be due in part to the lack of understanding of how a compass works, but also due to the need for this activity to slot in with the emerging and ongoing actions of co-participants, and for the 'oriented-to' object to remain as stable and intelligible as possible amidst the ongoing activities and changes in environment inherent in way-finding.

Thus far we have seen that collaborative way-finding is an activity that involves a combination of resources including the visual representation of a map, physical features in the landscape and technical features of mobile maps. In another video, the participant, who is a newcomer to the city, achieves an 'embodied sense of position' by gathering additional information and knowledge about his planned walking route from a source extraneous to the map. We see him waiting for a sandwich to be made, and he's browsing the map. First he locates the ultimate destination, City Hall, and then flicks through the 'blue routes' for both car and pedestrian. Moments later he asks his partner if they should take the driver's blue route along Hornsgatan because, he says, it's a road he doesn't know. However, his partner clarifies that Hornsgatan is a busy arterial road–our participant couldn't discover this by looking at the onscreen map alone. With this newly acquired expert knowledge of the area, he now has a better understanding of the information shown in the visual map and immediately reverts to the original 'blue route' for pedestrians, which follows the harbourside.

Alternative views of maps on mobiles do provide more in-depth information about the local topography and road usage, on request, to alleviate this kind of misunderstanding–helping map users to make better route choices. Nevertheless, it is difficult to decipher the conditions of local topography from aerial photographs, and crowdsourced photographs of an

area such as might be found embedded within mobile mapping apps are not always reliable for reasons that the alternative view may be out of date or simply wrong. Using another source of knowledge provided by a co-located other like this gives the user the opportunity to triangulate the information that has been taken from the mobile map.

6.4 Concluding thoughts on the practices of way-finding

As in the previous findings chapters, the participation in way-finding was divided between the *driver*, who held and operated the phone, and the *passenger*, who did not. In collaborative way-finding, the driver of the phone has a large share of the work to do, with this division of labour dictated not only by the orientation-work of establishing the group's location, which is easier to do when holding the device within the environment, but also shaped by the setting. The temporal ordering of way-finding is consequential; way-finding in a time-critical setting, such as travelling in a car or walking to arrive at a destination at a specified time, the 'driver' of the phone may need to take over the way-finding activity on the phone in order to get oriented and choose the best route to pursue in the moment. The variable impact of the setting therefore shapes how the division of labour occurs–with a leisure activity, for example, being more tolerant of any additional time required to ensure collaborative consensus between phone driver and passenger on what routing to adopt, turn by turn.

Collaborative way-finding involved participants adopting a number of observable practices in using mobile maps; the phone in general, and the screen in particular, became an 'oriented-to' object for face-to-face interactions relevant to the map use: collaborating way-finders aligned themselves around the device while dealing with planning routes, activities and places to go. Not only were the pragmatic details of where to go and what method of transport to use furnished by the phone itself–embodied alignment through gesture and bodily comportment was enacted and made orderly over the mobile phone screen.

The use of talk in the form of questions and commentary, as well as gestures and other non-verbal cues, helped our participants to make sense of where they were in relation to the map onscreen, while also serving to make their way-finding reasoning somewhat intelligible for their collaborators. Mutual accountability was a continual ongoing activity in way-finding, which participants oriented-to in varying degrees, in fragile assemblages exacerbated by the small screen size.

Perhaps more than previous sections–which looked at the core practices of search and messaging–this section illustrates the difficulties of collaboration in co-located mobile phone

use. Way-finding is a challenging activity regardless of the technology used; it involves successfully managing a number of ongoing activities, in any of which an error is perhaps more immediately apparent and consequential, especially when the setting is moving traffic, for example. The mobile map technology itself provides tools and features, including a number of affordances that help the user to self-orientate quickly and reliably, and these will be expanded upon in Discussion. Way-finding with co-located others adds an additional layer of complexity; however, the additional perspective and knowledge that another person can bring to the task can help ameliorate the issues of collaboration.

7 Discussion

Through the diverse studies covered in this thesis, I have been studying mobile technology and our interaction with it. However, during these studies, my analytic lens has slowly broadened, arriving at a perspective that views the mobile device less as a disruptive technological object, and rather as a publicly available resource drawn upon in recurrent actions to form practices that are constitutive to the local order of everyday life. In this discussion, I re-visit my research questions: I respond to them in reverse order, beginning with an ethnomethodological conceptualisation of the order of co-located phone use. I then reflect upon the methodological contribution of the thesis, made through the hybrid methods developed to access the practices of phone use *in vivo*. Lastly, the third, empirical research question will be addressed in the conclusion, summing up the results from the empirical chapters.

7.1 Constituting local order of the co-located mobile

Associated with many aspects of our lives–not only our use of technology–*practices* are recurrent and recognisable actions. We adopt practices, in collaboration with each other, as a way of making sense of our ongoing interactions. Without somewhat predictable and certainly recognisable practices, our lives would become a series of chaotic random actions. Conceptualising co-located mobile phone use through the lens of orderly practice recognises that order is important in everyday life. The *in vivo* research method revealed how local order is part of co-located phone use as a goal that people actively seek and maintain. What was achieved through phone use were social goals of shared knowledge, enjoyment and friendship–alongside the functional purpose for which particular mobile phone apps were being used. Already, in the early studies, the notion of phones as technologically deterministic resources which privilege device use over social interaction was questioned–instead, the studies highlighted the importance for participants in achieving and maintaining local order. Examining phone use practices and their constituent elements gives us access to and understanding of the temporal, participatory and material elements that make up situated mobile phone use.

The empirical chapters of the thesis have identified practices of mobile phone use by describing the ordered and recognisable recurrent actions used to accomplish search, messaging and way-finding in the co-located setting. I will now elaborate an

ethnomethodological conceptualisation of co-located mobile phone use as an approach for further understanding the role of phones in the everyday achievement of social order.

Ethnomethodology does not theorise about why a phenomenon occurs–rather it observes and analytically describes phenomena wherever they occur (Garfinkel, 1996). This seemed a fruitful approach to understanding the impact of mobile phones on our everyday interactions with each other. The mobile phone is still a relatively young technology, such that a focus on designing and evaluating devices based upon their usability and their ability to fulfil user needs has been central (Coulton & Lindley, 2019). Engaged in discovery, ethnomethodology (EM) and conversation analysis (CA) provide a systematic method for using recordings (audio and video) and transcription to describe the orderly, sequential organisation of a phenomenon. CA was developed by Sacks (Sacks et al., 1974), who used it to document and analyse the audio recordings of conversational interactions made in any setting he could collect data from. His analyses highlighted the machinery of talk and how orderliness was produced *in situ*. As Sacks made use of recordings from telephone calls, so this thesis is built upon recordings of mobile phone use.

In reviewing all the video recordings of mobile phone use in my corpus of research material, I was struck by how seldom the 'local order' of co-located interaction was disturbed by phone use. By 'local order', I refer to the maintenance of social order in a local environment. Indeed, the recognisable practices of co-located mobile phone use presented in the empirical findings (chapters 4, 5, 6) suggest that the phone is entering the 'local order'; it is becoming a constituent part of what Sacks called 'an absolutely fabulous machinery' of social order (Sacks, 1995). In order to make sense to each other, to achieve *mutual intelligibility*, people need regularity and 'order' (Rawls, 2011), and participants recognised and responded to the practices of phone use. Through them, co-operative, co-located action was achieved, local order was maintained, and digressions were identified and repaired. Common sense knowledge of technology is constituted and developed through these recurrent actions in social interaction. This knowledge is developed through interactions that both participants and researchers can observe and analyse.

Activity around the mobile phone develops in an ongoing and orderly manner which can be analysed productively through different elements of time and place, participation and materiality: the when, who and what of mobile phone practices. Accordingly, I propose to analyse co-operative phone use in an analytic 'diamond' (Figure 25), extracting four important elements of the empirical phenomena based on the studies reported in this thesis. As I will discuss, the local order of the mobile phone emerges in four ways: First, it is

temporally ordered and then it is ordered in terms of participant roles. Third, the material characteristics of the phone in the visual and physical field are important. And lastly, there is the crucial role of repair that ties this together with interaction acting to sustain the order:

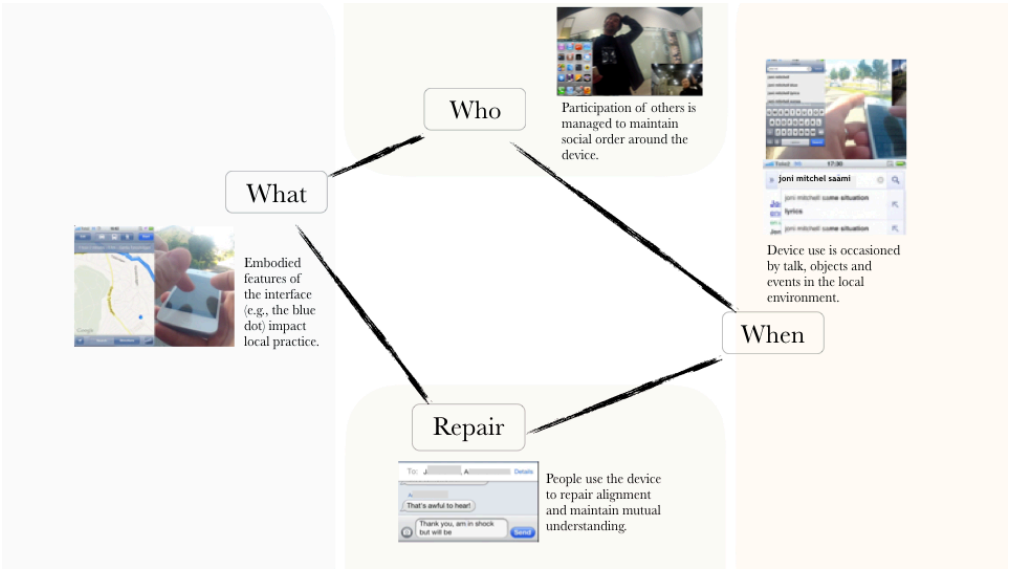


Figure 25 Conceptual 'diamond' of mobile phone use: A resource for future analysis of analysis of mobile device use in co-located interaction.

7.1.1 Who–participant roles in phone use

An important constituent part of the local order of mobile phone use were the roles adopted by participants. These were apparent through the ordinary workings of talk and interactional conduct, which reveal the type of category made relevant for the parties involved (Schegloff, 2007). The participant role is not simply a description, but rather a category-relevant attribute (Sacks, 1995, vol. II), relational to the particular context. It may be empirically grounded in detailed practices. Sacks observes that parties to talk-in-interaction can and do discriminate between descriptive attributes and categories, preparing category-relevant actions to meet the requirements of the different roles present. While mobile phones are often perceived as devices for individual use, what is apparent from the studies here is their inclusion in co-operative action. The video data clearly shows that the ecology of the device affords a pattern of use in co-operation, where there is one main or

dominant user and a secondary co-located user–metaphorically referred to as *driver* and *passenger*. In most cases, the person who holds the phone is the main dominant user, with a secondary co-located user potentially able to see the screen, and even at times to interact with the device. These roles do not align to 'phone owner' and 'others', and there are numerous examples in the research material where the mobile device is used by someone other than the owner. So while driver and passenger may initially be configured by phone ownership, the participant role is interchangeable and configured by action on the phone.

A participant role is not assigned by external forces, but rather by attributes of agency in a particular time and place. The driver is the person who operates the phone; the 'driver' can see and act upon the device much more easily than a co-located 'passenger'. With driver category membership comes specific 'category-bound activities', such as sharing the screen and explicating content which cannot be seen by co-located others, monitoring the onscreen maps and alerting companions to route details. In the way-finding material, drivers were able to achieve alignment between themselves, the map onscreen and the surrounding landscape by bodily turning and using the affordance of the blue dot embedded in the map onscreen, which helped orient them in space and time.

In terms of who knows what, the participant roles of 'knowing' and 'non-knowing' are relevant to mobile phone practices, and allude to the social distribution of knowledge, which can pass between collaborative participants through interaction to develop skills as well as recurrent practices, in an accumulative, co-operative way (Goodwin, 2017; Heritage, 2012). Goodwin refers us to the exchange of knowledge in conversation between teacher and student, yet the same dynamic can be seen in the empirical chapters here, for example, during the online search for the video of cleaning the elephant pen at the zoo where one participant was able to share knowledge about the video with their non-knowing friend.

Another important aspect of the role of driver is to activate and realise the affordance of mobile technology. As described earlier, an affordance relies upon an interdependence between attributes of the technology's situation and the attributes of the driver's ability to perceive, or knowledge of the affordance, for it to be activated and realised. In contrast, the mobile phone 'passenger' is a locally subsequent reference to other persons (Schegloff, 2007), with attributes derived only from their non-driver role, such as overlooking the screen, listening to the driver, contributing to search terms, and searching the environment for relevant information. These and other attributes highlight the agency of the phone's driver in shaping the part played by mobile technology in the constitution of local order.

7.1.2 When–the temporal order of use

Temporality, duration and sequential orderliness of action are central to ethnomethodology and conversation analysis (Glassner, 1982). Likewise, the temporal ordering of interaction is an essential aspect of collaborative mobile phone use. There is the sequential ordering to when we use our devices.

However, order 'proceeds at several levels' (Boden, 1990) and the temporal ordering of mobile phone use cannot, therefore, be taken to be a fixed and predictable regularity. Instead, the temporal order of phone use is dependent upon its local situation, including occasioned events, the co-presence of other people and ongoing activity. The local specificity of context is, likewise, unpredictable and continually changing (Dourish, 2004; Greenberg, 2001). Settings with high temporal demands, such as driving, coordinating work meetings, or a medical emergency, are therefore materially consequential to how the local action unfolds. As such, the temporal organisation of phone use can be conceptualised as machinery, with which mobile phone users must work to balance their actions. Faced with the 'machinery' of time, the user can look for occasions which make phone use relevant (Licoppe & Figeac, 2013). When to use the device in collaboration with others is thus not determined by the technology or rule-based processes, but in practice which proceeds reflexively by trial and error, and in which people build on their own experience and that of others.

Analytically, video research material is particularly salient to understanding the temporal organisation of mobile phone use, since it gives us access to what happened immediately prior to phone use–explicating both when and why people elect to use the phone, when the phone itself prompted use via notifications as well as when phone use is contextually occasioned. The question of when the device is brought into collaborative interaction is closely bound to the relevance (Schegloff, 1979) of its use. People do not use their mobile phones all the time, as it would not be relevant to do so. Different settings make phone use more or less relevant. For example, way-finding increases the relevance of opening map apps and using them in a co-located setting, yet way-finding while driving makes using the phone less relevant. In one video recording, the driver of a car waited till the vehicle was stationary to look at the mobile map–a moment when there was a time slot available in the primary car-driving activity. The temporal arrangements of phone use, therefore, are contingent on its relevance to the action-at-hand. Moreover, the material mobility of the device facilitated on-demand use permitting the user to delay search until as close as possible to the time and place of need.

On other occasions the device was used when message notifications were received on the phone. The temporal organisation in this notification setting was nevertheless still shaped by relevance–with some notifications read immediately upon receipt, while other less relevant notifications were ignored. Incoming notifications arrive unpredictably, and if a message from a remote sender was opened in the company of others, it was not uncommon for the recipient to give an account of that phone use, possibly even bringing the contents of the message into the local conversation. Where mobile phone use observably did disturb the 'local order', it could be associated with non-relevant use–meaning that the temporal organisation of phone use was in conflict with the local social interaction. A key example of this was when one participant repeatedly interrupted the telling of a story among a group of friends in the pub, by asking the story-teller for his email address to add to a contact in his mobile phone. The story-teller paused and continued with his story several times on being interrupted, although he only provided his email address after completing the story. Our participant had observably misjudged the timing of 'the machinery' of the social interaction unfolding before him, with consequences for the sequential orderliness of the storyteller's tale.

7.1.3 What–material and embodied aspects of phone use

The screen of the phone itself plays a large part in both constraining and facilitating collaborative interaction with the device. The phone's physical mobility allows its visible screen to be tilted and shared with co-located others in varied settings. Beyond this there is the material mobility of a small, lightweight computer that can be pulled out and used for different purposes like search in conversation. In addition, there are numerous occasions in the research material where the layout and content of what the *driver* can see and read onscreen, directly influences the local talk. We have seen incoming messages being brought into face-to-face conversations as a resource for topical cohesion. While the research conducted in India into the use of chat messages for workplace communication, revealed how messages received by field workers often rely upon interpretation by local managers before they became relevant and action-able by the worker themselves.

The physical screen of the mobile phone also affords an aligning object around and over which people can collaborate in the face-to-face setting. Co-located interaction can be initiated from information drawn from the mobile device, for example from a mobile map in way-finding. In further alignment, the talk and discussion about route options taking place over the mobile phone could be quickly checked in real time. The sequential orderliness of

what we hear participants topicalise while interacting around and involving a screen highlights that local talk is both *context shaped* and *context shaping* (Schegloff, 1979)–we produce topics for discussion ourselves, and our talk is also occasioned by what is happening in our immediate environment. The materiality of the phone extends to the content found within the interface–and the scrolling layouts can offer affordance-like features with 'rugged sequential' interface designs, providing the phone user with an 'occasion to gaze away', a relevant temporal slot to switch the focus of attention and involvement to another sequentially implicative activity (Licoppe & Figeac, 2013). So, we saw one participant search online for things to do in London when it's raining, and while he waited for the search results to fill in to the screen, he turned to look at and speak to their co-located friend.

The 'thing'-ness of the mobile phone, which Garfinkel referred to as quiddity or haecceity (Garfinkel, 1967), is what enables the phone to become more than simply a tool of communication. The device might also analytically be identified as a constituent resource with which the social order is performed, expressed, made and re-made. Hence, examining how people work with these devices does not involve identifying passive attributes that can be taken up in a social context; it is rather a question of revealing which situated accomplishments people turn to in order to simultaneously perform and reify their 'local order'. I argue in this thesis that the call to reveal how people both perform and sediment the 'local order' around collaborative mobile phone use is met by the study of practice. The close, moment-by-moment analysis of recurrent actions around the phone reveals the methods by which the phone use in co-located settings is made recognisable for others.

7.1.4 Repair and troubles in mobile phone use

Having now discussed the key constitutive elements of the local order of mobile phone use–the who, when and what–it remains to look at what happens when things go wrong. As part of using a complex interactive device, people naturally recurrently hit 'troubles'. Similarly, in co-located situations, we have to deal with the troubles of managing our attention as well as our participation in local interaction. Therefore, key to maintaining the orderly use of a mobile phone are practices which have developed to allow us to deal with those troubles. In earlier work, Brown & Laurier described a similarly new technology–satellite GPS navigation in cars–which went wrong regularly when in use. They noted that the work of using a sat-nav while driving a car was not to blindly follow the directions, but rather to develop a familiarity with the technology to the extent of being able to recognise when the map was getting it wrong, and dealing with those troubles while staying on track

and driving appropriately. Perhaps competent use of a technology can be better framed as an ability to deal with its 'natural, normal' troubles as they arise (B. Brown & Laurier, 2012).

Practices for dealing with confusions related to mobile phone use, were observed throughout the research material. In way-finding with mobile maps, there were occasions when the technology of the app was failing to locate the 'blue dot' or the direction of the 'compass view' accurately. Some users instead 'walked the blue dot' to try to find their orientation–involving walking a short distance before checking to see the new position relevant to the old position. Indeed, pedestrians were more likely to deviate from the planned route, perhaps because they could, and also because they may choose a more desirable route when they arrive *in situ*. City environments are three-dimensional and, as such, difficult to decipher in a two-dimensional map. Participants tried to counter this by drawing on as many different resources in planning their route as possible. Moreover, routes were readily adapted or abandoned as opportunities to diverge presented themselves *in situ*. Mobile mapping apps are overwhelmingly designed for driving–although this is changing–so pedestrians were observed adapting suggested routes to better align with their needs.

Successful collaboration around mobile phones does not mean that there are no problems, but rather that 'troubles' get dealt with as they arise. During co-located phone use, the local order can be maintained with repair, by managing the participation of others present. For example, in face-to-face settings such as sitting down to lunch, where the co-located friend has no access to the onscreen content, the potential trouble of ignoring a friend while engrossed in a mobile phone search can be mitigated by describing and narrating some of the content. Equally, the *driver* can ask for help in making sense of what appears on her or his phone by asking the *passenger* to help 'decode' the meaning of content. While the driver asking questions in this way is 'managing the participation' of the lunch companion, the local talk is being constrained and shaped by what has been found online and read from the interface of the phone. Repair is the ability of phone users to manage problems as they arise – what was clear from the research material is the primacy of talk as a resource for repair.

7.2 Methodological contribution

The theoretical discussion in the previous section, involving the conceptual diamond of how mobile phone use unfolds within everyday interaction with co-located others, is enabled by the innovative methods this thesis deployed. A second contribution then, are the hybrid methods adopted. Using mixed research methods in HCI is commonplace and one of the strengths of the field (Cairns & Cox, 2008; Sciuto et al., 2018). However, the complex uses

of mobile technology demand creativity and diversity in developing suitable approaches to study them. I argue for embracing hybridity in methods so as to pragmatically navigate the challenge of studying the phenomenon of a distributed technology for which there is no fixed research site. Previously, video analysis has been used successfully in the study of desktop computer screens in static workplace settings such as control rooms, doctors' surgeries, and auction rooms (Heath & Luff, 2000). However, computational technology has since transformed the functionality of our mobile phone. As such, settings of technology use are also in transition, and new methods are required to study mobile technology and other portable devices being used in co-operation.

While the mobile device itself can be used for harvesting large-scale, automatically logged data. With such data, questions about who was involved, why was the phone used at that point, and what did people say or do in response remain unanswered. Such data does not allow us to study how people make sense of mobile phone use–whether alone or in interaction with others. Video research material of co-located phone use, on the other hand, gives us access at least to the resources of collaboration. Interaction around the mobile is not only mediated through talk, it is embodied and material; people hold mobile phones which can connect them to information relating to any aspect of their lives –school, work, health, leisure, money–and move through the world while interacting with other people and objects. That is the setting that I wanted to address in this thesis. So, in designing the research methods, the aim was to capture what is said, see how people organise themselves around the phone, and critically, to see what action is occurring via the technology.

The action recorded in mobile collaborative settings involved multimodal, embodied action and was dependent on a range of tools, technologies and artefacts. The interaction was constituted by independent and interdependent tasks and activities–the phones came in and out of use in a stream of activity, with highly variable forms of participation and co-participation This highlighted a sustained awareness of others and ongoing activities, even while participants used their phones. What became clear through the lens of practice was that activities are made selectively visible. By taking the practices of mobile phone use as my object of study, the mundane interactions of everyday life were brought into the picture, as well as the multiplicity of settings where phones are used including the workplace, the home, and public spaces.

Yet the complex assemblage which constitutes mobile phone practice has other elements which are difficult to discern, identify and address and which largely elude the purview of video analysis of co-located interaction. These are the socioeconomic circumstances, cultural

norms and values, and a variety of other factors which shape the ongoing ordering of the setting and practice of mobile technology. In order to complement video analysis methods which do not provide a full picture of what makes up the context of practice, I have deployed other methods, such as ethnographic fieldwork (Gupta et al., 2014; O'Brien et al., 1999; Rodden et al., 2003), to help depict the relevant contexts in which the practices of mobile phone use take shape.

The interactive properties of mobile technology have opened up a potentially new realm for the study of social interaction, as they translate into a wealth of new empirical objects for social research (Licoppe, 2004). More awareness of the importance of collective configurations of people and technology is emerging: people do not operate their devices alone–they are sharing, being together, creating common meaning. Participation extends across life and work in multiple situations, and communities of practice (Bødker et al., 2016; Lampinen et al., 2018). An orientation towards the practices of phone interaction shows us how mobile phone use interpenetrates the public and private sphere–and a dichotomy of practices in the workplace versus the private sphere action are becoming less tenable (Bødker, Lyle, & Saad-Sulonen, 2017). The two spheres are increasingly entangled, as workplace communication and coordination are accessed through mobile devices. My hybrid methods approach echo that of work such as Licoppe, Rivière, & Morel's study of the interactional practices adopted by participants on the Grindr dating app (Licoppe et al., 2015), where the authors used a combination of interviews and video analysis recorded from the participants' phones.

7.2.1 Research in vivo

Deployed over two iterations of data collection, and involving video collected from wearable cameras combined with recordings of mobile phone screen interactions, the synchronised *in vivo* approach has provided a person-centred perspective on the use of mobile phones. The level of data preparation and analysis involved in the *in vivo* approach is high as it involves manual classification of hours of video data, followed by in-depth analysis of selected video recordings. Yet, the techniques of CA were particularly well suited for the focused analysis of the close, sequentially implicative configuration of talk-in-action of mobile phone use, providing clarity on the mechanically reproducible order and form which the practices of use took. The micro analysis of CA uncovered ethnomethodological themes, including the work done by participants to integrate the mobile phone into the 'local order' of social interaction with others - the *making plain the social order* of mobile phone use.

The perspective gained on technology use through the *in vivo* approach, then, was narrow in range–the output not concerned with providing generalisations about phone use, but with what can be learned from a detailed understanding how interaction, talk, and application use come together in specific examples. The goal was to understand mobile phone use and behaviour in a way that has relevance beyond the individual video recordings, some of which have been discussed here. This is not achieved by presenting behaviour that is 'typical'. Instead, I propose that other situations of use may be understood *in relation to* the video recordings that are transcribed, analysed and presented. The goal is also more broadly ethnographic: using video recordings to understand the changing nature of mobile phone technology for those who use it, and the role it plays in their social relationships (Waterson, 2019). The *in vivo* recordings are revealing, rather than typical—they allowed us an analytically available way into collaborative action with mobile phone technology.

7.2.2 Ethnographic interviews

Papers III, IV and V, reflected the transitional setting for computational technology. These studies were concerned with a specific site of mobile technology, each of which required a hybridity in methods to access and analyse. The study of Uber and ride-hailing services was an early investigation of an innovative app-based service; we used situated interviews and observations to collect the perspective of as many stakeholders involved as possible. By interviewing drivers while they worked, we were able to observe technology-in-action and gain understanding of the changing conditions of work for drivers, and the new skills and work practices required to meet them. By interviewing different stakeholders, this methodological approach allowed a broader ethnographic lens on ride-hailing apps, to acknowledge and describe business decisions which, mediated through the mobile phone, are responsible for transforming the everyday work practices of taxi drivers all around the world. The Uber study, then, worked with the traditional interview method and adapted it to suit the 'situated' availability of drivers for interview.

The next two studies introduced interview probes: First, we used trace data of participants' battery activity to retrospectively co-create their memories of what they were doing in relation to their battery maintenance actions in space and time (Paper IV). This had the effect of humanising the instrumental data around battery levels, explicating what happened and why, as well as what our participants did to work around the challenges of maintaining a mobile phone charge. Over the course of the interviews, distinctive practices of battery infrastructure care and maintenance emerged. Second, a study involving a speculative

investigation of the challenges of designing a speech-based intelligent agent for workplace meetings (Paper V), in which a hybrid approach combined elements of an interview study, a video analysis of workplace meetings, and evaluation of a low-fidelity prototype of a speech-based meeting agent. The prototype, which was created using transcriptions of observed and video recorded meetings, was used to support both prosaic and creative insights on how the technology might operate in the workplace meeting setting. Garfinkel suggested that using traces and proxies in interviews provide "aids to a sluggish imagination" (Garfinkel, 1967). In the two studies the probes proved valuable in helping interviewees recall mundane details of their previous technology use, and also to imagine how a technology that does not exist might function and operate within their work environment. The use of probes for research gives us opportunities for *extended empirical encounters* with people (Gaver et al., 1999); when we collect participant data we only get a tiny glimpse of them–especially if the data is logged data, gathered remotely from a mobile device. As users of technology, we are all in a *constant state of becoming* (Coleman et al., 1999; Srivastava, 2005), and our skills and practices develop as technology becomes more familiar as it is used in different settings, and in combination with different applications or additional artefacts. So, a research probe can allow us to spend more time in a quasi-empirical state of observation with our participants. For this to succeed, the low-fidelity nature of research probes is important: ambiguity and uncertainty foster engagement from participants. Probes can provoke inspiring responses, and ambiguity in their design sets up a mutual uncertainty between researcher and participant, which can leave space for interviewees to articulate what the new design could be like (Odom et al., 2016; Snyder, 2003). A participant's interpretation of an incomplete technology can give us access to their requirements of and attitudes towards the probe in a way that direct questioning would not achieve. By blocking the normative functionality of software or technology in a prototype probe, it is possible to generate new ideas, as participant responses can elaborate potential functions and desired features of the technology. For example, in my study of speech-based technology, participants made suggestions for what a meeting agent might do, and which had not been considered for the prototype, and their sense-making actions around the prototype demonstrated where their priorities for meeting notes and records lay.

7.2.3 Hybrid methods

Mobile phones challenge and constrain the kind of visibility and observability of practice which we can capture and use in research. The research material collected here is different–

the video is not as perfect as that gathered by a fixed camera. However, reflecting the technology itself, the range of phone use collected in videos gives us an authentic perspective on the embodied and messy deluge of information and communication being dealt with by people on their mobile phones, and how the phone is brought into and withdrawn from the ongoing and sequential ordering of face-to-face interaction. Clearly the methods must adapt and change. The application of hybrid methods involves a continuous mutual adjustment of research questions, data, techniques, contexts and settings. The object of enquiry is ambiguous because both the technological setting and, what is more, the social practices of use are emergent and their contributions to local order are entangled. The scope of my research changed focus from the micro-analysis of participant interactions happening in the immediate environment of the phone, to include broader ethnographic considerations of business models and organisational communications hierarchies. The empirical findings presented in this thesis reveal how affordances of mobile technology have enabled new practices. I argue that there is a stable commonality in working towards maintaining the local order which underpins all practices. I further argue that the prevailing conceptions of what automated logged methods bring to the study of social interaction around mobile phones do not equip us well to understand the transformations taking place–such techniques end up privileging the technology at the cost of attending to the social. However, the mobile phone can facilitate the development of hybrid methods of enquiry that can enable an intersection between computer engineering, social science and design.

8 Conclusion

We have now re-visited two of the research questions with which the thesis began. First, an analytic 'diamond' was used to present an conceptualisation of the order of co-located phone use which highlights four important elements of mobile phone practice: temporal order, participant role, materiality and repair. Then, I reflected on the methodological contribution made through hybrid research methods developed and deployed to access the practices of phone use *in vivo*. The remaining research question regarding the empirical contribution will now be addressed.

In the rush to tackle head-on the pressing contemporary issues involving mobile technology, there is, perhaps understandably, a tendency to overlook the mundane, everyday practices of what we actually do on and around our mobile phones. Yet these details are important if we are to judge the impact of mobile technology, understand the possibilities and dangers it offers, or evaluate claims about its broader impact on our sociality. In response to alarming claims about the impact of mobile technology on our behaviour, the starting point for this thesis was a desire to create knowledge regarding what people do with and around their mobile phones.

Of course, there are methodological difficulties in gaining access to the world of our everyday interactions with technology. Hybridity in research methodology has been proposed here (7.2), to combine ethnography with techniques of video analysis and the creative use of probes to support interviews to gain a holistic view of mobile phone use. By adopting ethnomethodology's reliance on empirical observation, we can avoid abstract and reductive generalisations about phone use, and instead discuss the observable action that does occur around mobile phone collaboration and through which the participants get things done.

To address the remaining research question, the empirical contribution of the thesis, is typology of collaborative practices observed and substantiated across the research material. Drawing extensively on *in situ* video recording of device use, as well as interviews and ethnographic observations, the empirical chapters cover three different types of device use: search, messaging, and way-finding.

What emerges from the studies in this thesis is a call for commitment to understanding the everyday practices that constitute mobile phone use and that lead to the implications they have for the orderly production of *in situ* intelligibility of the world involving mobile phones.

8.1 Practices of collaborative mobile phone use

For the investigation of how mobile and face-to-face interaction is now intertwined with our everyday practices, this thesis has begun with the here-and-now, by analysing phone use at the micro level, to observe how people make sense of day-to-day interactions to create and maintain 'local order'. I argue that recurrent and recognisable practices of mobile phone use are developed and sustained in collaboration with co-located others, creating common sense knowledge of mobile technology in order to benefit from it, while also maintaining orderly social interaction with friends, family and colleagues.

Traditionally, the research field of human–computer interaction (HCI) has thrived upon combining empirical understandings to develop new concepts and technology devices (Dourish, 2006; Sas et al., 2014). Rather than a straight transposition from findings to design, this thesis takes a close look at the 'new yet old' nature of collaboration around technology. The focus of the thesis has been to look at collaborative interactions which occur naturally and recurrently around mobile phones, to understand how the technology contributes to the co-production of social order. It transpires that doing things together relies upon a somewhat predictable 'local order' to enable people to work together, which, in the case of mobile phone technology, manifests in recurrent and recognisable practices of mobile phone use.

The thesis set out to query how the mobile phone is used in interaction with co-located others. Chapters 4, 5, and 6 describe the practices of key co-located mobile phone activities identified in a corpus of video research material; (Papers I, II and VI) augmented by ethnographic studies of mobile phone use in diverse settings (Papers III, IV, V and VII). The co-operative mobile activities identified and analysed were those associated with search, messaging and way-finding. These three activities were selected for their frequency in the research material, in addition to their potential for collaboration in the co-located setting. I will now summarise them per activity below.

8.1.1 Search

The participation of the *driver*, who is actively searching on the mobile phone, and the *passenger*, observing the search, was consequential to how the search is conducted–and both driver and passenger could be more or less involved in creating search queries collaboratively. By asking a co-located passenger for help in creating search terms, and using the suggestions given in combination with the driver's own keywords, can create a 'laminated' search request (Goodwin, 2017). This co-operative action served both to manage

the social participation of co-located others, and also to optimise the search query, by bringing more diverse terms to bear.

The social distribution of knowledge which occurred through the interaction of a collaborative search highlighted another emergent participatory role: participants may be *knowing* or *non-knowing* (Heritage, 1998), with associated roles to perform towards accomplishing the search. A non-knowing participant may instigate a search and ask for help in formulating the search terms for example, while a knowing participant (Goodwin, 1987) can offer confirmation when the correct result has been found by the non-knowing other. This dynamic of knowledge transformation, when one informs the other, is seemingly prosaic and obvious, yet highlights the co-operative *sense-making* interaction that underpins and motivates collaborative search activity: "Knowledge is not something that people possess in their heads; rather, it is something that people do together" (Gergen, 2000).

Collaborative search typically occurs in the social milieu and beyond its utilitarian function, the practice of search–including composing search terms, and reviewing and consuming results–fulfils a more nuanced requirement for both information and entertainment. Instances of search in the video research material analysed were often characterised by their humorous nature, involving both purposeful searches for funny items, and finding humour in the random and sometimes misaligned search results that their collaborative search terms might return. This represents a significant re-conceptualisation of the early notions of individual 'information foraging' (Pirolli, 2007), and points to an alternative *ludic* perspective on the mobile phone–that of a social device which is appropriated not only to inform but also to entertain and foster local social interaction.

8.1.2 Messaging

What is lacking in many studies of mobile messaging is a perspective on the technology which reveals how device use is organised. While abstracted data may tell us that the networked range of communication is narrower (R. Ling, 2008), it does not help us understand the content and context of messages being sent and received, or how new affordances are being appropriated into communication. The empirical contribution of this thesis to the evolving discourse around messaging and its role in the production of social order is to account for the ways that new forms of messaging afford novel practices, and how those in turn may circumvent dependence on co-location, or issues with language and even literacy. Mobile messages are asynchronous, which allows both sender and recipient to read and reply to messages in whatever way is appropriate to them–with co-located assistance if

necessary. Yet messages to and fro are delivered almost instantaneously and the interface of messaging apps lets the sender and recipient know when messages are being read and responded to in real time, which affords a form of communication that falls somewhere between traditional written and spoken language.

Adding to the novel practices of use, the permanent nature of messages introduces *multi-party participation*, whereby messages received can become a resource in the practical problem for social organisation in face-to-face conversation. In the video research material, messages were called upon in situations where a topic of conversation was required, for example, in providing resources for stepwise transition between two work colleagues, who were seen to progress from chatting about a message about a new online date sent by a remote sender, to discussing one colleague's personal experience with online dating. In this setting, the sender had no orientation towards such use, potentially exposing all parties in the conversation to the reuse of messages sent in ways that they had not anticipated–any face-to-face sharing that might occur around the received message is not visible to the remote sender. Easily searchable and shareable communications place a higher burden of trust on the sender of a message towards the receiver. Changing the required level of trust after a message has been sent is problematic.

Finally, countering arguments that messages and notifications, and the devices that mediate them distract people from important face-to-face interactions, the empirical findings present an alternative scenario where messages being brought into the co-located interaction and act to mediate relations that extend from face-to-face to online. Collaborative composition was a practice seen regularly in the research material, and it is worth reflecting on how messages and communication made via the phone might at times be as important as those made face-to-face. Co-located interaction provided support for the interpretation of incoming messages, and was used as a resource in the composition of responses.

8.1.3 Way-finding

The empirical findings around way-finding with mobile maps illustrate perhaps most clearly the challenges for co-orientation and mutual intelligibility that mobile phones present. We have already observed that the screen of a mobile phone can be made *glanceable* during collaborative mobile search and messaging–the screen can be viewed by a co-located 'passenger' and the onscreen content can be made intelligible by supporting commentary provided by the 'driver' who is holding the phone. However, the delicate assemblage of bodies and eyes that is required around a small mobile screen to make sharing it with co-

located others meaningful, may be compromised by the complexity of the information contained in the mobile map interface.

Achieving spatial orientation to the surrounding physical environment becomes difficult for all parties. The driver who is holding and operating the phone is best able to *achieve the gestalt of spatial alignment* between her or his own body, the edge of the map and the surrounding the landscape. As a result, the driver can become responsible for the larger division of labour of the way-finding task. This lopsided collaboration has the potential therefore to disenfranchise co-located others and, in addressing this imbalance in the local order of way-finding, passengers may draw upon their individual and relative mobility as a social resource. By walking away from the mobile phone driver, the passenger could be categorised as 'doing reconnaissance' by examining the surrounding environment, to contribute information relevant to the shared way-finding task.

Looking at how people get themselves spatially oriented within the urban environment (Haddington et al., 2014), highlights both the embodied nature of way-finding with mobile maps, as well as the challenge of how to distribute knowledge (Mondada, 2013) in shared way-finding. This is not a new problem for way-finders or cartography in general; however, perhaps the advantages that mobile maps provide for the device *driver* in achieving a gestalt of spatial alignment, serve to accentuate the difficulty experienced by the co-located passenger.

This is to say that way-finding reasoning needs to be made mutually intelligible to co-located others by talk, as well as embodied gestures (turning, looking and pointing). However, when normal, natural troubles of navigation (B. Brown & Laurier, 2012) do occur, this becomes more challenging for the driver, who must first establish whether there is a problem with her or his way-finding technique, or whether the problem is with the map app technology, or with her or his current reading of the map app. The additional and often less critical task of keeping those co-located updated may be subjugated to the primary task of figuring out the group's spatial orientation.

The new resources provided by ego-centric, locative map apps inspire different sorts of intersubjective mobile inquiry to support the local order of way-finding. Emergent practices, including *walking the blue dot*, used the dynamic features of the technology to establish orientation. These embodied practices reflect how the person holding the device becomes embedded within the mapping interface and represented by the 'you are here' blue dot, while the driver's own body has also become observably embedded within the local setting. The

blue dot moves in response to bodily movement through the landscape, affording the phone user an embodied understanding of their location.

8.1.4 Social order of the mobile

Social order enables society to function smoothly. Without it, society would break down. Garfinkel's ethnomethodology (EM) is an approach that gives us the tools and analytic perspective to study, at the micro level, how we make sense of the day-to-day interactions we have with one another; that is, how we bring about and sustain social order. I argue that practices of mobile phone use have become constitutive to local order in everyday life and that the study of these practices is key to understanding what social order is now like. I have summarised the empirical practices of search, mobile messaging and way-finding here and, based on this research, I argue that they are constituted by the elements of time, body, materiality and repair. I have also presented the methodological contribution that lies in the hybrid methods used to observe and collect suitable research material to analyse mobile phone use moment-by-moment. I will now conclude the thesis with thoughts on ways to take this work forward, as well as reflections on the work overall.

8.2 Future work

There are two directions that are promising for taking the work of this thesis forward: the first would be an expansion of the original *in vivo* studies. The expansion could be both in terms of the scale and diversity of participants, and also in the analytic techniques adopted to make sense of recorded and observed mobile phone use. The existing techniques for collecting, classifying and analysing large-scale ethnographic research material could be expanded to involve additional competences from conversation analysis, sociology and computer science, mixing automated analysis (machine learning), crowdsourcing and design. This approach would increase the diversity of the video material collected and expand our understanding about human activity with and around mobile phone use. In addition, the video research material could contribute to rethinking research and design processes around mobile devices, by bringing a more embodied perspective of everyday technological practices into design processes.

The aim of the *in vivo* approach is to capture the life around and made with mobile phones, to document and understand the new forms of everyday interaction enabled by these devices. Included in any future large-scale collection of video recordings of phone use, I

would anticipate recordings of new emerging uses and practices, to add to and augment those described in this thesis. For example, a participant may be recorded unlocking an e-scooter, or using Siri to search the internet, and the video recordings would also capture the uses of other new technologies *in situ* such as IoT devices in the home, speech interaction with other devices, and other everyday uses of AI-based technology. These are all topics of research that can benefit from hybrid methods and a practice-orientation.

While this thesis has commented on endogenous phenomena found in the video research material collected, a future large-scale video corpus could actively seek to analyse particular behaviours that are deemed problematic. Aspects of phone use that future work could gain potential insight into include addiction, overuse, cyber-bullying and the negative impacts of social media. Studying these *in situ* can both enhance our understanding and suggest ways to operationalise the phenomena under study. Recent research into how we engage with contemporary politics has used methods that closely resemble the *in vivo* approach (Waterson, 2019) to investigate the role of mobile technology, social media and the incidence of 'fake news'. Waterson's findings highlight the importance of looking at how people engage with content on their phones. What he observed in recordings of participants' everyday phone use was consumption that was 'heavily slanted' by filters operating within the mobile device itself, without the participants themselves being aware, including the browser as well as various social media. Rather than fake news, the video material gathered revealed the consumption of a stream of exaggerated news stories that were designed to entertain. This research emphasises how important it is that we, as researchers, remain clear-eyed in documenting and analysing what is done with the phone, rather than making inferences about the motivations and implications of different kinds of technology use or relying solely on self-reported usage, be it via interviews or surveys. A practice-orientation on phone use brings into view external resources that may be hidden or overlooked in more experimental research, but which may nonetheless contribute to the way that technology is used. Moreover, it avoids privileging the technology with too much power and agency. Analytically, future work could develop new approaches that rely upon qualitative methods as the work in this thesis has done, but it could also call upon new machine learning techniques to produce representative, quantitative analysis of the video research material collected.

A second furrow of future work could engage closely with design. Thus far, my research has done so only in limited ways, specifically in the form of design implications and recommendations which emerged from the studies first in speech recognition technology for

workplace meetings, and second in chat applications for workplace communications. Creative and speculative probes could be brought in to participatory design workshops in diverse settings and locations–for example, in emerging global markets such as India, or in different domain settings such as healthcare. Participatory design endeavours could work towards understanding if and how it is possible to rethink who has control over what apps do and why. Existing mobile technology and apps are largely still designed and developed by a small, and predominantly western, privileged group, and they are most often built for individual use (Brookshire, 2013b). Future work could expand the diversity of the development process to bring in those whose voices are currently excluded from the process, and also place a stronger emphasis on design for collective use (Bannon et al., 2018). Can we move towards a model that serves the needs of social groups of collaborators, rather than accommodating the needs of individual applications? Perhaps by observing people engaging with their phone in the social, co-located setting, it would be possible to think less about technological fixes, and factor in other issues such as business drivers which can conflict with their users' social and ethical needs.

Finally, as a project centred around the collection and use of video data, future *in vivo* work could also seek original channels of outreach, beyond the academic world. For example, the world as recorded through the lens of participants' mobile phone use has the potential to become the subject of a compelling ethnographic documentary. The mobile phone as a discrete reportage camera has been explored, by documentary work[12] highlighting the plight of refugees travelling across Europe. Future work could augment this distinctive perspective, by simultaneously recording and archiving interactions with the mobile device. This would require new approaches to editing, and present opportunities for creative collaboration with other researchers, designers, and artists.

8.3 Concluding thoughts

Mobile phones have developed to coordinate and mediate every aspect of life, work, love and death (Lagerkvist & Andersson, 2017). As such, mobile phones are very familiar, almost taken for granted, so research should try to introduce unfamiliar perspectives to help gain a critical distance from the technology. Ethnographic approaches drawing upon micro-analysis

[12] https://www.dw.com/en/tv/myescape/s-32606

of video recordings of use, rather than automated traces of use generated by the technology itself, provide the beginnings of a platform for doing that.

Given how familiar mobile phones now are to many, there has been surprisingly little research on how they are used in the everyday. The central idea behind this thesis was simply to explore what people actually do on their phones. The research materials collected through my studies reveal that using the mobile phone has transformed from instrumental one-to-one communication–if it ever was such–to a social, even collective, activity. Mobile phone use, and the settings that shape it, is an active and social process. Together, people produce accounts of what they are doing on their phones in co-located settings, making sense of what they see onscreen using recurrent and recognisable practices to enable mutual intelligibility. Moreover, the choices about when and what to do with mobile phones in co-operation, are made taking account of the relationships and resources that make up the surrounding context.

The mobile device, in many respects, is an individual device, in terms of the size, the design of its small screen, and its private nature (not to be accessed without permission). Nevertheless, its use is very frequently publicly available to everyone–companions and strangers alike–thereby becoming a resource for social action. For research, mobile phone use can be understood, analysed and explained in terms of the everyday settings in which it characteristically occurs. Phone use is surrounded by the endless flow of other activity and talk, and participation is a constitutive part of the ongoing relations through which we coordinate and construct our lives. It is the varied practices in the social contexts of use that my thesis has begun to document. What the co-operative practices presented here have revealed, is the entangled interrelationships between meaning-making, enjoyment, use and the maintenance of local order, that underpin their production.

This represents a fraction of what a future field of mobile studies, established to evaluate phones as an aspect of contemporary culture, might cover. I have purposely avoided analysing, for example, social media research material found in the corpus, but beyond the scope of the thesis. Yet the content accessed through the mobile phone is another resource present in our environment which is shaping our everyday practices of use. Drawing on what happened with web science (Berners-Lee et al., 2006), future work could adopt techniques from sociology to generate new ways of understanding the technology itself as a phenomenon, and the impacts it has. I have proposed a diamond of mobile phone use practices, constituted by the elements of time, body, materiality, and repair. With this framing, we can advance the analysis and understanding of mobile phone use and its developing role in the local order.

I have avoided analysing different sorts of social media consumption on mobile devices. Clearly, the multitude of media accessible through our phones are another ever present resource shaping our everyday practices. Future work could adopt the techniques discussed here to generate new ways of understanding social media technologies as a phenomenon, as the impacts they have on co-located interaction. In this thesis, I have proposed a ‘diamond’ of mobile phone use practices, with the elements of time, body, materiality and repair. This framing helps to advance the analysis and understanding of mobile phone use nad its developing role in our local order. Technology has become yet another tool in the orderly accomplishment of everyday life.

9 Bibliography

Adey, P., Bissell, D., Hannam, K., Merriman, P., & Sheller, M. (2014). *The Routledge Handbook of Mobilities*. Routledge.

Adomavicius, G., & Tuzhilin, A. (2011). Context-Aware Recommender Systems. In F. Ricci, L. Rokach, B. Shapira, & P. B. Kantor (Eds.), *Recommender Systems Handbook* (pp. 217–253). Springer US. https://doi.org/10.1007/978-0-387-85820-3_7

Ahmed, S. I., Bidwell, N. J., Zade, H., Muralidhar, S. H., Dhareshwar, A., Karachiwala, B., Tandong, C. N., & O'Neill, J. (2016). Peer-to-peer in the Workplace: A View from the Road. *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems*, 5063–5075. https://doi.org/10.1145/2858036.2858393

Alexandra Samuel. (2017, February 21). *Meet the Black Technologist Who Changed How Your Brain Works*. JSTOR Daily. https://daily.jstor.org/alan-emtage-first-internet-search-engine/

Almeida, T. A., Silva, T. P., Santos, I., & Gómez Hidalgo, J. M. (2016). Text normalization and semantic indexing to enhance Instant Messaging and SMS spam filtering. *Knowledge-Based Systems*, *108*, 25–32. https://doi.org/10.1016/j.knosys.2016.05.001

Anderson, K., Nafus, D., Rattenbury, T., & Aipperspach, R. (2009). Numbers Have Qualities Too: Experiences with Ethno-Mining. *Ethnographic Praxis in Industry Conference Proceedings*, *2009*(1), 123–140. https://doi.org/10.1111/j.1559-8918.2009.tb00133.x

Ariga, A., & Lleras, A. (2011). Brief and rare mental "breaks" keep you focused: Deactivation and reactivation of task goals preempt vigilance decrements. *Cognition*, *118*(3), 439–443. https://doi.org/10.1016/j.cognition.2010.12.007

Arminen, I., & Weilenmann, A. (2009). Mobile presence and intimacy—Reshaping social actions in mobile contextual configuration. *Journal of Pragmatics*, *41*(10), 1905–1923. https://doi.org/10.1016/j.pragma.2008.09.016

Badham, V. (2019, June 28). You can't enforce a ban on mobile phones in the classroom – we should teach kids to hate them instead | Van Badham. *The Guardian*. https://www.theguardian.com/technology/commentisfree/2019/jun/28/you-cant-enforce-a-ban-on-mobile-phones-in-the-classroom-we-should-teach-kids-to-hate-them-instead

Bakhtin, M. M. (1982). *The Dialogic Imagination: Four Essays* (M. Holquist, Ed.; C. Emerson, Trans.; New Ed edition). University of Texas Press.

Banerjee, N., Rahmati, A., Corner, M. D., Rollins, S., & Zhong, L. (2007). Users and Batteries: Interactions and Adaptive Energy Management in Mobile Systems. *Proceedings of the 9th International Conference on Ubiquitous Computing*, 217–234. http://dl.acm.org/citation.cfm?id=1771592.1771605

Bannon, L., Bardzell, J., & Bødker, S. (2018). Introduction: Reimagining Participatory Design—Emerging Voices. *ACM Transactions on Computer-Human Interaction*, *25*(1), 1–8. https://doi.org/10.1145/3177794

Baren, J. V., Lanen, F. V., & Ijsselsteijn, W. (2003). Staying in Touch: Social Presence and Connectedness through Synchronous and Asynchronous Communication Media. *In: Proceedings of the International Conference on Human-Computer Interaction*

Baritz, L. (1960). *The servants of power: A history of the use of social science in American industry.* Wesleyan University Press. https://doi.org/10.1037/11283-000

Barkhuus, L., & Polichar, V. E. (2011). Empowerment through seamfulness: Smart phones in everyday life. *Personal and Ubiquitous Computing*, *15*(6), 629–639.

Barley, S. R. (1996). Technicians in the Workplace: Ethnographic Evidence for Bringing Work into Organizational Studies. *Administrative Science Quarterly*, *41*(3), 404–441. JSTOR. https://doi.org/10.2307/2393937

Barley, S. R., & Kunda, G. (2001). Bringing Work Back In. *Organization Science*, *12*(1), 76–95. https://doi.org/10.1287/orsc.12.1.76.10122

Baym, N. K. (1996). *Agreements and Disagreements in a Computer-Mediated Discussion*. https://doi.org/10.1207/s15327973rlsi2904_2

Belkin, N. J., Oddy, R. N., & Brooks, H. M. (1982). ASK FOR INFORMATION RETRIEVAL: PART I. BACKGROUND AND THEORY. *Journal of Documentation*, *38*(2), 61–71. https://doi.org/10.1108/eb026722

Berkel, N. V., Ferreira, D., & Kostakos, V. (2017). The Experience Sampling Method on Mobile Devices. *ACM Computing Surveys*, *50*(6), 1–40. https://doi.org/10.1145/3123988

Berners-Lee, T., Hall, W., Hendler, J., Shadbolt, N., & Weitzner, D. J. (2006). Creating a Science of the Web. *Science*, *313*(5788), 769–771. https://doi.org/10.1126/science.1126902

Boden, D. (1990). People are talking: Conversation analysis and symbolic interaction. In *Symbolic interaction and cultural studies*. University of Chicago Press.

Boden, D. (1994). *The business of talk: Organizations in action*. Polity Press.

Bødker, S., Korsgaard, H., & Saad-Sulonen, J. (2016). `A Farmer, a Place and at least 20 Members- The Development of Artifact Ecologies in Volunteer-based Communities. *Proceedings of the 19th ACM Conference on Computer-Supported Cooperative Work & Social Computing - CSCW '16*, 1140–1154.

Boellstorff, T., Nardi, B., Pearce, C., & Taylor, T. L. (2012). *Ethnography and Virtual Worlds: A Handbook of Method*. Princeton University Press.

Böhmer, M., Hecht, B., Schöning, J., Krüger, A., & Bauer, G. (2011). Falling Asleep with Angry Birds, Facebook and Kindle: A Large Scale Study on Mobile Application Usage. *Proceedings of the 13th International Conference on Human Computer Interaction with Mobile Devices and Services*, 47–56. https://doi.org/10.1145/2037373.2037383

Bowers, J., Button, G., & Sharrock, W. (1995). Workflow From Within and Without: Technology and Cooperative Work on the Print Industry Shopfloor. In H. Marmolin, Y. Sundblad, & K. Schmidt (Eds.), *Proceedings of the Fourth European Conference on Computer-Supported Cooperative Work ECSCW '95: 10–14 September, 1995, Stockholm, Sweden* (pp. 51–66). Springer Netherlands. https://doi.org/10.1007/978

Brookshire, B. (2013, May 8). *Social Science is WEIRD, and That's a Problem.* Slate Magazine. https://slate.com/technology/2013/05/weird-psychology-social-science-researchers-rely-too-much-on-western-college-students.html

Brown, B., & Green, N. (2012). *Wireless World: Social and Interactional Aspects of the Mobile Age*. Springer Science & Business Media. https://doi.org/10.1007/978-1-4471-0665-4

Brown, B., & Laurier, E. (2012). The Normal Natural Troubles of Driving with GPS. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, 1621–1630. https://doi.org/10.1145/2207676.2208285

Brown, B., & O'Hara, K. (2003). Place as a Practical Concern of Mobile Workers. *Environment and Planning A: Economy and Space*, *35*(9), 1565–1587

Brown, B., Weilenmann, A., McMillan, D., & Lampinen, A. (2016). Five Provocations for Ethical HCI Research. *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems*, 852–863. https://doi.org/10.1145/2858036.2858313

Brown, K. M., Dilley, R., & Marshall, K. (2008). Using a Head-Mounted Video Camera to Understand Social Worlds and Experiences. *Sociological Research Online*, *13*(6) Burawoy, M. (1982). *Manufacturing Consent: Changes in the Labor Process Under Monopoly Capitalism*. University of Chicago Press.

Button, G., & Sharrock, W. (2016). In support of conversation analysis radical agenda. *Discourse Studies*, *18*(5), 610–620. https://doi.org/10.1177/1461445616657955

Button, Graham, & Sharrock, W. (1998). The Organizational Accountability of Technological Work. *Social Studies of Science*, *28*(1), 73–102. https://doi.org/10.1177/030631298028001003

Cairns, P., & Cox, A. L. (Eds.). (2008). *Research Methods for Human–Computer Interaction*. Cambridge University Press. https://doi.org/10.1017/CBO9780511814570

Cambier, R., Derks, D., & Vlerick, P. (2019). Detachment from Work: A Diary Study on Telepressure, Smartphone Use and Empathy. *Psychologica Belgica*, *59*(1), 227–245. https://doi.org/10.5334/pb.477

Carrascal, J. P., & Church, K. (2015). An In-Situ Study of Mobile App & Mobile Search Interactions. *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems*, 2739–2748. https://doi.org/10.1145/2702123.2702486

Chesher, C. (2012). Navigating sociotechnical spaces: Comparing computer games and sat navs as digital spatial media. *Convergence*, *18*(3), 315–330. https://doi.org/10.1177/1354856512442762

Chotpitayasunondh, V., & Douglas, K. M. (2016). How "phubbing" becomes the norm: The antecedents and consequences of snubbing via smartphone. *Computers in Human Behavior*, *63*, 9–18. https://doi.org/10.1016/j.chb.2016.05.018

Church, K., & de Oliveira, R. (2013). What's up with whatsapp?: Comparing mobile instant messaging behaviors with traditional SMS. *Proceedings of the 15th International Conference on Human-Computer Interaction with Mobile Devices and Services*

Church, K., Smyth, B., Cotter, P., & Bradley, K. (2007). Mobile information access: A study of emerging search behavior on the mobile Internet. *ACM Transactions on the Web*

Coleman, M., Collings, M., & McDonald, P. (1999). Teaching anti-oppressive practice on the diploma in social work: Integrating learning. *Social Work Education*, *18*(3), 297–309. https://doi.org/10.1080/02615479911220291

Coulton, P., & Lindley, J. G. (2019). More-Than Human Centred Design: Considering Other Things. *The Design Journal*, *22*(4), 463–481. https://doi.org/10.1080/14606925.2019.1614320

Cowan, R., & Jonard, N. (2004). Network structure and the diffusion of knowledge. *Journal of Economic Dynamics and Control*, *28*(8), 1557–1575. https://doi.org/10.1016/j.jedc.2003.04.002

Dhir, A., Kaur, P., Jere, N. R., & Albidewi, I. A. (2012). Understanding mobile phone battery—Human interaction for developing world A perspective of feature phone users in Africa. *2012 2nd Baltic Congress on Future Internet Communications*

Dixon, N. (2018). Stranger-ness and Belonging in a Neighbourhood WhatsApp Group. *Open Cultural Studies*, *1*(1), 493–503. https://doi.org/10.1515/culture-2017-0046

Dollar, P., Wojek, C., Schiele, B., & Perona, P. (2009). Pedestrian detection: A benchmark. *2009 IEEE Conference on Computer Vision and Pattern Recognition*, 304–311.

Donner, J. (2015). *After Access: Inclusion, Development, and a More Mobile Internet* (L. DeNardis & M. Z. PhD, Eds.; 1 edition). The MIT Press.

Dourish, P. (2004). What we talk about when we talk about context. *Personal and Ubiquitous Computing*, *8*(1), 19–30. https://doi.org/10.1007/s00779-003-0253-8

Dourish, P. (2006). Implications for Design. *Proc. ACM Conf. Human Factors in Computing Systems CHI 2006*, 541–550.

Dourish, P., & Bell, G. (2011). *Divining a Digital Future: Mess and Mythology in Ubiquitous Computing*. MIT Press.

Ducharme, J. (2018). 'Phubbing' Is Hurting Your Relationships. Here's What It Is. *Time*. https://time.com/5216853/what-is-phubbing/

Ellis, D. A. (2019). Are smartphones really that bad? Improving the psychological measurement of technology-related behaviors. *Computers in Human Behavior*, *97*,

Ferreira, D., Ferreira, E., Goncalves, J., Kostakos, V., & Dey, A. K. (2013). Revisiting Human-battery Interaction with an Interactive Battery Interface. *Proceedings of the 2013 ACM International Joint Conference on Pervasive and Ubiquitous Computing*,

Fielding, N. (1981). *The National Front*. Routledge & Kegan Paul.

Forlizzi, J., & Battarbee, K. (2004). Understanding Experience in Interactive Systems. *Proceedings of the 5th Conference on Designing Interactive Systems: Processes, Practices, Methods, and Techniques*, 261–268.

Fortunati, L. (2002). The mobile phone: Towards new categories and social relations1. *Information, Communication & Society*, *5*(4), 513–528.

Garfinkel, H. (1967). *Studies in ethnomethodology*. Prentice-Hall.

Garfinkel, H. (1988). Evidence for Locally Produced, Naturally Accountable Phenomena of Order, Logic, Reason, Meaning, Method, etc. In and as of the Essential Quiddity of Immortal Ordinary Society, (I of IV): An Announcement of Studies. *Sociological Theory*, *6*(1), 103. https://doi.org/10.2307/201918

Garfinkel, H. (1991). Respecification: Evidence for locally produced, naturally accountable phenomena of order, logic, reason, meaning, method, etc. in and as of the essential

haecceity of immortal ordinary society (I) – an announcement of studies. In Graham Button (Ed.), *Ethnomethodology and the human sciences* (pp. 10–19).

Garfinkel, H. (1996). Ethnomethodology's Program. *Social Psychology Quarterly*, *59*(1), 5–21. JSTOR. https://doi.org/10.2307/2787116

Garfinkel, H. (2002). *Ethnomethodology's Program: Working Out Durkheim's Aphorism* (A. W. Rawls, Ed.). Rowman & Littlefield Publishers.

Garfinkel, H., Lynch, M., & Livingston, E. (1981). The work of a discovering science constructed with materials from the optically discovered pulsar. *Philosophy of the Social Sciences*, *11*(2), 131.

Gaver, B., Dunne, T., & Pacenti, E. (1999). Design: Cultural probes. *Interactions*, *6*(1), 21–

Geertz, C. (1983). *Local knowledge: Further essays in interpretive anthropology* (3. ed., [repr.]). Basic Books.

Gergen, K. (2000). *The Saturated Self* (Reprint edition). Basic Books.

Gherardi, S. (2008). Situated Knowledge and Situated Action: What do Practice-Based Studies Promise? In D. Barry & H. Hansen, *The SAGE Handbook of New Approaches in Management and Organization* (pp. 516–525). SAGE Publications Ltd.

Gherardi, S. (2009). Introduction: The Critical Power of the `Practice Lens'. *Management Learning*, *40*(2), 115–128. https://doi.org/10.1177/1350507608101225

Gibson, J. J. (1979). The Theory of Affordances. In *The Ecological Approach to Visual Perception*.

Giddens, A. (1984). *The Constitution of Society: Outline of the Theory of Structuration*. University of California Press.

Glas, R. (2012). *Breaking Reality: Exploring Pervasive Cheating in Foursquare*. 14.

Glassner, B. (1982). An Essay on Iterative Social Time. *The Sociological Review*, *30*(4), 668–681. https://doi.org/10.1111/j.1467-954X.1982.tb00673.x

Glenn, P. (2003). *Laughter in Interaction*. Cambridge University Press.

Goetz, J., & LeCompte, M. (1984). Goetz, Judith Preissle, and Margaret Diane LeCompte, Ethnography and Qualitative Design in Educational Research . New York: Academic Press, 1984. *CIRS: Curriculum Inquiry and Related Studies from Educational Research: A Searchable Bibliography of Selected Studies*. https://stars.library.ucf.edu/cirs/681

Goffman, E. (1959). *The presentation of self in everyday life* (Repr). Penguin.

Goffman, E. (1961). *Asylums; essays on the social situation of mental patients and other inmates.* Anchor Books.

Goffman, E. (1963). *Behavior in public places: Notes on the social organization of gatherings*. Free Press of Glencoe.

Goffman, E. (1974). *Frame analysis: An essay on the organization of experience*. Harvard University Press.

González, M. C., Hidalgo, C. A., & Barabási, A.-L. (2008). Understanding individual human mobility patterns. *Nature*, *453*(7196), 779–782. https://doi.org/10.1038/nature06958

Goodwin, C. (1979). The interactive construction of a sentence in natural conversation. *Everyday Language: Studies in Ethnomethodology*, 97–121.

Goodwin, C. (1987). Forgetfulness as an Interactive Resource. *Social Psychology Quarterly*, *50*(2), 115–130. https://doi.org/10.2307/2786746

Goodwin, C. (1994). Professional Vision. *American Anthropologist*, *96*(3), 606–633. https://doi.org/10.1525/aa.1994.96.3.02a00100

Goodwin, C. (2000). Action and embodiment within situated human interaction. *Journal of Pragmatics*, *32*(10), 1489–1522. https://doi.org/10.1016/S0378-2166(99)00096-X

Goodwin, C. (2007). Participation, stance and affect in the organization of activities. *Discourse & Society*, *18*(1), 53–73. JSTOR.

Goodwin, C. (2017). *Co-Operative Action*. Cambridge University Press.

Goodwin, C., & Heritage, J. (1990). Conversation Analysis. *Annual Review of Anthropology*, *19*(1), 283–307. https://doi.org/10.1146/annurev.an.19.100190.001435

Graham, E. E. (1995). The involvement of sense of humor in the development of social relationships. *Communication Reports*, *8*(2), 158–169. https://doi.org/10.1080/08934219509367622

Greenberg, S. (2001). Context As a Dynamic Construct. *Hum.-Comput. Interact.*, *16*(2), 257–268. https://doi.org/10.1207/S15327051HCI16234_09

Greiffenhagen, C., & Watson, R. (2009). Visual repairables: Analysing the work of repair in human–computer interaction. *Visual Communication*, *8*(1), 65–90. https://doi.org/10.1177/1470357208099148

Gupta, N., Martin, D., Hanrahan, B. V., & O'Neill, J. (2014). *Turk-Life in India*. 1–11. https://doi.org/10.1145/2660398.2660403

Haddington, P., & Keisanen, T. (2009). Location, mobility and the body as resources in selecting a route. *Journal of Pragmatics*, *41*(10), 1938–1961. https://doi.org/10.1016/j.pragma.2008.09.018

Haddington, P., Keisanen, T., Mondada, L., & Nevile, M. (2014). *Multiactivity in Social Interaction: Beyond multitasking*. John Benjamins Publishing Company.

Hamill, L., & Lasen, A. (Eds.). (2005). *Mobile world: Past, present, and future*. Springer.

Harper, R. (2015). Explorations in the Grammar of "Being in Touch": From Locke to Winch, from SMS to Skype. In J. Floyd & J. E. Katz (Eds.), *Philosophy of Emerging Media* (pp. 349–360). Oxford University Press. https://doi.org/10.1093/acprof:oso/9780190260743.003.0022

Harper, R., Hughes, J., & Shapiro, D. (1989). Working in harmony: An examination of computer technology in air traffic control. *E-CSCW '89*, 73–86.

Hauser, C. J. (2019, December 7). 'This is small talk purgatory': What Tinder taught me about love. *The Guardian*. https://www.theguardian.com/lifeandstyle/2019/dec/07/small-talk-purgatory-what-tinder-taught-me-about-love

Heath, C., Svensson, M. S., Hindmarsh, J., Luff, P., & Vom Lehn, D. (2002). Configuring awareness. *Computer Supported Cooperative Work (CSCW)*, *11*(3), 317–347.

Heath, Christian, Hindmarsh, J., & Luff, P. (2010). *Video in Qualitative Research*. SAGE Publications Ltd.

Heath, Christian, Knoblauch, H., & Luff, P. (2000). Technology and social interaction: The emergence of 'workplace studies'. *The British Journal of Sociology*, *51*(2), 299–320. https://doi.org/10.1111/j.1468-4446.2000.00299.x

Heath, Christian, & Luff, P. (1992). Collaboration and controlCrisis management and multimedia technology in London Underground Line Control Rooms. *Computer Supported Cooperative Work (CSCW)*, *1*(1–2), 69–94.

Heath, Christian, & Luff, P. (2000). *Technology in Action*. Cambridge University Press.

Henze, N., Rukzio, E., & Boll, S. (2011). 100,000,000 taps: Analysis and improvement of touch performance in the large. *Proceedings of the 13th International Conference on Human Computer Interaction with Mobile Devices and Services*, 133–142. http://dl.acm.org/citation.cfm?id=2037395

Heritage, J. (1984). A Change-of-State Token and Aspects of its Sequential Placement. *In J. Maxwell Atkinson and John Heritage (Eds.), Structures of Social Action*.

Heritage, J. (1988). *Explanations as Accounts: A Conversation Analytic Perspective*.

Heritage, J. (1991). *Garfinkel and Ethnomethodology* (1 edition). Polity.

Heritage, J. (1998). Oh-prefaced responses to inquiry. *Language in Society*, *27*(03), 291–334.

Heritage, J. (2012). The Epistemic Engine: Sequence Organization and Territories of Knowledge. *Research on Language & Social Interaction*, *45*(1), 30–52. https://doi.org/10.1080/08351813.2012.646685

Hewett, T. T., Baecker, R., Card, S., Carey, T., Gasen, J., Mantei, M., Perlman, G., Strong, G., & Verplank, W. (1992). *ACM SIGCHI Curricula for Human-Computer Interaction*. ACM.

Hindmarsh, J., Fraser, M., Heath, C., Benford, S., & Greenhalgh, C. (2000). Object-focused interaction in collaborative virtual environments. *ACM Transactions on Computer-Human Interaction*, *7*(4), 477–509. https://doi.org/10.1145/365058.365088

Hindmarsh, J., Heath, C., vom Lehn, D., & Cleverly, J. (2002). *Creating assemblies: Aboard the Ghost Ship*. 156–165. https://doi.org/10.1145/587078.587101

Holt, E., & Clift, R. (2006). *Reporting Talk: Reported Speech in Interaction*. Cambridge University Press. https://doi.org/10.1017/CBO9780511486654

Horst, H. A., & Miller, D. (Eds.). (2012). *Digital anthropology* (English ed). Berg.

Hosking, S. G., Young, K. L., & Regan, M. A. (2009). The effects of text messaging on young drivers. *Human Factors*, *51*(4), 582–592. https://doi.org/10.1177/0018720809341575

Höst, A. (2019, August 30). *Cell phone sales worldwide 2007-2018*. Statista. https://www.statista.com/statistics/263437/global-smartphone-sales-to-end-users-since-2007/

Hsieh, S. H., & Tseng, T. H. (2017). Playfulness in mobile instant messaging. *Computers in Human Behavior*, *69*(C), 405–414. https://doi.org/10.1016/j.chb.2016.12.052

Hughes, J. A., Randall, D., & Shapiro, D. (1992). Faltering from Ethnography to Design. *Proceedings of the 1992 ACM Conference on Computer-Supported Cooperative Work*, 115–122. https://doi.org/10.1145/143457.143469

Hurdley, R. (2006). Dismantling Mantelpieces: Narrating Identities and Materializing Culture in the Home. *Sociology*, *40*(4), 717–733. https://doi.org/10.1177/0038038506065157

Hutchby, I. (2001). Technologies, Texts and Affordances. *Sociology*, *35*(2), 441–456. https://doi.org/10.1017/S0038038501000219

Hutchby, I., & Tanna, V. (2008). Aspects of sequential organization in text message exchange. *Discourse & Communication*, *2*(2), 143–164. https://doi.org/10.1177/1750481307088481

Hyland, K. (2005). *Metadiscourse: Exploring Interaction in Writing*. Bloomsbury Publishing.

Ingwersen, P., & Järvelin, K. (2005). *The Turn: Integration of Information Seeking and Retrieval in Context*. Springer Science & Business Media.

Inkpen, A. C., & Tsang, E. W. K. (2005). Social Capital, Networks, and Knowledge Transfer. *Academy of Management Review*, *30*(1), 146–165. https://doi.org/10.5465/amr.2005.15281445

Jameson, F. (1976). On Goffman's Frame Analysis. *Theory and Society*, *3*(1), 119–133. JSTOR.

Jefferson, G. (2004). *Glossary of transcripts symbols with an introduction. U (Ed. Lerner, GH) Conversation Analysis: Studies from the first generation*. Amsterdam: John Benjamins Publishing Company.

Jefferson, Gail (Ed.). (1989). *Harvey Sacks—Lectures 1964-1965*. Springer.

Jefferson, Gail, Drew, P., Heritage, J., Lerner, G., & Pomerantz, A. (2015). *Talking about Troubles in Conversation: Talking about Troubles in Conversation*. Oxford University Press, Incorporated. http://ebookcentral.proquest.com/lib/sub/detail.action?docID=1980788

Jefferson, Gail, Sacks, H., Schegloff, E. A., Jefferson, G., Sacks, H., & Schegloff, E. A. (1987). *Notes on Laughter in the Pursuit of Intimacy*. 152–205.

Jiang, B., & Yao, X. (2006). Location-based services and GIS in perspective. *Computers, Environment and Urban Systems*, *30*(6), 712–725. https://doi.org/10.1016/j.compenvurbsys.2006.02.003

Jin, J., & Dabbish, L. A. (2009). Self-interruption on the Computer: A Typology of Discretionary Task Interleaving. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, 1799–1808. https://doi.org/10.1145/1518701.1518979

Johnston, M. J., King, D., Arora, S., Behar, N., Athanasiou, T., Sevdalis, N., & Darzi, A. (2015). Smartphones let surgeons know WhatsApp: An analysis of communication in emergency surgical teams. *The American Journal of Surgery*, *209*(1), 45–51. https://doi.org/10.1016/j.amjsurg.2014.08.030

Kamvar, M., & Baluja, S. (2006). A large scale study of wireless search behavior: Google mobile search. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, 701–709. http://dl.acm.org/citation.cfm?id=1124877

Kamvar, Maryam, Kellar, M., Patel, R., & Xu, Y. (2009). Computers and Iphones and Mobile Phones, Oh My!: A Logs-based Comparison of Search Users on Different Devices. *Proceedings of the 18th International Conference on World Wide Web*, 801–810. https://doi.org/10.1145/1526709.1526817

Katz, J. E., & Aakhus, M. (2002a). *Perpetual contact: Mobile communication, private talk, public performance*. Cambridge University Press.

Katz, J. E., & Aakhus, M. (2002b). *Perpetual Contact: Mobile Communication, Private Talk, Public Performance*. Cambridge University Press.

Khanna, V., Sambandam, S. N., Gul, A., & Mounasamy, V. (2015). "WhatsApp"ening in orthopedic care: A concise report from a 300-bedded tertiary care teaching center.

European Journal of Orthopaedic Surgery & Traumatology, *25*(5), 821–826. https://doi.org/10.1007/s00590-015-1600-y

Kuhlthau, C. C. (1991). Inside the search process: Information seeking from the user's perspective. *Journal of the American Society for Information Science*, *42*(5), 361–371. https://doi.org/10.1002/(SICI)1097-4571(199106)42:5<361::AID-ASI6>3.0.CO;2-#

Kuss, D. J., van Rooij, A. J., Shorter, G. W., Griffiths, M. D., & van de Mheen, D. (2013). Internet addiction in adolescents: Prevalence and risk factors. *Computers in Human Behavior*, *29*(5), 1987–1996. https://doi.org/10.1016/j.chb.2013.04.002

Labov, W. (1972). *Sociolinguistic Patterns*. University of Pennsylvania Press.

Lagerkvist, A., & Andersson, Y. (2017). The grand interruption: Death online and mediated lifelines of shared vulnerability. *Feminist Media Studies*, *17*(4), 550–564. https://doi.org/10.1080/14680777.2017.1326554

Lampinen, A., McGregor, M., Comber, R., & Brown, B. (2018). Member-Owned Alternatives: Exploring Participatory Forms of Organising with Cooperatives. *Proc. ACM Hum.-Comput. Interact.*, *2*, 100:1–100:19. https://doi.org/10.1145/3274369

Lanerolle, I. de, Walton, M., & Schoon, A. (2017). *Izolo: Mobile diaries of the less connected*. https://www.academia.edu/35248677/Izolo_mobile_diaries_of_the_less_connected

Laurier, E., & Brown, B. (2008). Rotating maps and readers: Praxiological aspects of alignment and orientation. *Transactions of the Institute of British Geographers*, *33*(2), 201–216. https://doi.org/10.1111/j.1475-5661.2008.00300.x

Laurier, E., Brown, B., & McGregor, M. (2016). Mediated Pedestrian Mobility: Walking and the Map App. *Mobilities*, *11*(1), 117–134. https://doi.org/10.1080/17450101.2015.1099900

Laurier, E., & Philo, C. (2002). *Natural Problems of Naturalistic Video Data*. 11.

Laver, J. (1975). Communicative functions of phatic communion. In A. Kendon, R. M. Harris, & M. R. Key (Eds.), *Organization of Behavior in Face-to-face Interaction*. Walter de Gruyter.

Licoppe, C. (2004). 'Connected' Presence: The Emergence of a New Repertoire for Managing Social Relationships in a Changing Communication Technoscape. *Environment and Planning D: Society and Space*, *22*(1), 135–156. https://doi.org/10.1068/d323t

Licoppe, C. (2017). Skype appearances, multiple greetings and 'coucou': The sequential organization of video-mediated conversation openings. *Pragmatics*, *27*(3), 351–386. https://doi.org/10.1075/prag.27.3.03lic

Licoppe, C., & Figeac, J. (2013). Patterns of Gaze Switching in the" Naturally-Occurring" Uses of Smartphones in Urban Mobile Settings. *Dept. of Economics and Social Sciences TELECOM ParisTech*. http://www.i-3.fr/wp-content/uploads/2013/06/WP-13-TS-01.pdf

Licoppe, C., & Figeac, J. (2015). *Direct video observation of the uses of smartphone on the move. Reconceptualizing mobile multi-activity*. https://halshs.archives-ouvertes.fr/halshs-01121703

Licoppe, C., Rivière, C. A., & Morel, J. (2015). Grindr casual hook-ups as interactional achievements. *New Media & Society*, 1461444815589702. https://doi.org/10.1177/1461444815589702

Ling, R. (2004). *The Mobile Connection: The Cell Phone's Impact on Society*. Elsevier.

Ling, R. (2008). *New tech, new ties: How mobile communication is reshaping social cohesion*. MIT Press. https://doi.org/10.7551/mitpress/7568.001.0001

Ling, R. (2010). *New Tech, New Ties: How Mobile Communication Is Reshaping Social Cohesion*. MIT Press.

Ling, R. S., & Pedersen, P. E. (Eds.). (2005). *Mobile communications: Re-negotiation of the social sphere*. Springer.

Ling, R., & Yttri, B. (1999). *"Nobody sits at home and waits for the telephone to ring:" Micro and hyper-coordination through the use of the mobile telephone*. 28.

Livingstone, S. (2006). Children's Privacy Online. In *Computers, Phones, and the Internet: Domesticating Information Technology* (pp. 128–143). Oxford University Press.

Livingstone, S. (2008). Taking risky opportunities in youthful content creation: Teenagers' use of social networking sites for intimacy, privacy and self-expression. *New Media & Society*, *10*(3), 393–411. https://doi.org/10.1177/1461444808089415

Livingstone, S. (2018). iGen: Why today's super-connected kids are growing up less rebellious, more tolerant, less happy – and completely unprepared for adulthood. *Journal of Children and Media*, *12*(1), 118–123. https://doi.org/10.1080/17482798.2017.1417091

Livingstone, S., & Bober, M. (2005). *UK Children Go Online: Final report of key project findings* [Monograph]. http://www.children-go-online.net

Livingstone, S., Haddon, L., Görzig, A., & Ólafsson, K. (2012). *The perspective of European children*. 171.

Lofland, J., Snow, D. A., Anderson, L., & Lofland, L. H. (1995). *Analyzing Social Settings: A Guide to Qualitative Observation and Analysis* (4th ed.). Wadsworth Publishing.

Lorch, R. F., Lorch, E. P., & Klusewitz, M. A. (1993). College students' conditional knowledge about reading. *Journal of Educational Psychology*, *85*(2), 239–252. https://doi.org/10.1037/0022-0663.85.2.239

Luff, P., & Heath, C. (1998). *Mobility in collaboration*. 305–314. https://doi.org/10.1145/289444.289505

Lunzer, E., & Gardner, K. (1979). *The Effective Use of Reading*. Heinemann Educational Books Limited, 22 Bedford Square, London WC1B 3HH, England (8.

MacEachren, A. M. (1995). *How Maps Work: Representation, Visualization, and Design*. Guilford Press.

Marchionini, G. (1997). *Information Seeking in Electronic Environments*. Cambridge University Press.

Marcus, G. E. (1995). Ethnography in/of the World System: The Emergence of Multi-Sited Ethnography. *Annual Review of Anthropology*, *24*(1), 95–117. https://doi.org/10.1146/annurev.an.24.100195.000523

Marcus, G. E., & Saka, E. (2006). Assemblage. *Theory, Culture & Society*, *23*(2–3), 101–106. https://doi.org/10.1177/0263276406062573

Mcgregor, M., Brown, B., & Glöss, M. (2015). Disrupting the cab: Uber, ridesharing and the taxi industry. *Journal of Peer Production*, *6*. http://urn.kb.se/resolve?urn=urn:nbn:se:su:diva-125139

McIlvenny, P., Broth, M., & Haddington, P. (2009). Communicating place, space and mobility. *Journal of Pragmatics*, *41*(10), 1879–1886. https://doi.org/10.1016/j.pragma.2008.09.014

Mead, M. (1928). *Coming of age in Samoa: A psychological study of primitive youth for western civilisation* (1st Perennial Classics ed). Perennial Classics.

Meyer, J. C. (2000). Humor as a Double-Edged Sword: Four Functions of Humor in Communication. *Communication Theory*, *10*(3), 310–331. https://doi.org/10.1111/j.1468-2885.2000.tb00194.x

Mondada, L. (2008). Using Video for a Sequential and Multimodal Analysis of Social Interaction: Videotaping Institutional Telephone Calls. *Forum: Qualitative Social Research*, *9*(3). https://doi.org/10.17169/fqs-9.3.1161

Mondada, L. (2011). *The organization of concurrent courses of action in surgical demonstrations*. https://halshs.archives-ouvertes.fr/halshs-00375993

Mondada, L. (2012). Talking and driving: Multiactivity in the car. *Semiotica*, *2012*(191). https://doi.org/10.1515/sem-2012-0062

Mondada, L. (2013). Displaying, contesting and negotiating epistemic authority in social interaction: Descriptions and questions in guided visits. *Discourse Studies*, *15*(5), 597–626. https://doi.org/10.1177/1461445613501577

Mondada, L., & Svinhufvud, K. (2016). Writing-in-interaction. *Language & Dialogue*, *6*(1), 1–53. https://doi.org/10.1075/ld.6.1.01mon

Moore, R. J., Churchill, E. F., & Kantamneni, R. G. P. (2011). Three sequential positions of query repair in interactions with internet search engines. *Proceedings of the ACM 2011 Conference on Computer Supported Cooperative Work*, 415–424. http://dl.acm.org/citation.cfm?id=1958889

O'Brien, J., Rodden, T., Rouncefield, M., & Hughes, J. (1999). At Home with the Technology: An Ethnographic Study of a Set-top-box Trial. *ACM Trans. Comput.-Hum. Interact.*, *6*(3), 282–308. https://doi.org/10.1145/329693.329698

Odom, W., Wakkary, R., Lim, Y., Desjardins, A., Hengeveld, B., & Banks, R. (2016). From Research Prototype to Research Product. *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems - CHI '16*, 2549–2561. https://doi.org/10.1145/2858036.2858447

O'Hara, K. P., Massimi, M., Harper, R., Rubens, S., & Morris, J. (2014). Everyday Dwelling with WhatsApp. *Proceedings of the 17th ACM Conference on Computer Supported Cooperative Work & Social Computing*, 1131–1143. https://doi.org/10.1145/2531602.2531679

O'Hara, K., & Sellen, A. (1997). A comparison of reading paper and on-line documents. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems - CHI '97*, 335–342. https://doi.org/10.1145/258549.258787

O'Neill, J., & Martin, D. (2003). Text Chat in Action. *Proceedings of the 2003 International ACM SIGGROUP Conference on Supporting Group Work*, 40–49. https://doi.org/10.1145/958160.958167

Orlikowski, W. J. (1992). The Duality of Technology: Rethinking the Concept of Technology in Organizations. *Organization Science*, *3*(3), 398–427. https://doi.org/10.1287/orsc.3.3.398

Orlikowski, W. J. (2000). Using Technology and Constituting Structures: A Practice Lens for Studying Technology in Organizations. *Organization Science*, *11*(4), 404–428. https://doi.org/10.1287/orsc.11.4.404.14600

Orlikowski, W. J. (2007). Sociomaterial Practices: Exploring Technology at Work. *Organization Studies*, *28*(9), 1435–1448. https://doi.org/10.1177/0170840607081138

Orlikowski, W. J. (2008). Using Technology and Constituting Structures: A Practice Lens for Studying Technology in Organizations. In *Resources, Co-Evolution and Artifacts* (pp. 255–305). Springer London. https://doi.org/10.1007/978-1-84628-901-9_10

Oulasvirta, A., Rattenbury, T., Ma, L., & Raita, E. (2012). Habits Make Smartphone Use More Pervasive. *Personal Ubiquitous Comput.*, *16*(1), 105–114. https://doi.org/10.1007/s00779-011-0412-2

Pargman, D., & Jakobsson, P. (2008). Do you believe in magic? Computer games in everyday life. *European Journal of Cultural Studies*, *11*(2), 225–244. https://doi.org/10.1177/1367549407088335

Pettersson, M., Randall, D., & Helgeson, B. (2004). Ambiguities, Awareness and Economy: A Study of Emergency Service Work. *Computer Supported Cooperative Work (CSCW)*, *13*(2), 125–154. https://doi.org/10.1023/B:COSU.0000045707.37815.d1

Pew Research Center. (2015, August 26). Americans' Views on Cellphone Use in Social Settings. *Pew Research Center: Internet, Science & Tech*. https://www.pewresearch.org/internet/2015/08/26/chapter-4-phone-use-in-social-gatherings/

Pirolli, P. (2007). *Information Foraging Theory:Adaptive Interaction with Information*. Oxford University Press, USA.

Pomerantz, A., & Fehr, B. J. (1997). Conversation analysis: An approach to the study of social action as sense making practices. *Discourse as Social Interaction*, *2*, 64–91.

Pred, A. (1984). Place as Historically Contingent Process: Structuration and the Time-Geography of Becoming Places. *Annals of the Association of American Geographers*, *74*(2), 279–297. https://doi.org/10.1111/j.1467-8306.1984.tb01453.x

Prior, P., & Thorne, S. L. (2014). 3 Research paradigms: Beyond product, process, and social activity. In E.-M. Jakobs & D. Perrin (Eds.), *Handbook of Writing and Text Production*. DE GRUYTER. https://doi.org/10.1515/9783110220674.31

Psathas, G. (1994). *Conversation Analysis: The Study of Talk-in-Interaction* (1 edition). SAGE Publications, Inc.

Qiu, J. L., Cartier, C., & Castells, M. (2009). *Working-Class Network Society: Communication Technology and the Information Have-Less in Urban China* (W. J. Drake & E. J. W. III, Eds.). The MIT Press.

Quan-Haase, A., Cothrel, J., & Wellman, B. (2005). Instant Messaging for Collaboration: A Case Study of a High-Tech Firm. *Journal of Computer-Mediated Communication*, *10*(4). https://doi.org/10.1111/j.1083-6101.2005.tb00276.x

Raval, N., & Dourish, P. (2016). Standing Out from the Crowd: Emotional Labor, Body Labor, and Temporal Labor in Ridesharing. *Proceedings of the 19th ACM Conference*

on Computer-Supported Cooperative Work & Social Computing, 97–107. https://doi.org/10.1145/2818048.2820026

Rawls, A. W. (2008). Harold Garfinkel, Ethnomethodology and Workplace Studies. *Organization Studies*, *29*(5), 701–732. https://doi.org/10.1177/0170840608088768

Rawls, A. W. (2011b). Wittgenstein, Durkheim, Garfinkel and Winch: Constitutive Orders of Sensemaking. *Journal for the Theory of Social Behaviour*, *41*(4), 396–418. https://doi.org/10.1111/j.1468-5914.2011.00471.x

Rawls, A. W. (2011c). Garfinkel, Ethnomethodology and the Defining Questions of Pragmatism. *Qualitative Sociology*, *34*(1), 277–282. https://doi.org/10.1007/s11133-010-9185-6

Reeves, S., & Brown, B. (2016). *Embeddedness and sequentiality in social media*. 1050–1062. https://doi.org/10.1145/2818048.2820008

Riffe, D., Lacy, S., Watson, B. R., & Fico, F. (2019). *Analyzing Media Messages: Using Quantitative Content Analysis in Research* (4th ed.). Routledge. https://doi.org/10.4324/9780429464287

Riggins, S. H. (1990). *Beyond Goffman: Studies on communication, institution, and social interaction*. Mouton de Gruyter. http://site.ebrary.com/id/10599214

Roberts, J. A., & David, M. E. (2017). Put down your phone and listen to me: How boss phubbing undermines the psychological conditions necessary for employee engagement. *Computers in Human Behavior*, *75*, 206–217. https://doi.org/10.1016/j.chb.2017.05.021

Rodden, T., Rogers, Y., Halloran, J., & Taylor, I. (2003). Designing Novel Interactional Workspaces to Support Face to Face Consultations. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, 57–64. https://doi.org/10.1145/642611.642623

Rooksby, J. (2013). Wild in the Laboratory: A Discussion of Plans and Situated Actions. *ACM Trans. Comput.-Hum. Interact.*, *20*(3), 19:1–19:17. https://doi.org/10.1145/2491500.2491507

Sacks, H. (1973). On some puns with some intimations. In *Sociolinguistics: Current Trends and Prospects*. Georgetown University Press. https://repository.library.georgetown.edu/bitstream/handle/10822/555465/GURT_1972.pdf

Sacks, H. (1989). An Analysis of the Course of a Joke's Telling in Conversation. In R. Bauman & J. Sherzer (Eds.), *Explorations in the Ethnography of Speaking* (2nd ed., pp. 337–353). Cambridge University Press. https://doi.org/10.1017/CBO9780511611810.022

Sacks, H. (1995). *Lectures on Conversation, Volumes I and II* (Gail Jefferson & E. A. Schegloff, Eds.). Wiley-Blackwell.

Sacks, H., Schegloff, E. A., & Jefferson, G. (1974). A Simplest Systematics for the Organization of Turn-Taking for Conversation. *Language*, *50*(4), 696. https://doi.org/10.2307/412243

Salo, M., & Frank, L. (2017). User behaviours after critical mobile application incidents: The relationship with situational context: User behaviours after critical mobile application incidents. *Information Systems Journal*, *27*(1), 5–30. https://doi.org/10.1111/isj.12081

Saracevic, T. (1997). The Stratified Model of Information Retrieval Interaction: Extension and Applications. *Proceedings of the ASIS Annual Meeting*, *34*, 313–327.

Sas, C., Whittaker, S., Dow, S., Forlizzi, J., & Zimmerman, J. (2014). Generating implications for design through design research. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, 1971–1980. https://doi.org/10.1145/2556288.2557357

Schalkwyk, J., Beeferman, D., Beaufays, F., Byrne, B., Chelba, C., Cohen, M., Kamvar, M., & Strope, B. (2010). "Your Word is my Command": Google Search by Voice: A Case Study. In *Advances in Speech Recognition* (pp. 61–90). Springer. http://link.springer.com/chapter/10.1007/978-1-4419-5951-5_4

Schedl, M., Gómez, E., & Urbano, J. (2014). Music Information Retrieval: Recent Developments and Applications. *Foundations and Trends® in Information Retrieval*, *8*(2–3), 127–261. https://doi.org/10.1561/1500000042

Schegloff, E. A. (1979). *The Relevance of Repair to Syntax-for-Conversation*. 27.

Schegloff, E. A. (1986). The Routine as Achievement. *Human Studies*, *9*(2/3), 111–151. JSTOR.

Schegloff, E. A. (2007). *Sequence Organization in Interaction: Volume 1: A Primer in Conversation Analysis* (1 edition). Cambridge University Press.

Schüll, N. D. (2014). *Addiction by Design: Machine Gambling in Las Vegas*. Princeton University Press.

Sciuto, A., Saini, A., Forlizzi, J., & Hong, J. I. (2018). 'Hey Alexa, What's Up?': A Mixed-Methods Studies of In-Home Conversational Agent Usage. *Proceedings of the 2018 on Designing Interactive Systems Conference 2018 - DIS '18*, 857–868. https://doi.org/10.1145/3196709.3196772

Segerstad, Y. H. af, & Weilenmann, A. (2013). Methodological Challenges for Studying Cross-Platform Conversations. *AoIR Selected Papers of Internet Research*, *3*(0). https://firstmonday.org/ojs/index.php/spir/article/view/8729

Sellen, A., Eardley, R., Izadi, S., & Harper, R. (2006). The Whereabouts Clock: Early Testing of a Situated Awareness Device. *CHI '06 Extended Abstracts on Human Factors in Computing Systems*, 1307–1312. https://doi.org/10.1145/1125451.1125694

Sheller, M., & Urry, J. (2006). The New Mobilities Paradigm. *Environment and Planning A: Economy and Space*, *38*(2), 207–226. https://doi.org/10.1068/a37268

Sidnell, J., & Stivers, T. (2013). *The handbook of conversation analysis*.

Silverman, D. (2007). *A Very Short, Fairly Interesting and Reasonably Cheap Book about Qualitative Research*. SAGE.

Simmel, G. (1950). *The Sociology of Georg Simmel*. Simon and Schuster.

Slade, G. (2012). *The big disconnect: The story of technology and loneliness*. Prometheus Books.

Smith, M., Cadiz, J. J., & Burkhalter, B. (2000). Conversation trees and threaded chats. *Proceedings of the 2000 ACM Conference on Computer Supported Cooperative Work - CSCW '00*, 97–105. https://doi.org/10.1145/358916.358980

Snyder, C. (2003). *Paper prototyping: The fast and easy way to design and refine user interfaces*. Morgan Kaufmann Pub.

Spinney, J. (2011). A Chance to Catch a Breath: Using Mobile Video Ethnography in Cycling Research. *Mobilities*, *6*(2), 161–182. https://doi.org/10.1080/17450101.2011.552771

Srinivasan, J., & Burrell, J. (2015). *On the Importance of Price Information to Fishers and to Economists: Revisiting Mobile Phone Use Among Fishers in Kerala*.

Srivastava, L. (2005). Mobile phones and the evolution of social behaviour. *Behaviour & Information Technology*, *24*(2), 111–129. https://doi.org/10.1080/01449290512331321910

Suchman, L. (1987). *Plans and Situated Actions: The Problem of Human-Machine Communication*. Cambridge University Press.

Suchman, L. (1997). Centers of Coordination: A Case and Some Themes. In L. B. Resnick, R. Säljö, C. Pontecorvo, & B. Burge (Eds.), *Discourse, Tools and Reasoning: Essays on Situated Cognition* (pp. 41–62). Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-662-03362-3_3

Suchman, L., Blomberg, J., Orr, J. E., & Trigg, R. (1999). Reconstructing Technologies as Social Practice. *American Behavioral Scientist*, *43*(3), 392–408. https://doi.org/10.1177/00027649921955335

Sutcliffe, A. G., & Ennis, M. (1998). Towards a cognitive theory of information retrieval. *Interacting with Computers*, *10*, 321–351. https://doi.org/10.1016/S0953-5438(98)00013-7

Tagg, C. (2015). *Exploring Digital Communication: Language in Action*. Routledge.

Teevan, J., Karlson, A., Amini, S., Brush, A. J. B., & Krumm, J. (2011). *Understanding the importance of location, time, and people in mobile local search behavior*. 77. https://doi.org/10.1145/2037373.2037386

Terasaki, A. K. (2004). Pre-announcement sequences in conversation. In G. H. Lerner (Ed.), *Pragmatics & Beyond New Series* (Vol. 125, pp. 171–223). John Benjamins Publishing Company. https://doi.org/10.1075/pbns.125.11ter

The Economist. (2018). *EIU Inclusive Internet Index*. https://theinclusiveinternet.eiu.com/summary

Tindell, D. R., & Bohlander, R. W. (2012). The Use and Abuse of Cell Phones and Text Messaging in the Classroom: A Survey of College Students. *College Teaching*, *60*(1), 1–9. https://doi.org/10.1080/87567555.2011.604802

Tolmie, P., Crabtree, A., Rodden, T., & Benford, S. (2008). 'Are You Watching This Film or What?': Interruption and the Juggling of Cohorts. *Proceedings of the 2008 ACM Conference on Computer Supported Cooperative Work*, 257–266.

Tse, E., Shen, C., Greenberg, S., & Forlines, C. (2007). *How pairs interact over a multimodal digital table*. 215–218. https://doi.org/10.1145/1240624.1240659

Tsukas, C. K., & Knudsen, C. (Eds.). (2005). *The Oxford handbook of organization theory: Meta-theoretical perspectives*. Oxford Univ. Press.

Turkle, S. (2012). *Alone Together: Why We Expect More from Technology and Less from Each Other* (First Trade Paper Edition edition). Basic Books.

Twenge, J. M. (2017, September). Have Smartphones Destroyed a Generation? *The Atlantic*. https://www.theatlantic.com/magazine/archive/2017/09/has-the-smartphone-destroyed-a-generation/534198/

van Aart, C., Wielinga, B., & van Hage, W. R. (2010). Mobile Cultural Heritage Guide: Location-Aware Semantic Search. In P. Cimiano & H. S. Pinto (Eds.), *Knowledge Engineering and Management by the Masses* (pp. 257–271). Springer. https://doi.org/10.1007/978-3-642-16438-5_18

Van Damme, K., Courtois, C., Verbrugge, K., & De Marez, L. (2015). What's APPening to news? A mixed-method audience-centred study on mobile news consumption. *Mobile Media & Communication*, *3*(2), 196–213. https://doi.org/10.1177/2050157914557691

Vom Lehn, D., Heath, C., & Hindmarsh, J. (2001). Exhibiting Interaction: Conduct and Collaboration in Museums and Galleries. *Symbolic Interaction*, *24*(2), 189–216. https://doi.org/10.1525/si.2001.24.2.189

Wajcman, J., Bittman, M., & Brown, J. E. (2008). Families without Borders: Mobile Phones, Connectedness and Work-Home Divisions: *Sociology*. https://doi.org/10.1177/0038038508091620

Walkerdine, V. (2010). Communal Beingness and Affect: An Exploration of Trauma in an Ex-industrial Community. *Body & Society*, *16*(1), 91–116. https://doi.org/10.1177/1357034X09354127

Wasko, & Faraj. (2005). Why Should I Share? Examining Social Capital and Knowledge Contribution in Electronic Networks of Practice. *MIS Quarterly*, *29*(1), 35. https://doi.org/10.2307/25148667

Waterson, J. (2019, December 5). Uncovered: Reality of how smartphones turned election news into chaos. *The Guardian*. https://www.theguardian.com/politics/2019/dec/05/uncovered-reality-of-how-smartphones-turned-election-news-into-chaos

Weilenmann, A. H., & Leuchovius, P. (2004). 'I'M Waiting Where We Met Last Time': Exploring Everyday Positioning Practices to Inform Design. *Proceedings of the Third Nordic Conference on Human-Computer Interaction*, 33–42. https://doi.org/10.1145/1028014.1028019

Weilenmann, A., & Larsson, C. (2002). Local Use and Sharing of Mobile Phones. In B. Brown, N. Green, & R. Harper (Eds.), *Wireless World: Social and Interactional Aspects of the Mobile Age* (pp. 92–107). Springer London. https://doi.org/10.1007/978-1-4471-0665-4_7

Wellman, B. (2002). Little Boxes, Glocalization, and Networked Individualism. In M. Tanabe, P. van den Besselaar, & T. Ishida (Eds.), *Digital Cities II: Computational and Sociological Approaches* (pp. 10–25). Springer. https://doi.org/10.1007/3-540

Whittaker, S. (2011). Personal information management: From information consumption to curation. *Annual Review of Information Science and Technology*, *45*(1), 1–62. https://doi.org/10.1002/aris.2011.1440450108

Williams, T. (2001). *John Duns Scotus*. https://plato.stanford.edu/entries/duns-scotus/

Woolgar, S., & Grint, K. (1991). Computers and the Transformation of Social Analysis. *Science, Technology, & Human Values*, *16*(3), 368–378. https://doi.org/10.1177/016224399101600305

Woolgar, S., & Neyland, D. (2013). *Mundane Governance: Ontology and Accountability*. OUP Oxford.

Wyche, S. P., Smyth, T. N., Chetty, M., Aoki, P. M., & Grinter, R. E. (2010). Deliberate interactions: Characterizing technology use in Nairobi, Kenya. *Proceedings of the 28th International Conference on Human Factors in Computing Systems - CHI '10*, 2593. https://doi.org/10.1145/1753326.1753719

Zhao, S., & Elesh, D. (2008). COPRESENCE AS 'BEING WITH': Social contact in online public domains. *Information, Communication & Society*, *11*(4), 565–583.