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Alan Chamberlain
Andy Crabtree *Editors*

Into the Wild: Beyond the Design Research Lab

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About the Editors

Alan Chamberlain is a Senior Research Fellow in the Mixed Reality Laboratory at the University of Nottingham. He has published numerous papers on varied aspects of human–computer interaction. He has a long-standing interest in the development of computational systems in real-world settings (research in the wild). His research interests relate to real-world problems as articulated by various communities of practice and relate to human–computer interaction, ethnography, action research, participatory design, rural aspects of computing and user engagement in order to develop networks of people that are able to involve themselves in the practices of innovation and design.

Andy Crabtree is Professor in the School of Computer Science at The University of Nottingham. His research focuses on the relationship between computing systems and social interaction. He has made substantive contributions to models of innovation and systems development, design and evaluation methodology, distributed systems, network infrastructure and e-Science. His work has informed systems development across a range of application domains, including library services, customer services, interactive exhibitions, mixed reality games, home networks and applications, e-social science, tourism and leisure, culture and heritage.

Research 'In the Wild'

Alan Chamberlain and Andy Crabtree

Over recent years the term 'in the wild' has increasingly appeared in publications within the field of Human Computer Interaction (HCI). The phrase has become synonymous with a range of approaches that focus upon carrying out research-based studies reporting on user behaviour in 'natural', 'situated' contexts, as distinct to lab-based studies. The objective of this book is to bring together a range of perspectives from a variety of researchers who have carried out studies in the wild. By bringing these together we aim to explore and demonstrate how such studies can support research in different fields and domains. In doing this we wish to help the broader research community understand some of the issues, reasoning, methods and practical matters that are involved in doing research in the wild. This edited collection is part of an ongoing and developing debate, and as such provides both a backdrop and platform that will promote further discussions in this emerging area.

1 The Turn to the Wild

Early works in this area of an influential nature were based within the field of Anthropology and Cognition, with researchers attempting to unravel and evolve theories of practice and cognition, showing through their studies the situated, distributed, and emergent nature of cognition in the real world (see for example Suchman 1987; Lave 1988; Hutchings 1995). In many respects this research went against accepted notions of the time and reshaped fundamental understandings of cognition and human practice and how it might impact the design and use of digital technologies. 'In the wild' studies are now routinely carried out to understand the everyday uses of emerg-

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ing technologies and shape the design of systems and applications to better fit the situations in which they are deployed and used.

Early HCI focused on the interface between the user and machine and design of the 'software control dialogue' (Grudin 1990). HCI researchers began to recognise, however, that digital technologies are ecologically situated, which necessitated an appreciation of wider socio-technical issues. Of particular note is the 'turn to the social' that occurred during the late 1980s and early 1990s and the development of CSCW (Computer Supported Cooperative Work), which prompted designers to look beyond the computer interface to the socially embedded nature of systems beyond the lab, as researchers have done more recently when comparing lab-based and 'in the wild' studies (Rogers et al. 2013). As Grudin (1990) wrote, "the location of the 'user interface' has been pushed farther and farther out from the computer itself, deeper into the user … environment." The need to understand and appreciate the socially embedded nature of technology required that researchers go out 'into the wild'. With the development of technologies that are mobile, ubiquitous and embedded in mundane objects or 'things' (the so-called Internet of Things) it becomes increasingly important to understand technology at an ecological rather than at a species level, which cannot be accomplished in a sterile lab-based setting.

It might be said then that a fundamental concern with ecological validity motivates the turn to the wild. The Glossary of HCI (Papantoniou et al. 2018) tells us that "*…ecological validity refers to an acknowledgment of the fact that human action is situated and highly contingent on contextual factors/variables. To obtain 'valid' results, humans should [therefore] be studied in the richness of their natural environment.*" This means that is important, if not imperative, to move out of the lab. It is only then that the real world, real time nature of human action and cognition can be apprehended, and systems be shaped around them. By taking technology out into the wild, we are better placed to understand the ecological factors that impact it and understand what needs to be done to make it fit into the settings in must inhabit.

An evolving body of 'in the wild' studies have emerged over recent years, for an introduction to this work (see Crabtree et al. 2013). In examining these studies, we start to see a marked difference between the situated use of technology in the real-world and its development, creation and use in research labs. This begs the question, is there more to research in the wild than merely studying technology that has already been developed in a lab, or do we need to leave the lab behind and start to appreciate the in situ nature of the setting where such technologies will be used as a premise for design? It's clear to see that lab-based studies may lead to situations where participants are over-controlled and that the activities and actions they are asked to engage in do not map onto, and are not reasoned about in the same ways, outside of such controlled environments. It is for reasons such as this that Davies (2005) argues that lab studies are not a substitute for deployment: "*it is impossible to understand ahead of time the impact of the environment on technology (or indeed, the impact of technology on the environment), and this is often critical to system design.*" Understanding the environment of use can engender better understanding of the context in which technology will actually be deployed and the heterogeneous factors at play in the real world beyond the laboratory doors.

This position is of course contestable and contested. Kjeldskov et al. (2004) launch a notable critique of research in the wild and beg question "is it worth the hassle?", for as Rogers et al. (2007) note carrying out research-in-the-wild is both labour intensive, financially expensive, and significant investment. We can already appreciate the difficulty of carrying out research in the wild, particularly in settings where groups and multiple actors are involved. As Grudin wrote nearly 30 years ago, "group processes are often variable and context-sensitive, and usually unfold over time and in different locations; organizational change that results from introducing technology may take even longer to observe; and generalizing from observation is difficult—each group's experience is governed by its constitution and the conditions under which technology is introduced (Grudin 1990)." Nonetheless, and as the articles in this book hopefully demonstrate, the returns on 'in the wild' research offer significant insights that offset its costs.

This is not to suggest that we abandon the lab and move entirely into the wild. The purpose of the research and the end-point of a project all have to be factored into the way that the research is carried out. Arguably developing technology to support paramedics responding to an emergency situation will inevitably need to go through multiple rounds of in the wild testing and evaluation based in different situations, whereas an educational game might require a different approach to understanding and evaluating its applied use. So, there may well be cases where lab-based studies are rightly prioritised over studies in the wild and vice versa, and research needs to consider this when developing its design approach. At root we need to ask, are carefully controlled experimental results required or do we need to explore and understand what the technology will look like in the wild? Ultimately, as the 'turn to the social' in HCI opened up a new vistas and research agendas, then turn to the wild further expands our field of vision and immerses design *in* the world.

2 Contributors and Contributions

This volume brings together a variety of perspectives on research in the wild. Without giving to much away, below we give the reader a flavour of the chapters that make up this work. We start in this chapter with Alan Dix's walk around Wales. In charting this Alan offers intriguing glimpses of the many issues that can affect research in the wild. Alan's is a journey of discovery that helps us to see what is involved in both doing a journey, understanding that journey, and bringing the understandings gained to bear on possible design solutions. As Alan puts it, "research in the wild is always methodologically challenging, dealing with unconstrained use, data collecting for the unexpected, creating transferable knowledge from particular incidents, and inevitably pushing the boundaries of professional objectivity."

Chapter "Step by Step Research", by Andy Crabtree, Peter Tolmie and Alan Chamberlain, provides a sociological orientation to the wild as an everyday and unremarkable place for those that inhabit it and the technologies situated within it. The authors make the case that the 'unremarkable' status of the everyday world is

consequential, as it means that the wild is a mundane place whose social features may easily be overlooked by design researchers. This chapter elaborates "a collection of in-the-wild approaches for conducting foundational research on socio-technical systems, moving the development of future systems out of the laboratory to engage directly with users at each turn in the development process."

Chapter ""Research in the Wild": Approaches to Understanding the Unremarkable as a Resource for Design", by Tomasso Columbino Jutta Willamowski and Antonietta Grasso takes a thought provoking look at what happens when organisations examine the approaches they use to carry out research and how research agendas are prioritised and controlled. Doing research in the wild and reflecting upon the roles and motivations of the actors involved allows the authors to uncover 'uncomfortable lessons' about corporate research. This chapter will be of particular interest to researchers that are interested in innovation in organisations and how research in the wild blurs the distinction between prototype and product, experiment and deployment.

Chapter "Deeper into the Wild: Technology Co-creation Across Corporate Boundaries", by Richard Harper, Siân Lindley, Richard Banks, Phil Gosset and Gavin Smyth questions the mechanisms that might be employed to carry out design research and the problematic nature of methodology. As Harper et al. emphasize, taking an enquiry-based approach can be difficult and can sometimes suffer from a lack of direction. Nonetheless, early stage research is key to design and development. In presenting and elaborating the evaluation of a new type of data store, the authors consider the role of researchers as early stage in the wild adopters and what this might mean for design. As the authors put it, "Our engagement with the technology is not, as it were, intended to let us figure out how to appropriate the technology; our research has entailed engaging with it so as to fathom our own imaginations made real through use of the technology."

Chapter "HCI in the Wild Mêlée of Office Life—Explorations in Breaching the PC Data Store" by Keith Cheverst Nick Taylor, and Trien Do moves the focus to a rural village in Lancashire. The authors address what is involved in doing community-based research and giving communities a voice in design. In an honest response to the fact that what is created and deployed can never respond to the needs of an entire community composed of people with differing needs and wants, Cheverst et al.'s work focuses upon the culture of the community and the ways in which that might be represented, shared and used by multiple stakeholders. As a final parting comment the chapter asks us to think about impact that research can have upon a community. This in itself is an ethical question that needs to be pondered upon.

Chapter "Supporting Shared Sense of History Within a Rural Village Community" by Jon Whittle, Maria Angela Ferrario and Will Simm also explores community-based research and picks up the ethical challenge. The authors explore egalitarian approaches to doing research in the wild that actively engage and involve people and share power. A particularly valuable part of the paper lies in the discussion of innovation and the concept of 'responsible innovation'. The interdisciplinary nature of research in the wild is also highlighted in a chapter that is not only timely, but key to developing research approaches in general.

Chapter "Community-University Research: A Warts and All Account" by Ewa Luger and Tom Rodden explores ethics as a constituent part of in the wild studies and examines the foundational nature of consent in research and design. Questions are asked about the nature and prediction of harm in 'in the wild' research and the consequences of carrying out research that may be taken out of the control of the researchers' hands. Luger and Rodden note, "new variables, such as third parties, can come into play creating a highly dynamic research environment that stymies the identification of right or wrong conduct through a host of unexpected temporal, social and other contextual factors". They ask, how do we design in situations where we might not know the actual context of the research? The notion of 'responsive consent' and the role of the 'participant as researcher' are considered in response.

Chapter "Ethics and Consent in the (Sociotechnical) Wild" by Nick Race, Dave Randall, Mark Rouncefield and Roger Slack explores the practical character of ethics and is food for thought. Using examples from their work the authors examine "relationship between researchers and subjects" and question amongst other matters notions of community and trust. Being able to gain insights based on real-world studies is valuable and this chapter serves to inform researchers both about the actual issues that occurred in specific 'in the wild' projects and to generalise findings in a palatable way that may enable the broader community to understand some of the difficulties of carrying out 'research in the wild" in diverse settings.

In Chapter "Practical Ethics", Peter Tolmie provides a thoughtful response to many issues relating to 'research in the wild' in a carefully constructed piece that makes the reader think about both the practicalities and the unpredictable nature of working in the wild. Tolmie writes, "I want to take this proposition seriously and examine what research orientations to 'the wild' actually look like and what the implications of those orientations might be." He crafts an intelligent argument based on a significant amount of literature in the field and his discussions throw the homogenous notion of 'in the wild' into sharp relief. We think that Peter's work is a perfect way to end this book.

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Step by Step Research

Alan Dix

1 Introduction

When the term 'research in the wild' is used, it may refer to studies of novel technology in a museum, observing shoppers in a mall, or deploying a mobile app to observe real large-scale use. The settings may be outdoors, but are most often urban. They are open and contingent, but still relatively controlled.

This chapter is about a three and half month, one-thousand-mile walk around Wales undertaken as a research journey. In some ways this is still relatively 'tame', there are no large game animals, although the sight of thirty bullocks charging down a field towards one is not un-alarming. However, it is a mode of enquiry that is physically challenging, sometimes painful, and not infrequently uncomfortable.

Research in the wild is always methodologically challenging, dealing with unconstrained use, data collecting for the unexpected, creating transferable knowledge from particular incidents, and inevitably pushing the boundaries of professional objectivity. The Wales walk stretches this envelope further.

Parts of this chapter will read like a 'war story'; the practical problems simply to keep things working at the time often overshadowed deeper research goals. However, these practical problems as much as the methodological ones define the nature of Research in the Wild.

The next section provides background to the Wales Coast Path and the reasons behind this walk. It also reviews a selection of relevant walking related literature and technology. This is followed by a description of the execution challenges, the physical and practical problems associated with walking as research. We then look at some of the research outcomes and outputs, and use these to illustrate deeper methodological challenges.

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2 Just Walking

2.1 The Wales Coast Path, Perimeter, and Perimeteers

In 2012 the Wales Coast Path was formally opened. While there were various existing paths around portions of the coast, the Wales Coast Path links these into a single, complete, way-marked route around the entire coast of Wales, 870 miles in total. This makes Wales the only country in the world to have a complete coastal path.

The path was conceived in 2006, largely to attract tourism following on from the success of the Pembrokeshire Coast Path (now over 40 years old), Anglesey Coast Path and Ceredigion Coast Path (at that point still under development).

There is also a long-distance footpath, running up the border between Wales and England, following the route of Offa's Dyke, the 9th Century earthwork that separated Mercia (the English Kingdom) and the Welsh. This runs north–south, coast to coast, and so, together with the Wales Coast Path, enables a complete circumnavigation of Wales by foot, approximately 1050 miles (1700 km).

The first such 'perimeteer' was Arry Beresford-Webb, who ran the entire distance in 39 days, a marathon distance each day; her extreme achievement was timed to finish in Cardiff on the day of the opening in May 2012. Since then and this time there have been a number of nonstop walks of the Coast including one en-masse walk "Walk on Wales" in aid of a military veterans charity (WCP 2014). There have been fewer complete perimeter walks (or runs!); at the time of writing just nine in addition to my own.

2.2 Why Walk?

The majority of the full coastal walks have been in aid of charity. However, my walk was always a multi-faceted one. The initial impetus was personal, an overriding sense when I heard of the opening of the Wales Coast Path, that I had to walk it. However this was quickly followed by a realisation of the research potential, both for my own research areas and also for others. The borders and coast cut through both the major urban areas of Wales and remote rural locations; it thus acts as a form of socio-economic transect of a modern nation.

One of the issues that I was expecting was problems in connectivity, as much of the time I would be in remote rural areas. As well as poor mobile connectivity, I knew fixed internet would also be problematic. During a preparatory visit to St. Davids, a major town (or strictly tiny city) in the Pembrokeshire peninsula, I visited a supermarket to buy food. The checkout tills had recently been replaced with ones that connected to the bank via the internet. However, the connection was down and so the cashier had to look out old paper-based credit-card payment machines. I have had an interest in the ways mobile applications cope with poor connectivity since the mid 1990s (Dix 1995) and so one goal of the walk was to understand how this and

other IT issues affected the walker as a tourist and the communities through which the path passes.

Another issue of interest was maps, the way local mapping emphasises different aspects, compared with 'standard maps', and often uses different perspectives such as oblique hills-eye views, or even fish-eye views portraying a town centre at higher scale than the periphery. The availability of online mapping, especially Google maps, has made it easy to add maps to web sites, but always standard God's eye maps, potentially threatening more locally focused and individual mapping. As Barbara Bender said:

> Post-Renaissance maps cover the surface of the world with an homogeneous Cartesian grip. (Bender 1996, p. 41)

As well as these and other personal technological, social and philosophical interests, I offered myself as a 'living lab', taking note of specific concerns and carrying equipment for other researchers.

An example of the former was the issue of 'off path destinations', that is towns and villages nearby, but just off the main path. The Wales Coast Path was created largely for its tourism potential, but how far does its benefit spread from the route of the path itself? While I walked I kept a lookout for where off-path destinations were, or more often were not, signed or otherwise apparent.

An example of the latter was the bio-sensing devices I carried (EDA and ECG). These came about due to a pre-walk talk at Nottingham where one of the attendees put me in touch with a researcher there who studies this kind of data.

2.3 Walking Technology

There are many research and commercial applications focused on the act of walking. The most obvious examples are mobile tourist guides, which date back many years (Cheverst et al. 2000). More recently this notion has been inverted by Hobbit (Posti et al. 2014), which deliberately highlights routes that are infrequently walked or away from other users; this reflects the idea that those walking in woods and other rural locations do so deliberately to seek solitude, again inverting the focus on social networking and hyper-connectivity.

Hobbit is also unusual in its rural focus; the majority of mobile application research has been targeted at urban areas, largely because this is where universities are situated. However, there is also an active industry in the production of devices (e.g. Garmin,[1] SPOT[2]) and mobile phone applications (e.g. ViewRanger[3]) that help navigate or

[1] http://www.garmin.com.

[2] http://www.findmespot.eu/en/.

[3] http://www.viewranger.com/.

capture experiences in the wild. While many are effectively standalone, others enable connections with social media and other information sources (e.g. Social Hiking[4]).

Similarly, there is a rapidly growing market in devices and applications to track and share sporting or health and fitness related activities. Some, such as Nike + FuelBand, can be used independently, but actively encourage sharing of activity data in order to encourage competition:

> Sync with your device, see your progress and compete against your friends. (Nike website, 31/7/2014, http://www.nike.com/gb/en_gb/c/nikeplus-fuelband)

However, detailed user studies have shown that, while social elements are appreciated, it is intrinsic motivation and individual goals, that are the main determinants of behaviour (Spillers and Asimakopoulos 2014).

The mobile-phone-based research application HeartLink takes this a stage further enabling a live two-way interaction (Curmi et al. 2013). HeartLink connects to a commercial chest-strap heart sensor and transmits live heart rate information to friends and supporters. In turn they can 'cheer' the wearer, which is conveyed by vibrating the phone.

2.4 Walking as Research

Within the humanities there has been a long history of using walking as a means of creative stimulus, notably Wordsworth walked not just outdoors, but continually paced his study whilst composing. The nature of walking and more widely the journey has also been both a topic in itself (Odyssey, Marco Polo) and also the thread that ties together otherwise disparate stories from Australian Aboriginal dream time to city ghost walks.

The relation between walking, paths, narrative and lifelines has been a topic of more philosophical inquiry, for example, the rich writings of Solnit (2001, 2006) or Ingold's focus on the importance of the line as opposed to the Cartesian privileging of the point (Ingold 2007). These philosophical strands connect to psychogeography, which uses walking extensively to understand the felt nature of environments (Coverley 2010). While psychogeography is predominantly urban-focused, there are some, such as the Macfarlane Wild Places trilogy, with a more rural and wilderness perspective (Macfarlane 2008, 2010, 2013).

At a more pragmatic level, field walking is an important part of archaeologists' practice allowing them to get a sense of the land, complementing information from remote sensing such as aerial photographs, and written records (Connolly 2007). In addition, being on the ground offers the potential to collect surface artefacts (for example, those revealed through ploughing), and also to get a feel for the potential of past human habitation, where they may have chosen to live, to farm, and not least, to walk.

[4] http://www.shareyouradventure.com/.

Within the socio-technical literature walking has been predominantly the object of study, rather than used as the means of study. For example, space syntax theorists have compared actual walking patterns with those predicted by their methods (Kostakos et al. 2010); ubicomp and mobile HCI researchers have used movement patterns as part of the design of context-sensitive user interfaces and services (Cheverst 2000; Pribeanu et al. 2001; Dix et al. 2000); walking may be an integral part of an activity being studied, as was the case with Bidwell et al.'s (2013) work with solar charging in rural Africa; and health and well-being researchers have combined environmental and bio-sensors into many mobile applications. In general when mobile interfaces, such as those discussed in the previous section, are designed to be used while walking, these are, quite reasonably, evaluated while walking, but where the walkers are test users not researchers.

The subjective nature of walking has also been the subject of various applications and studies. Several of the applications we have discussed (e.g. Hobbit and HeartLink), have this as a principal function. Other researchers have simply used the evocative nature of walking, particularly of a familiar area, as a research instrument, for example, Stanton Fraser et al. (2013) used mobile blogging (moblogging) in order to reveal perceptions of urban spaces while Bidwell and Browning (2006) used egocentric videos taken during walking to help elicit the 'sense of being in' a place at a local natural landmark in tropical Queensland, Australia.

Since my Wales walk, the volume of research within HCI focused on outdoor activity has increased markedly, including work on running (Curmi et al. 2013; Spillers and Asimakopoulos 2014) and walking (Posti et al. 2014; Eslambolchilar et al. 2016). The level of interest has been sufficient for a number of workshops and workshop series to emerge with slightly different foci including NatureCHI (Häkkilä et al. 2016), CHI Outdoors (Jones et al. 2017), UbiMount (Daiber et al. 2017) and Technology on the Trail (Virginia Tech 2017; McCrickard et al. 2018)

3 Execution Challenges

There are clearly challenges performing research in any context, from repetitive strain injury while typing an article, to obtaining sufficient participants when performing a laboratory experiment. Research in the wild has many of the same problems as desktop or lab-based research, but adds many more due to the uncontrolled nature of the physical environment and human interactions in it.

However, even 'Research in the Wild' often means simply studying the use of an innovative application in a museum foyer or mobile app in an urban street, and typically for relatively short periods. Three and half months walking in all weathers creates new challenges on top of those of more civilised research in the 'wild'.

3.1 Physical—Time, Pain and Damp

Walking one thousand miles is demanding physically on the body, not helped by the fact that I had not walked seriously since I was eighteen. Happily, I suffered no serious injuries, but did have a variety of musculoskeletal aches and pains, including some form of strain or tendonitis in one foot, which left it swollen for several weeks, and long term pain in both foot pads that took several months to clear up after the walk was over.

Despite the occasional encounter with a herd of charging bullocks or steep cliff-side paths, the coast of Wales is far less hazardous than, say, a trip to the International Space Station, but the level of discomfort and danger does pose some ethical problems. Self-experimentation has a long history especially in medicine (Gandevia 2005), but is still the subject of active ethical debate (Annas 2010; Cunningham 2004). More problematic is when the experimenter is a research student or employed research assistant. For example, Ellie Harmon a doctoral student at University of California, Irvine has walked the 2650 miles of the Pacific Crest Trail as part of her studies on 'dis-connection in its multiple forms'[5] and volcanology researchers, by the nature of the subject, spend time close to active volcano vents. Even if the subject fully understands the risks, what level of discomfort or risk is acceptable?

The process of walking also takes considerable time. This creates an opportunity cost: is the extensive time justified compared with, for example, spending three and half months writing, or three and half months creating experimental software? In many ways the time taken was an essential part of the method, this is effectively slow research, and the slow pace of walking means that I was forced to spend time going through parts of the coast (for example, the post-industrial towns of north east Wales) that I might otherwise have rushed past and so missed some of the insights described later in this chapter.

However, I also underestimated the time taken to walk the distance with consequent threats to some of the goals of the expedition, and also skipping rest and writing days, adding to the physical and psychological stresses.

Weather was also an issue, both in terms of physical discomfort, whether getting soaking wet or suffering sunburn, but also in its impact on equipment. Cameras suffered particularly as they cannot be sheltered completely, there are some gaps in the record where conditions were too bad, and two cameras were effectively worn-out during the trip. Other equipment had to be well protected, with heavy-duty waterproof bags, adding to carrying weight.

This is particularly an issue for bespoke equipment. For just over half the trip I carried a box designed by researchers at the dot.rural research centre in Aberdeen. This included a GPS, temperature sensor and GSM module to transmit data. This of course suffered from the general lack of mobile signal, limiting its utility, but in addition, the physical form posed problems. The box was light but was a comparatively bulky rectangular box, meaning it was hard to pack without a corner sticking through the rucksack into one's back. Furthermore, the on-off switch was a rocker,

[5] http://ellieharmon.com/.

so that after a day bouncing in the rucksack it would typically have been knocked off by the end of the day. Both these problems were solved by wrapping the box in light clothing, but ultimately the rechargeable battery stopped working, presumably the effect of continual movement, and the occasional jarring fall. Lab experiments typically involve static equipment in indoor conditions; designing equipment that can withstand long term use in adverse conditions is a non-trivial engineering challenge.

3.2 Personality—Waving Banners

In laboratory settings one takes considerable effort to ensure that the researcher's personal character does not affect the experiment. Qualitative research often involves face-to-face interviews, and so interpersonal skills are critical; however, even here the artificial situation creates a legitimacy to ask questions and a staged role as 'interviewer'.

Some 'in the wild' research is in this respect more like a laboratory experiment acting as external observer to normal behaviour or behaviour in the presence of intervention technology. However, the walk was not like that, by its nature the majority of contacts were accidental and often in semi-social situations, people met on the path, in bed and breakfast accommodation, cafes or pubs. The ability to collect data is therefore intimately tied to one's personal skills and character.

While I am reasonably good at talking with people, I (in common with many computer scientists!) find it very hard to initiate conversations. In order to help this I took leaflets and cards explaining the walk and also had a banner on the back of my rucksack. Between them, these helped establish a role as 'the Wales walker', which helped set the tone of conversations. Furthermore, the banner meant that people often approached me and asked questions.

This is an example of *personality prosthesis*. A lever, block and tackle, or fork-lift truck acts as a physical prosthesis allowing the operator to lift more than they could by muscle power alone. An electronic calculator, or address book similarly extends cognitive abilities acting as prostheses for mental arithmetic or memory. The banner in a corresponding way acted as a prosthesis allowing me to perform interpersonal tasks that I would have otherwise have found difficult or impossible.

3.3 Practical—Tending Technology … No Army of RAs

Although not entirely wired up, I was carrying a fair amount of digital technology: two phones (on different carriers to maximise connectivity), iPad, Garmin GPS, SPOT satellite emergency GPS, dot.rural data box, USB battery, digital camera, voice recorder, wrist-worn EDA, and ECG. Much of this needed charging each evening and often some sort of periodic download of data. A high-power four-output USB

charger made this simpler, but even simply charging this number of devices was a major task.

However, the downloading of data onto laptop (and making frequent backups) was more time consuming. Unfortunately, this is rarely a matter of simply plugging in and leaving devices, but typically involved a complex rota of tasks, some time critical. Some were easier: the camera would literally upload its photos to the laptop when plugged in, and copying text from iPad to laptop was relatively simple through iTunes.

Most complex was the ECG sensor, which connected onto a special reader device, which then connected to a laptop via USB. Unfortunately there were only device drivers for Windows 7 meaning a special laptop had to be carried especially for this task. Once on the Windows device it was transferred via USB stick to the main laptop (a Mac Air) where Dropbox would share it (when next WiFi connected). The software to read the device involved several stages of reading, saving and reinitialising, all of which took considerable time, and some of which would time out leaving the device in an inconsistent state if not watched continually.

In nights when I was staying at a bed-and-breakfast and having a taxi carry the bags of computers from place to place, all of this had, in addition, to be unpacked and packed each day.

All in all this simple housekeeping or 'tending technology' took at least an hour a day … before I could start the, on average, two hours of writing and reporting for the past day.

In addition to this daily or near daily housekeeping, there were periodic tasks, especially in the rare opportunities with efficient WiFi. For photographs, this included running processes to reduce their size, uploading them to Flick and moving the full-size versions onto a separate hard disk (19,000 photos are too large for a laptop disk). For blogging this involved copying and formatting the text, finding suitable photographs to illustrate the day and then updating status on Twitter and Facebook on both personal and 'alanwalkswales' accounts.

Normally, when research in the wild involves some form of novel technology or sensing technology, it is both for a short period and is heavily supported; often multiple research assistants hang over laptop screens for the entire duration of the study. If this had been a shorter expedition I would undoubtedly have one or more people to act as a support team; they would have taken over the mundane tasks leaving more time for writing and rest. When planning a more long-term and solo expedition it is easy to neglect the time and effort needed for basic digital housekeeping.

While this is a lesson for research in the wild, it is also a distillation of a more general issue with digital technology. Devices are often marketed in terms of their utility, and sometimes timesaving, whilst in use. However, installation and charging can take a disproportionate amount of time, not to mention a plethora of leads, and in ubiquitous computing charging has been a constant and unresolved problem. Yet, despite this, the topping and tailing of once-off installation and configuration, and on-going daily housekeeping are rarely included in scenarios of use.

4 Outputs and Outcomes

The aim of this chapter is to explore the methodological challenges of the walk, but in order to exemplify these some of the research outputs and outcomes are described here. In the next section these will be used to exemplify different methodological challenges raised by each.

4.1 Technology and Connectivity

One of the aims of the walk was to explore the technological needs of the walker and of the communities along the path. A key issue was expected to be levels of connectivity following from a long-term personal research interest in connectivity issues for mobile user interfaces dating back to the early 1990s (Dix 1995) and more generally time in the user interface dating back more than 25 years (Dix 1987, 1992; Dix et al. 1998).

One of the practical limitations to this exploration was that the levels of connectivity around the coast were far worse than had been expected, even after living on an island with minimal mobile connectivity. Typically the best mobile signal in a day was 2 bars of GSM, with 2G signal very rare, and 3G almost non-existent. While mobile reception maps appear to show relatively good coastal connectivity, this is primarily focused out to sea as yachts-folk are more affluent than those living in rural communities on the land—signal follows money.

The paucity of raw connectivity was exacerbated by poor software design. Prominent examples were Twitter mobile apps, which failed entirely in areas of even moderate reception despite being based on 140 character messages. The reasons for this appeared to be:

(i) Each 140 character Tweet is wrapped in about 4–7 K of XML in the API.
(ii) To reduce server load a single large request (typically 50 items) is made to populate the feed.
(iii) The interface is synchronous at initialisation loading the whole feed before allowing a status to be set.

These are a combination of poor software engineering and poor interface design. Together they mean that nearly a quarter of a megabyte has to be downloaded before it is possible to send a Tweet. Other apps had similar behaviour, with the exception of email, which was designed in the 1970s and hence has protocols designed for intermittent and low-bandwidth connectivity. These observations suggest a need for clear guidance and appropriate user interface architectures so that interaction degrades gracefully in areas of poor connectivity.

4.2 *Supporting Technology and Activity*

Although poor connectivity reduced app usage while walking, in fact there was considerable technology in use surrounding the act itself:

- Data collection technology recording the route taken (GPS) and biological measures (ECG and EDA)
- Technology carried while walking, for use in emergencies (phone on battery pack in the rucksack and 'SPOT' emergency SOS device)
- Technology used while stopped during a day's walk (iPad for writing)
- Technology used before the walk started (principally for planning transport and accommodation)
- Technology used in evenings or rest days, particularly when connectivity was available (more planning, blogging, uploading photos)
- Technology used after the walk (more blogging, sorting photos, reporting).

In many ways this reinforces the normal HCI and socio-technological design advice to take note of the big picture. However, it is easy to focus on technology during an act rather than the broader activity (see Fig. 1).

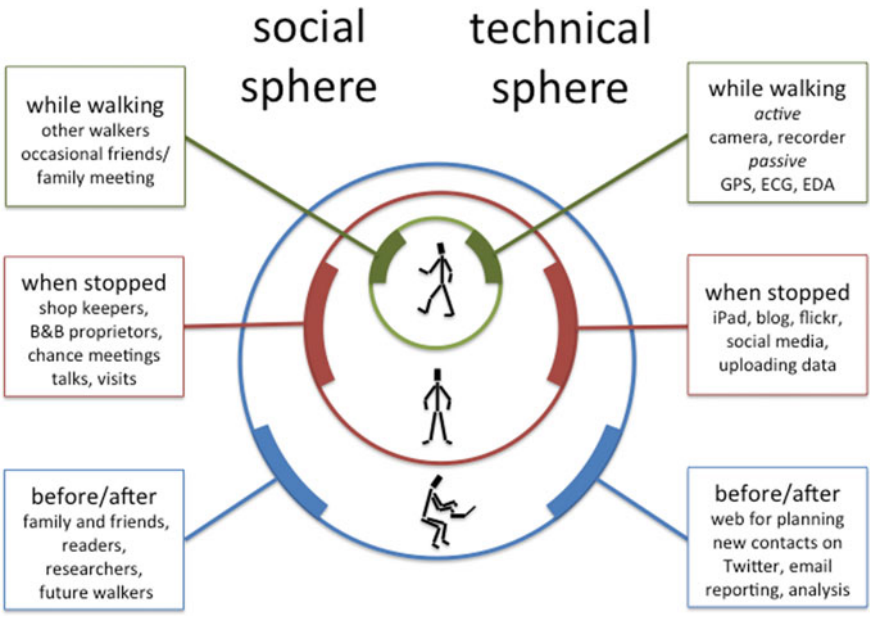

Fig. 1 Onion-layers of experience: social and technical interactions around the act of walking (from Asimakopoulos and Dix 2017)

4.3 Heart of Community

Travelling from east to west along the North Wales coast, one travels through some of the most deprived areas of Wales.

The single most deprived area is West Rhyl. This has a simple explanation. In common with many Victorian seaside towns it is suffering general decay due to the growth in overseas sun-seeking holidays. This then leads to cheap bed and breakfast accommodation, which is used as overspill for those on housing lists from neighbouring cities. In the case of Rhyl, it is effectively the dumping ground for Liverpool with hard-to-place individuals and families sent there.

However, there are another set of villages and small towns where past industrial activity has been lost, leading to widespread unemployment. Towards the east, villages such as Connah's Quay and Flint are visibly depressed, in Connah's Quay even the pubs are all closed down. Yet further west there are villages where industry and employment have equally been lost and yet there remains a heart to the community. Is this random or are there systematic factors that make it more likely that one community will survive and retain its internal strength and another die from within?

This is really a human geography question raised by the journey. It seems the sort of question that ought to be in the heart of psychogeography, except the psychogeographers have a more urban bias and appear to be more interested in vivid description and romance than intervention.

There is clearly an east-west trend, and yet all set within a close area. There are things that feel as though they could be making the difference:

- *Estuary versus open sea*—While the mudflats of estuaries have a barren beauty and are havens for wildlife, they can also be depressing.
- *Urban influence*—While it is mainly Rhyl that has become overspill for Liverpool, there may be other urban influences, perhaps creating an external focus, neglecting inner resources.
- *Community churn*—Connected to the urban effect, Flint has been an immigrant town for at least 150 years, with the part north of the railway called 'Irish Town' in the 19th century and today with a very large Polish community. While bringing fresh influences, does this also weaken the sense of heritage?
- *Industries of the land*—The villages and towns of the east were mainly 'brought in' industry: chemical works, and factories, often originally related to local conditions, but in recent memory about raw materials that are shipped in. In contrast the villages of the west are based around quarrying. Does this connection to the land encourage a sense of community roots?

These are open questions, but these physically close and yet very different communities seem a good proving ground for understanding the causes of community decay, and maybe understanding how to prevent or even reverse it.