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Step by Step Research

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Abstract Research in the Wild, a well-trodden phrase in the literature, but how wild is wild? Walking the streets of one of the most deprived areas in the country, or gazing out to sea, from an 'unspoilt' valley that, beneath the greenery, is pockmarked with 19th century mine workings. If the way is well signed (according to the tourist literature), does that make it no better than a controlled lab experiment, a repeatable journey. And 'research' is maybe no less problematic. If a researcher walks one thousand miles does that make it research in the same way that an artist piling bricks makes it art?

This chapter describes a three and half month journey by foot around the periphery of Wales, which takes in the most downtrodden and industrially derelict areas of the country as well as gentrified 'regenerated' waterfronts; oil refineries, and picture postcard 'destinations'. It is a story that is as challenging methodologically as it is physically and mentally; low on systematicity, high on subjectivity, more about uncovering questions than finding answers.

The questions raised are as varied as the landscape. What makes one post-industrial community fail whilst another retains its heart? Why does software cope so badly with poor connectivity, making already difficult situations worse? Above all, is there a future for the margins beyond depopulation, retirement coast, or theme park?

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.

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 Amy (Arr) Carmicael, 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 military veterans charity (WCP 2014). There have been fewer complete perimeter walks (or runs!); at the time of writing just 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. Garmin¹, SPOT²) and mobile phone applications (e.g. ViewRanger³) that help navigate or capture experiences in the wild. While many are effectively standalone, others enable connections with social media and other information sources (e.g. Social Hiking⁴).

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

¹ <http://www.garmin.com>

² <http://www.findmespot.eu/en/>

³ <http://www.viewranger.com/>

⁴ <http://www.shareyouradventure.com/>

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 psycho-geography, which uses walking extensively to understand the felt nature of environments (Coverley 2010) While psycho-geography 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.

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 principle 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 (Häkkinen 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?

⁵ <http://ellieharmon.com/>

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 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, 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 folk-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 these 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 Flickr and moving the full-size versions onto a separate hard disk (19,000 photos are too large for 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 had 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 reason for this appeared to be:

- i) Each 140 character Tweet is wrapped in about 4–7K 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 also Fig. 1 later).

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 psycho-geography, except the psycho-geographers 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 vs 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 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.

4.4 Interstitial communities and transhumance

At the edge of Monmouth is a small caravan park. It at first appears to be mainly a touring site as the caravans are all small, not the vast static caravans that are planted liberally around much of the coast. However, you then notice that each caravan is surrounded by a small garden, each different: some with small ankle-high picket fences, some with tubs of plants – the majority of the caravans are clearly there for the season, indeed season after season. Many of the owners are semi-retired and are here for four or five days a week, some are here virtually permanently going 'home' every two or three weeks to do the washing, but otherwise living permanently on the site during the season. There is a whole seasonal community here.

In Anglesey I discover that many of the residents of the static caravan sites are retired and live there all year except the month around New Year when the site closes to fulfil planning permission. They typically have another house, but the caravan is their more permanent domicile, the word 'home' becomes problematic.

Traditionally many rural communities had winter and summer homes, moving up into the mountains as cattle and sheep grazed higher pastures. In Georgian times and through to the early 20th century, it was common for upper and upper-middle class families to have a second home at the spa, by the sea, or abroad, even the Queen holds court at Sandringham over Christmas.

While it has become common not to know your neighbour, here are real communities forming that slip between the gaps. For these caravan sites, the majority of (semi)residents are retired or semi-retired, however amongst the working population various factors including negative equity, fluid employment, professional couples with jobs in different cities, countries or continents have created substantial numbers of people living in multiple places, were the notion of 'home' is problematic.

4.5 Low-level quantitative data: location and biosensing

I carried a number of sensors that gave low-level data about the walk.

- *Location (GPS)* – A Garmin dedicated GPS unit and a phone app Viewranger created GPX traces of the journey. These were sometimes incomplete if I forgot to turn on the devices or if batteries ran out during the day. They also contain occasional sporadic readings way off track due to glitches in GPS location and periods of rapid movement if I forgot to turn off the devices before getting on a bus to go back to a campsite.
- *Heart (ECG)* – I wore a medical-grade twin-electrode ECG recorder. Typically this stored 2 days and a night of data. It is, to my knowledge, the largest long-term trace of ECG activity in the public domain. The daytime recordings offer the potential to correlate heart activity with the terrain, weather, etc. The overnight readings allow long-term analysis, especially interesting given my fitness level changed dramatically during the walk.
- *Skin (EDA and temperature)* – I wore an Affectiv Q sensor⁶, rather like a wristwatch, which measured electro-dermal activity (EDA), effectively skin moisture as used in lie detectors and also skin temperature.
- *Movement (accelerometers)* – Both the ECG and EDA devices included three-axis accelerometers, allowing the calculation of movement levels, and potentially to act as a *post hoc* pedometer.

4.6 Analysis of blogs – lostness and social relationships

As well as quantitative data there is an abundance of qualitative data, 19,000 photographs, audio blogs and more than 150,000 words of daily text blogs. There are two main research activities around these:

- *Meta data and Semantic mark-up* – Meta data has been prepared to enable easy connections between the qualitative and quantitative data. In particular everything is time-stamped making it possible, for example, to notice an unusual incident in the heart-rate or accelerometer data, and then drill in to any photographs or audio blogs at that time. In addition, semantic mark-up is being added to the blog entries, including all names and places.
- *Qualitative analysis* – The data is all available freely to view online or download for third party use, but in addition a collaborator has been analysing

⁶ The Affectiv Q is no longer available, but the MIT group that initially produce it has designed an improved wrist worn sensor to be built by a new company Empatica. <http://affect.media.mit.edu/projectpages/iCalm/iCalm-2-Q.html>

the blog entries using inductive analysis techniques. The original focus was on issues of wayfinding and lostness, but one of the core categories that emerged was social engagement.

In some ways the latter was unexpected as the walk was essentially solitary, albeit with the intention of making community contacts along the way. In response to this persona reflection led to a list of nearly twenty different categories of social contacts, from other walkers to academic collaborators.

5. Methodology Challenges

In the previous section we looked at following research outputs/outcomes:

- a) Limitations of technology and mobile and broadband connectivity
- b) Supporting technology in the broader activities around walking
- c) Understanding how a post-industrial community retains its heart
- d) The issue of interstitial communities and modern-day transhumance
- e) Low-level quantitative data: location and bio-sensing
- f) Semantic mark-up of blog text
- g) Qualitative analysis of blogs – lostness and social relationships

We will now look in more detail at the methodological challenges raised by these.

5.1 Technical questions

The issues of connectivity (outcome a) raised during the walk certainly contribute to wider public policy discussions about rural broadband and mobile connectivity raised elsewhere (Townsend et al. 2013) and indeed has already been used in this context (Morgan et al. 2014). Arguably, for this purpose, it would probably have been better to simply drive from community to community and systematically sample connectivity using standardised measures. However, there is also something about the subjective experience of attempting (and often failing) to perform real tasks that goes beyond the bare numbers.

In particular, public reports typically quote broadband speed as the key metric, for example, the Royal Society of Edinburgh's report 'Digital Scotland' makes a strong case for bringing fibre to every area of 2000 people:

"Any circle drawn on the map of Scotland to include a settled population of at least 2,000 people, should also include a hub"

Key Recommendations (RSE 2010, p.4)

This is certainly important, but, both from my walking experience and also day-to-day life living in an island, I know it is the intermittency and unreliability

that is more crippling. Based on this it would be possible to create some form of metric and measuring application that, for example, periodically probed the connection, and reported the frequency of incidents when connectivity dropped to below 10% of normal speed, or where end-to-end delay exceeded 1 second.

That is the subjective experience does two things:

- Helps to probe the implications of technical issues for real life
- Poses questions that are amenable to systematic quantitative analysis

In addition to these infrastructure issues, much of the subjective angst was due to the inability of software to deal with limited connectivity. This then led to a putative technical deconstruction of the reasons why the software was failing, for example, the combination of factors that lead to Twitter's poor performance. This can then be used to propose architectural design practices that avoid the worst of the problems.

That is:

- Subjective experience 'in the wild' raises critical software issues
- This then leads to technical analysis and potential design solutions.

5.2 Externalisation through reporting

The analysis of the way technology supports the broader activities around walking (outcome b) did not arise directly from the experience of walking. Indeed the opposite was the case, while walking I felt I was not using technology as much as I should given the goals of the expedition. It was only when I was writing and preparing talks about the walk that I noticed the incongruity between, on the one hand, the volume of data collected and, on the other hand, the time 'tending technology' and my assertion that in the end I used little technology.

Once the realisation dawned, it was easy to list numerous ways in which technology was used in the broader activity of walking, and it seemed almost perverse that someone who had taught about looking at the wide socio-technical picture for many years, could be so blind when applied to their own actions. Except that this is precisely the standard problem of expert knowledge, it is hardest to see when closest to it.

So, I had both the knowledge that broader activities are important, and that there was lots of technology being used, but both were tacit. As is so often the case (Dix and Gongora 2011), it was the process of writing and preparing talks that externalised that tacit knowledge, and acted as a creative impetus.

5.3 *Qualitative questions*

The issues regarding post-industrial and interstitial communities (outcomes c & d) were ones that emerged naturally from observations made during walking.

In some ways the former, is closest to psychogeography, an appreciation of the overall emotional feel of places, elicited largely through, effectively voyeuristic, and slow, walking – the *flâneur*. A frequent critique of psychogeography is that it is strong on method, but weak on results. This would be arguably true here too, although there is at least the posing of a problem, and some inkling of reasons.

The prolonged nature of the walk is helpful. Macfarlane (2005) suggests placing glass on a map, drawing around it, and then walking the resulting circle; however, the assumption is that this would be a day's walk through urban streets. The border and coast of Wales is effectively a huge glass circle, cutting not arbitrarily through villages and cities, but certainly drawing one through a wide variety of physical and social landscapes. The slow movement over multiple days makes it easier to spot slow changes and trends, and to see details alongside the immediate emotional impact.

The issues of interstitial and modern day transhumance arose less from this slow movement, and more from reflection on individual events, experiences and conversations. In some way this is closer to the technique of the social-anthropologist, although certainly not of the disinterested observer variety. Being a walker, a wanderer, a vagrant, puts one in a liminal position thrown bodily into situations and yet also the outsider, the visitor – light of foot and soon to leave.

In this case, it is easy to see that the issue, once noted, is a general one; caravan site communities are clearly common around the whole country. Whilst in US culture the trailer park community is a frequent motif, for some reason this is not a notion in the British imagination beyond the traveller camp. There are exceptions such as Lydia Holly's caravan in South Riding (Holtby 1936) or the 1970s situation comedy 'Romany Jones'⁷, set in a caravan site for the down at heel, but in general the media image of the caravan site is mostly the setting for semi-ludicrous summer holidays.

While gypsy communities have been the subject of extensive ethnographies, social studies, and books celebrating heritage and lifestyle, the seasonal semi-retired fall between the cracks of academic perception. The demographic shift in the UK and other developed countries has been towards a growing proportion of older people. There has been extensive discussion of the way this will lead to higher needs for later-stage care, especially related to dementia. However, there will also be an increasing number of 'fit elderly', so it is likely these liminal semi-retired communities will grow in importance.

Methodologically, in both these cases, the pace of the walk helped identify a specific and local issue, which, on reflection, is seen to be something that will

⁷ http://en.wikipedia.org/wiki/Romany_Jones

recur widely. In neither case are we seeing systematic study or deep analysis, the walk served to raise issues. Having identified these issues, there is still the need:

- to corroborate extent (from impressions to evidence)
- to address the problem, and/or study the issue in detail? (may not be me)

5.4 Third party analysis to personal reflection

A qualitative analysis of the blog entries was carried out by a collaborator, Stavros Asimakopoulos. Although the reporting of this analysis has been a joint activity (Asimakopoulos and Dix, 2017), the initial grounded theory analysis was deliberately performed independently by Asimakopoulos, with this author acting effectively as the data subject. In some ways this is just a form of single person study, with the same advantages of depth and disadvantages of breadth inherent in the technique (Razak 2008). As a diarist of the walk I was explicitly aware of the research potential of my writing, but so also are most subjects recruited for diary-based studies. So in many ways this part of the analyst is closest to traditional techniques, with Asimakopoulos taking the role of external researcher and me taking the role of (helpful) subject.

However, while the initial analysis was independent, the subsequent reflection on the categories has been a joint activity, informed by my subjective understanding as well as Stavros' external view. Perhaps most interesting from this point of view is the emergence of social relationships as a key element.

Rather like my initial assessment of technology use, if asked, I would have said the walk was largely solitary, and that I was worried that I was not having as much time as I'd intended to engage with local communities. Yet the story that emerged from the writing was very different. Having been prompted by this inductive analysis, I then reflected more not just on the number of people with whom I interacted or communicated, but also different categories of relationship and types of social interaction. While many of these appeared in the blogs, the final list goes beyond those that emerged purely from the external analysis; the reflection of the author as participant researcher was essential. Rather like the technology issues, this is effectively a form of externalisation, but this time driven by third party analysis.

Just like the use technology, the level of social interaction at the moment of walking was low, but as soon as one considered the wider activities surrounding the actual act of walking the range and number of social interactions increased. That is, we have an onion-ring view of experience from the core experience through various layers which are more peripheral temporally, and yet essential socially and technologically (see Fig. 1).

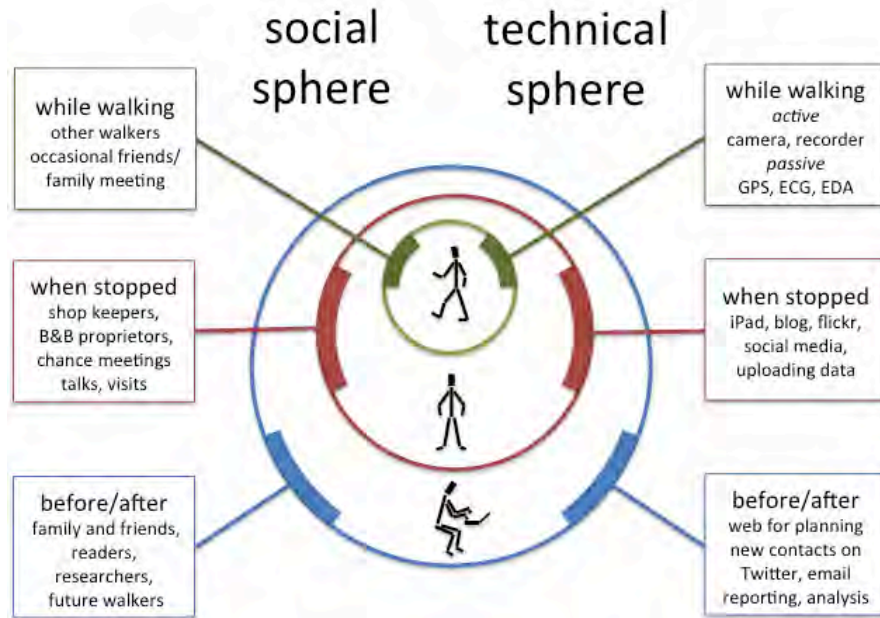


Figure 1. Onion-layers of experience: social and technical interactions around the act of walking (from Asimakopoulos and Dix, 2017)

5.5 Pure data

Finally, we consider the raw quantitative data (outcome e) and semantic mark-up and cross linking of datasets (outcome f).

The pure bio-sensor data is perhaps methodologically simplest, it is just measurements, no subjectivity, no pollution of subject as researcher. However, part of the value of this 'objective' data is that it can be connected to the qualitative accounts (text blogs, audio blogs and photos), to enable rich interpretation. A substantial amount of analysis can be performed on the objective data alone: bio-sensors + GPS track + terrain + historic weather data. However, if there is an unusual peak in, say, heart rate, that is not explained by terrain or weather, then it is useful to be able to consult the qualitative data: maybe an encounter with a bull or fellow traveller. For example, a student at the University of Konstanz was using the data as part of a Bachelors project (Kolb, 2015; Dix and Ellis, 2015) and noticed a sudden heart rate peak at 8am one morning; it turned out to be a point when I had been writing and suddenly realised I'd be late to meet someone who was walking with me that day.

I tried to be as honest as possible in the blogs, and so the periods during the middle of the walk where I was at a low ebb are there as well as the high points. With photos and audio blogs I was also very aware of creating a record, and so would take photos as the terrain changed, or occasionally record a note concerning an event, for example, just after taking a tumble on Offa's Dyke, which I assumed would show up on accelerometers and EDA, but which also I realised followed a period when blood sugar levels were low. That is, this is a record that was knowingly created and crafted, with both advantages in terms of additional potential for analysis, but also all the layers of self-presentation of any such account. Even the photographs, while attempting to be candid, are often framed to include some features and exclude others; rhetoric, narrative and data are mixed.

The purpose of collecting this data was not so much for my own research, but to be available for others (e.g. Kolb, 2015 and Niu, 2017, see Fig. 2), and, as noted above, this coloured the accounts I created. However, this creates a number of new personal academic challenges.

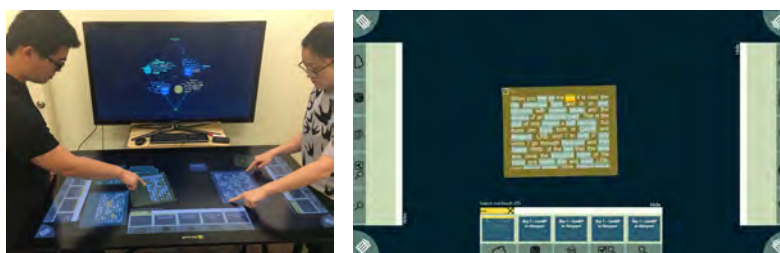


Figure 2. AwareSpace (Niu 2017) a touch-based system for exploring textual material developed using Alan Walks Wales blog data (*photo credit S. Niy*)

To be useful the data has to be documented and made available in ways that allow a future researcher to use it independently of me. While I have previously advocated the importance of data gathering as a separate activity within a rigorous discipline (Dix 2010), I have not previously attempted to either prepare or document data for others. One of the problems with open data is that making data available, even in standard formats, does not make it usable; while the automated analysis of big data and the policy implications of open data are major research areas, these issues of meaningful documentation are very much a second cousin, rather like computer system documentation.

I have also realised that while I have extensive experience in publishing and promoting the interpretation of results of research, I have no experience whatsoever in publishing and promoting the underlying data. The web was initially created to help spread the data of large-scale physics, and natural science journals are increasingly demanding original data be published alongside articles; yet there are only a few areas of computer science (e.g. computer vision, information retrieval, natural language processing) with coherent data sharing policies. Furthermore there are potential uses well beyond my own natural

communities, for example, in sports or health studies. While I often have worked in cross-disciplinary settings, I have no experience of this deliberate 'marketing' to other disciplines.

Despite the substantial challenges, I believe that the creation of data sets is crucial to the development of my discipline; I encourage PhD students to share their data (where anonymity allows) and have suggested that we should have some form of HCI & design data journal, where data (qualitative and quantitative) is published with accompanying documentation based on three criteria:

- Some *a priori* reason to believe the data will be useful – you don't just randomly collect data. Of course this *a priori* reason may well not be how it eventually gets used.
- A systematic description of the collection methodology, so that other researchers can understand the context and reliability of the data.
- Clear documentation of the data itself including formats, structure, and meaning of fields, so that other researchers can use it independently.

One of the reasons for thinking about a data *journal*, is that the academic value system is driven by publication, hence it is hard to convince researchers to put effort into making data available. That is, there needs to be a substantial shift in our perception of the value of data production as research activity.

The Research Excellence Framework, the UK 5-yearly assessment of university research, explicitly recognises a 'database' as a research output in the humanities, but does *not* do so for science-based subjects (REF 2012). In computer science, dataset creation is effectively considered as valuable but not meritorious. The Leverhulme Trust, which prides itself in funding trans-disciplinary work, is, if anything, even less encouraging in its guidelines for project grants:

"The Trust will not fund applications in which the balance between assembling a data bank or database and the related subsequent research is heavily inclined to the former." (Leverhulme 2014)

The barriers to the effective creation, sharing and reuse of data are high.

6. Conclusions

It is hard to summarise the lessons of a thousand miles. The most obvious methodological concern is perhaps the subjective and inevitably unrepeatable nature of the experience. However, this is not an uncommon issue. Researchers are often engaged personally and emotionally with their subjects, whether as anthropologists embedded in an alien community, or single-person researchers becoming friends with their subject. Similarly in forms of cooperative inquiry or

where participants are recruited as co-researchers, the participants are not merely subjects of study, but actively engaged and in the study (Boylorn 2008).

Indeed it is rare for a researcher not to have some element of personal commitment, otherwise there would be no passion, neither are their subjects ignorant of being studied. Arguably the level of immersion is somewhat extreme in this case, but certainly no more so than the medical researcher working with small children, or those working in technology for development contexts.

The subjective immersion clearly also has benefits in terms of depth of understanding and richness of interpretation. The key is certainly to be aware of the potential for partial or biased observations, and then to factor this into the academic interpretation.

Generalising from a unique experience, is arguably an oxymoron, and yet that is the essence of all learning. The mode of generalisation is not statistical, there is no completeness of sampling, neither is it controlled, but more like abduction, moving from a single instance or small number of instances through reasoning. This is common in both experience- and technology-driven research.

A good example of this was in the Savanna experimental mobile game, part of the Equator project (Facer et al. 2004). In this outside game, children took the role of predators and needed to be in the same area in order to 'hunt', but in one case a group became frustrated as they struggled to see the prey at the same time even though they had gathered round someone who had spotted prey. The reason was partly because children would stop as soon as they saw prey and hence were at the extreme edge of an active zone, partly because GPS units were held in back-packs, and partly about the uncertainty of GPS readings. However, having spotted this single instance, it was clear that there were lessons here in common with very different kinds of experience such as museums.

Within my research, the issues of interstitial communities and modern transhumance, or the way technology is used more in the broader supporting aspects of walking, are both examples where an issue once spotted was clearly seen to have wider ramifications. The full evidence for the generalisation comes not from the data gathered or the experience in itself, but more the reasoning drawing on wider sources of personal and academic knowledge prompted by the specific instance.

The factors and processes in research interpretation are also quite rich. In some cases results sprung directly from insights during the walk, in some it was the process of writing and talking that led to fresh interpretations, and in others there has been a rich feedback between third-party analysis and first-party reflection. In the future I also hope that more third-parties will study the qualitative and quantitative data entirely independently. That is as a single person, and within this single, albeit extended, experience I took on roles from being the pure observer of others, to pure subject of study and pretty much everything in between.

Very often the outcome of these process has not been a closed result, but more an open question. When preparing for the walk and talking about the experience to come, I frequently said that when a question is known and understood it is

relatively easy to find solutions, and that what I hoped to learn most from the walk was new questions. This is surely the greatest benefit of research in the wild, not answering the questions one already has, there are other ways to do this, but in throwing oneself into a situation without control, of unbounded potential, to see the unexpected, the unplanned and truly extraordinary.

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