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The Walk:
exploring the technical and social margins

Notes of Presentation

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http://alandix.com/alanwalkswales/

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Extended Abstract

Walking has long been an instrument of political activism, such as the Jarrow March in Britain and the Salt March in India in the 1930s, and before that of war. It has been a spiritual practice, a source of literary inspiration and in some cases regarded as an art in itself. In the case of psychogeography, the act of walking is an integral part of academic and philosophical practice. However, it is fair to say that walking is not a typical part of HCI research methodology.

From mid-April to the end of July this year, I walked the perimeter of Wales, a distance of 1058 miles (1700 km). This was partly a personal journey encircling the country of my birth, not without overtones of pilgrimage, certainly a symbolic act, and maybe, depending on your definitions, art. It was also a research journey, seeking to understand the social and community issues of the 'margins' (literally and metaphorically) of a modern nation, including the impact or otherwise of information technology. This layering of aims and approaches could be regarded as post-modern, but I preferred the words of the Dean of Cardiff School of Art and Design, who described the methodology as mediaeval, and subsequently the blog about the walk was compared with the writing of Gerald of Wales written in 1188.

In this talk I will explore some of the things I have learnt from this perambulatory research; we will consider the design of mobile technology, the meaning of community, and the role of the subjective in academic study.

However, the 'results' of this are as much questions as answers. Remote rural communities in Wales, and no less in India and the rest of the world, often face a deepening, fuelled by the digital revolution, of the existing social and economic divides. Can appropriate design and policy counter the apparently inevitable technological entrenchment of existing power? Methodologically, is there a role for this level of slow-paced physicality and ethically is there a place for physical pain?

Finally, a critical aspect of the walk has been its permeability. I laid myself open to others as a living lab, and the data gathered is being made available to the entire research community. It started as my journey, but one of the first tangible outcomes is a digital exhibition by others, inspired by, but not 'about', the walk. Just as the act of walking collapses the distinction of places into a threaded narrative of journey, is there also a space for research that defies the discretisation of publications as metricised outputs, and the cabalistic disintegration of disciplines and groups, a space for methods of work that link, join, and lay themselves open to use by all?

Introduction

This paper is based on the keynote talk I gave to APCHI 2013 / India HCI 2013 in Bangelore, India on 27th September 2013.

From mid-April to the end of July this year, I walked the perimeter of Wales, a distance of 1058 miles (1700 km). This was partly a personal journey encircling the country of my birth, not without overtones of pilgrimage, certainly a symbolic act, and maybe, depending on your definitions, art. It was also a research journey, seeking to understand the social and community issues of the 'margins' (literally and metaphorically) of a modern nation, including the impact or otherwise of information technology.

In this talk I will explore some of the things I have learnt from this perambulatory research; we will consider the design of mobile technology, the meaning of community, and the role of the subjective in academic study.

A Brief History of Walking

Being bipedal is one of the defining features of humans compared with other animals, amongst other things giving us the freedom to use our hands to construct (leading to technology) and to gesture (leading to language). Our feet took us out of Africa and across the world from the lush lands of Persia and India to the only recently ice-gripped lands of Britain. For long periods of time even animal transport was, in the large part, for the transport of goods, and it is only in the modern age that the wheel has superseded the foot for long distance travel.

So, to a large extent the history of humanity is the history of walking.

Since the ages of the empires 6000 years ago, walking has been an instrument of war. Europe is criss-crossed by Roman roads built predominantly for the rapid movement of its Legions to control and subjugate an empire thousands of miles from end to end. This is a useful reminder too, that the technical development of transport is as much to do with the modification of the environment as it is with the development of machines to move through the environment; few cars can travel without roads. Whilst many animals accidentally create paths and tracks worn into the ground; we engineer these paths.

The histories of military campaigns are full of long marches: Napoleon's army lost in the snows of Russia; Mao's Long March. These become the subject of fable and folk tale, reflecting the close connections between narratives and journey that date back to the earliest times. Indeed it is only in the late twentieth century that mechanical transport has taken over from the march for long-distance troop movements, and even then often to drop troops onto the ground for foot patrols.

More recently, as power structures have partially inverted, walking has been an instrument of political activism. At a small scale the foot demonstration with banners and close-packed marchers is a common sight in modern states, albeit if these are sometimes crushed with more or less violence and sophistication. Protest walks can be used to highlight issues or to disrupt the fast flow of non-pedestrian traffic. In some cases, for example the 'Marching Season' in Northern Ireland, it fulfils an older purpose of claiming land.

While the majority of walks of political activism are short; long-distance walks, by their rarity and by their scale have created both immediate impact and a permanent place in the collective history. Notably in the 1930s, at opposite ends of the British Empire, Ghandi's Salt March in India protested against the draconian tax on salt, whilst the Jarrow March from Newcastle to London in the UK highlighted the poverty of the depression in the North of England. In the latter case the walk was not just for its own impact, but because the walkers could not afford the one pound train fare to London to make their protest there. While the drone or inter-continental missile delivers the message of the powerful, the foot is the weapon of the poor.

Walking is often deeply connected with spirituality and across the world there are sites of pilgrimage, where it is not just the being at the place that is significant, but also the manner by which you get there. You may fly to Mecca but everyone walks seven times round the Kaaba; in Croagh Patrick in Ireland, climbing barefoot over the rough stones is part of the pilgrimage, bloody feet and all; and when Henry I did penance for the murder of Thomas a Becket, he walked in sackcloth and ashes to Canterbury – the King just like a pauper.

Walking has also been traditionally associated with the arts and literature. In Australia the song lines cut across the country, with stories of the dreamtimes attached to places along the way. Taking travel more generally, while the road movie is a recent genre, journey tales stretch back many millennia from the Exodus of the Israelites from Egypt to Jason and the Argonauts in Greek mythology. In the Outer Hebrides, near the Isle of Tiree where I live, there are even special songs for 'waulking' the cloth, in early days literally treading on the wet cloth to set it.

Walking was critical in the European Romantic movement of the 19th century. Wordsworth is reputed to have walked 175,000 miles in his lifetime [Ma13, p.16], but also composed much of his poetry whilst pacing his study in Dove Cottage. His sister reported that his study was 12 paces across, and it is perhaps no surprise that his most common verse form was iambic pentameter, five 'iambs' each of two syllables, just like five left-right paces, with an extra pace at the end to breathe and turn – a perfect match between space and metre. Wordsworth was maybe more excessive, but not alone in his commitment to walking, which is a continual theme in 19th century writing; Rouseau said "*my mind only works with my legs*" ([Ro82], quote as in [Ma13, p.27]).

More recently psychogeography has adopted walking as a major facet of its methodology [Co10]. This often involves deliberately arbitrary paths, for example drawing a shape on a map and then trying to stick as close to it as possible. The idea here is that this avoids taking the obvious main routes and therefore immerses the walker in areas in a semi-random way, making each stand more starkly due to its unexpected juxtapositions.

The Wales walk is not so arbitrary, taking as route the existing borders and coasts of Wales, and yet there is an element of unchosen-ness, and there were certainly areas, which you are forced to walk through, that you might otherwise avoid.

Psychogeography has been critiqued as being rich in methodology, but poor in results. The early idea was to try to understand the relationships between

the physical geography of a neighbourhood or area in relation to its 'feel' and the impact on the psyche of visitor (and possibly inhabitant). Certainly from personal experience, it is challenging to turn the rich experience of the walk into lessons or results that can be useful more generally.

Psychogeography has also been predominantly interested in urban environments, but there are a number of writers, notably MacFarlane in his travel trilogy "The Wild Places", "Mountains of the Mind", and "The Old Ways", which are focused on the countryside and wilderness [Ma08., Ma10, Ma13]

Given all of this, it is worth noting that today the rich walk for exercise or pleasure, and my own walk, albeit unusually long, was freely chosen. However, the vast majority of miles walked are not chosen: the refugee, the homeless, the worker who cannot afford bus fares, or the old person in the countryside where there is no transport. Walking can be the weapon of the poor, but is more often simply the lot of the poor.

Walking Wales

The Wales Coast Path

In May 2012 the Welsh Coast Path was opened. This is a mapped and way-marked route around the whole coast of Wales, a distance of 870 miles (1400km). There were existing footpaths around sections of the coast, but this new national coast path linked them together as well as creating many miles of new footpath. This makes it the only country in world with a complete route around its coast. The coastline varies from sharp-edged cliffs to long dune-backed beaches, including some of the most remote rural areas

of the country as well as passing through or near all the largest cities and towns. It is hoped that this new path will be a major stimulus to tourism and also be a symbolic part of the campaign to encourage exercise and physical well-being more generally in an increasingly obese nation.

Borderlands

In addition there is an existing 180 mile (300km) long-distance path along the route of Offa's Dyke the 9th Century border between Wales and England. These borderlands have always been contested and fought over leaving the detritus of war: Iron Age hill forts, Roman garrisons, Norman Castles. and Offa's Dyke itself. The shifting line cuts north–south, in some places following the meandering edges of the Severn across its fertile flood plains; rather like modern oil-fuelled conflicts, there may have been less fighting if the land had been barren. Even in my own childhood there were Welsh maps showing thirteen counties in Wales and English maps showing twelve. It was only during local government re-organisation in the early1970s that the contested county, Monmouth, at the south of the borderlands, was, peacefully, ceded to Wales.

Together, the new Wales Coast Path and existing Offa's Dyke path mean that it is possible to traverse the entire periphery of the country.

In April 2012 I was down in Cardiff for a meeting and was driving back when I heard the news about the opening of the coast path. Instantly I knew I had to walk it. Later I realised that this expedition linked together many areas of my professional and personal life, but the instant response was more visceral, a knowing of the right thing to do.

I am not sure if the original conviction was in part a subconscious linking of these strands, or whether it was more that I creatively wove them together as I considered the idea. It is probably a combination of the two. However, if over the coming months there had been no merit in the initial idea and it had not made (some) sense under scrutiny, it would have died. It is so important

to be open to these subconscious prompts and convictions, whether as the sublimation of our experience or the word of the divine, but the conscious deliberation and testing is also critical; what makes us human not mere animals.

In research we often go to great lengths to describe our work as if it were the only and best thing to do, we have tables of criteria, and of course our own work, our own systems, have ticks in all the boxes. The truth is many of our choices are, while not utterly random, to a large extent arbitrary. There are many paths that we could take, some are clearly foolish and unlikely to yield knowledge, but among the rest there is rarely a single optimal thing to do next. If our research were really that linear it would not be research. While most research choices are not as extreme as a 1000 mile walk, it is equally important to be honest about their reasons.

I started to walk in April 2013, nearly a year after the official opening. During that first year there had been a small number of complete traversals of the Welsh perimeter following Wales Coast Path and Offa's Dyke. The first had been by Amy (Arry) Carmichael who ran (yes ran), the entire distance; 39 days, a marathon distance every day.

So, my walk was not the first, and certainly not the fastest, but I was undertaking with an IT and community focus that was unique.

Vision

The vision that emerged for the walk falls into four interlinked facets:

Personal – I am Welsh, but haven't lived in Wales for nearly 35 years, so the walk had elements of *homecoming*, in particular it was planned to end in Cardiff , my home town, on 28th July, my birthday. The act of *encircling* evokes a sense of *encompassing*, or even *repossessing*, as if in knowing the edges you know the whole. There is both a truth in this, but also a fallacy. This is not so different from academic understanding; precise definitions are

in a sense like borders: drawing a line round a topic or concept. As such they are at best misleading and at worst blind you with a false sense of understanding. However, in the act of defining, mentally walking the conceptual boundaries, you often learn things abut the heart of the matter. There is also a sense of *pilgrimage*, perhaps more about roots and identity than spirituality, but the two are linked, childhood and church are inseparable, and just like the towns and cities, the majority of holy places in Wales are clustered around the coasts – the old paths of communication.

Practical – I aimed to understand the IT needs of walker and local communities along the way with an eye to doing something practical. On Tiree, I have been involved in a number of small projects to use IT in the community. One of these was a mobile heritage app, bringing the island's historic archive to life in the landscape ... all with virtually no mobile signal! I also organise Tiree Tech Wave, a biannual hacker/maker event, once in the spring and once in the autumn. This is aimed partly at enriching the participants' creative engagement with technology, but also partly to bring technology to this remote community [TT13, DD11].

Philosophical – I have already mentioned some of the rich history and literature of walking. In my own work I have reflected before on the rich understanding of *space* and over recent years issues of *physicality* have been central to a large part of my work [Dx00,Dx09b, RH10, DG13]. This is partly because understanding human cognition can help design, but also has facets of a more philosophical enquiry. For the walk issues of *identity* and *locality* were expected to be central, but also the way that the route of the walk moves through individual communities and localities, maybe threading together the disparate knots, or maybe simply acting as itinerant voyeur.

Research –The walk linked together a number of elements of my own *personal research agenda*, both the slightly more philosophical/cognitive understandings of space mentioned above, and also the more technical issue relating to time and the user interface dating back over 25 years to my 1987 paper "The Myth of the Infinitely Fast Machine" [Dx87]. As part of this, issues of intermittent and low bandwidth connectivity were expected to be particularly relevant. In addition to my personal research agenda I offered myself to the community as a *living lab*: inviting other researchers to monitor me, wire me up or simply suggest concerns or issues to watch out for on the way. This included wearing biosensors, described below, using (or often failing to use) various mobile apps, and looking out for 'off path destinations'; that is places to visit, eat or stay that were not immediately on the coast path.

No hard boundaries – transdisciplinarity and subjectivity

This sounds like a disparate set of goals and aims, and even more so since the walk also held an open agenda, looking for fresh questions and issues that arose on the way.

This is both a strength and a weakness.

In many ways I took on too much, had too many expectations, and inevitably some aspects were less successful than others. However this is also to be expected, the set of prior goals gave a prima facie reason for the walk, but one of the lessons of all field research and in particular 'research in the wild' is that it is rarely the initial objectives that turn out most significant. It is not that these initial goals are not important, they set an agenda and general outlook, and help clarify what is or is not likely to be a good data gathering approach. However, it is also important to hold these goals lightly, always ready to see the unexpected.

In addition to this tuned, yet open agenda, there is a more fundamental radical transdisciplinary approach to much of my work.

I make no hard boundaries between the personal and the philosophical, between research and practice. By this I do not mean that distinctions do not need to be made as we reflect and report on work, but that the phenomena of the world do not fall into simple categories. In order to understand aspects of the word we find it useful to make distinctions, to separate out certain kinds of phenomena and describe them in isolation, but this is an epistemological distinction not an ontological one.

Particularly problematic in the sciences is the role of the individual and the subjective. Interestingly, in philosophy the role of the individual is less

contested. Descartes "*I think therefore I am*" is a combination of subjective introspection and rational analysis, and the whole phenomenological movement is centred on the primacy of felt experience [De37].

In the study of human consciousness, Searle distinguishes between *epistemic subjectivity* and *ontological subjectivity* [Se97]. Epistemic subjectivity concerns questions for which we may have an opinion, but where there exists some objective external answer; for example,, "how high is the Eiffel Tower?". Ontological subjectivity is where the subjective experience is an essential part of the phenomena under study; for example, "is Paris romantic?". The latter may correlate with externally observable phenomena, such as brain scans, and may be influenced by objectively controllable influences, such as champagne intake, but the access to the 'romantic' feeling must always be through subjective assessment and experience.

Moreover, as we study phenomena, we inevitably bring our own biases and expectations, our knowledge and ignorance. In the hard sciences the white lab coat in a sense embodies the idea that in some way all scientists are equal; whoever performs the experiment is immaterial to its results. This is the essence of repeatability. This is the reason for the passive voice in scientific writing, "reagent X was added to Y and it was observed that Z".

However, even here things are problematic. In sunspot research, what counts as a single spot or group is hard to pin down; some people are better at identifying sunspots than others [Ow13]. For this reason, the observer is also recorded and data is 'corrected' to take into account differences between observers; "It was observed that" is not necessarily an 'objective' statement.

Of course this is even more relevant in human sciences. A recent Scottish Government survey was criticised because one of the questions concerned sexual orientation [Wa13,Sc12]. The figure for non-heterosexual orientations was considered too low by some groups, who pointed out that a face-to-face survey in the family home would by its nature lead to under-reporting. In general data gathered from people will undoubtedly depend on the skills, appearance and personality of the interviewer, and in many cases gender and ethnicity also.

When it comes to the interpretation and implications of raw data these effects are even more extreme.

As an example, a recent paper looked at metrics of emotional balance and happiness amongst different income groups in different countries and then correlated that with measures of the religiosity of individuals and the nations as a whole [GN13]. In general, richer people were happier than poorer people, but for those with strong religious faith the difference was far less (in a few cases even reversed). In general, those with faith were more balanced and happier and especially the poor were far happier if they had strong faith. However, the take-away message from the article was not that faith is good for you, but that religious faith was bad for the economy,

because poor people with faith were not miserable enough and so would lack aspiration and not work as hard.

In general the implications drawn, even from numerical results, depend on the expectations of the interpreter. Furthermore, not acknowledging this in the passive voice used in much of academic writing is at best disingenuous and misleading, and potentially deceitful.

This is not an argument to abandon the notion of objective knowledge, but more to accept that much of our work, by its nature, does not fall into the category of pure observer-independent effects. Rather than removing or ignoring the role of the researcher, we need to acknowledge and account for it, as is common and accepted practice in much of the social sciences and humanities.

All this said, an individual 1000 walk is probably a little extreme in terms of its subjective and personal nature than most work in HCI.

At a talk I gave at Cardiff Metropolitan University just before starting the walk, I had stated that the style of research was perhaps more in the style of 19th Century explorations. However, in her summing up after, the Dean of the Cardiff School of Art and Design suggested that it was more Mediaeval than Victorian. Later, someone commenting on my daily blogs, compared them to the writings of Gerald of Wales, a 12th century writer [Ge88], so the Dean clearly had a point. As she was a historian by background, this was intended as a positive remark, and I was very pleased with the notion, but I leave it to readers to make their own judgement.

Walking as Research

Slow research

One of the most obvious features of walking as a research methodology is that it is slow. When I walk on the flat, say down a road, and I know where I am going, so don't have to think about the route, I walk approximately four miles an hour (6km/h), compared with say 40 mph (65 km/h) driving down country roads, 70mph (110 km/h) the maximum (legal) speed on a British motorway, or 500mph (800 km/h) in a plane.

In an age addicted to speed, walking is unconscionably slow, but the very slowness creates its own pace and forces you to notice things you might otherwise miss, and to experience places you might otherwise speed through. Combined with the systematic nature of the coastal path, this meant I saw things and areas I would have been unlikely to deliberately visit. This was particularly obvious in the Dee Estuary in the north east of Wales, a very depressed and not at all pretty area, but one where I learnt such a lot.

In other areas there has been an increasing appreciation of the value of 'slow'. This began with 'Slow Food' in Italy in 1986, but became more widespread with a broader 'slow movement' following Karl Honoré's "In Praise of Slow" [Ho04]. In the mid 2000s I led a mini-project on "Slow Time" trying to help people become aware of the slower rhythms of life: milliHz (about 20 mins), microHz (about 12 days) and nanoHz (30 years) [DP06]. This was in turn inspired in part by Stuart Brandt's "How Buildings Learn", which explored the different timescales of domestic architecture [Br97].

Although I had planned for this to be a 'slow' experience, in fact one of the pervading memories is of feeling rushed. My four mile an hour walking pace on flat roads that I know, became two miles an hour on rough ground, where I needed to navigate and was taking hundreds of photographs a day. This was exactly the speed the Ramblers, those who walk regularly as a hobby, had told me to expect, but I had ignored this expert knowledge. Distances I had expected to take 4-5 hours a day to walk were taking 8-10 hours, As I had fixed the overall duration of the walk, I could not simply take more time, so for a long time the walk exhibited the same feelings of stress and time constraint as my normal academic life.

Slow is not simply a matter of walking.

It also hurt. Not all the time, and my feet were remarkably blister free, with just five sticking plasters used the entire journey. However, in the middle section especially, various long-term aches and pains emerged, and it took my feet approximately a month to recover after I finished. There are ethical issues here even when the task is freely chosen, but certainly you could not demand this kind of thing of a student. However, an element of discomfort and risk is common in many other areas of research from anthropology to vulcanology.

Waving banners

One of the aims of the walk was to engage with local people and communities. The slow element was part of this, and one of the aspects compromised by the time constraints (not slow enough). However, this was also problematic due to my personality. Although I can talk endlessly, I find it very hard to start a conversation, especially with a stranger. During the walk I wore a banner strapped to my rucksack. The banner meant that other people would initiate conversation, asking me about the banner. It also lent an element of 'officialness'; I was not simply sitting or walking, but someone on a mission.

The banner is an example of what I call 'personality prosthesis'.

You might have an artificial leg or arm fitted if you have had an accident, or simply wear glasses. Even if we have no impairment, we use various forms of physical prostheses to augment our bodies, using a forklift truck or block and tackle to lift weights too heavy for us, or car to move faster than our legs would carry us. We also use cognitive prostheses, a calculator to augment our mental arithmetic, or diary to help our memory. Although you might attend a gym or night classes to improve aspects of your physical or mental capabilities, there is no great shame in using these physical or cognitive prostheses.

However, when it comes to aspects of personality or cognitive style, people very rapidly fall into a language of moral failing, "if I were a more tidy person ...", "if I were more organised ...". Our underlying personality is not going to change easily, if at all (although maybe we can shape our character), so complaining about it is like an engineer saying "if only this steel were fifteen times stronger". As a designer faced with a material with limitations, we would work to achieve our aims *given* the limitations.

The banner was precisely that. If I were more extrovert, more gregarious, I would find it easy to strike up the conversations I wanted to. But I am not. The banner helped me to achieve the aims *given* who I am.

Never apologise for who you are, only for what you do.

The best technology

One of my aims was to investigate technology for the walker: what technology would make it easier / better for me as a walker, and for other walkers. I recall asking one walker, "what technology do you use?"; "a map," was his immediate answer.

Not everyone is like this and an increasing number of people are using dedicated GPS devices or phone apps as their primary navigation. Indeed when I talked to Rosie Unsworth, who was walking the Wales Coast Path in the opposite direction, she told me that she had exclusively used her phone, in particular using ViewRanger [Vi13], which enabled her to download all

the OS maps for the path which would otherwise have been very voluminous.

I don't know the overall balance of technology use, as the nature of coast paths is that you only occasionally need any sort of navigation except when the path, for reasons of topography or legal access, has to branch inland. However, where I did observe others using navigation aids, it was exclusively a paper map or using maps and instructions in guidebooks.

This said, clearly the trend, especially among younger hikers, is to use more technology, which is beginning to cause headaches for rescue services, who are increasingly being called out to help people who have only a GPS device or phone and have either dropped and broken it, or found its battery has run out.

In a recent survey in the White Mountain National Forest in the USA, less than a half of hikers had a compass with them, although 60% had some from of GPS [MS13]. However, the paper notes that of the GPS users, the vast majority were using phone-based service that failed in the park, and that even dedicated GPS devices had black spots in the park.

To be honest, while I was wired up with biosensors (see next section) and had a 'Spot' device broadcasting my location to satellite to appear on a real-time map, I very rarely consulted navigation technology or other apps on the way. This was partly due to battery problems; my phone was most often in the rucksack charging on an external battery pack. It was also due to the difficulty of using the phone in slightly damp conditions. Some days, if I went into a cafe during the day or got to bed and breakfast at the end, it would be several minutes before the touch screen would respond to gestures, despite wiping both screen and fingers to dry them. There were also connectivity-related issues with many apps (see later).

After my camera, the most heavily used piece of technology that I had with me was an Olympus voice recorder. This had a number of advantages:

- *Physicality*– it had real buttons, and so it worked with damp fingers, and could be navigated by touch alone when cupped in one's fingers or held inside one's hood to protect it from rain

- *Non-visual* – while there was an LCD screen, common functions could be operated without consulting this. I wear reading glasses and so using a screen involved getting glasses out, and trying to de-mist them, before being able to do anything. To be fair also a problem with maps.

- *On-the move* – the combination of the above, with the fact that, when the ground is not too rough, you can speak while talking, meant I did not have to stop to use it; important when timing got tight.

In fact, although I rarely saw people actively using technology for navigation, it is likely that many will have been carrying mobile phones, or consulted an online weather forecast before starting. Technology can be used in several ways during and around walking as an activity:

- *Actively used on the move* – navigation apps, infrequent Twitter, camera, voice recorder, wrist-watch-style heart-rate devices (for consulting while moving), iPods and MP3 players.

- *Passively gathering/transmitting data* – SPOT and ViewRanger transmitted my location to online maps, biosensors, many now wear Nike Bands, or similar devices.

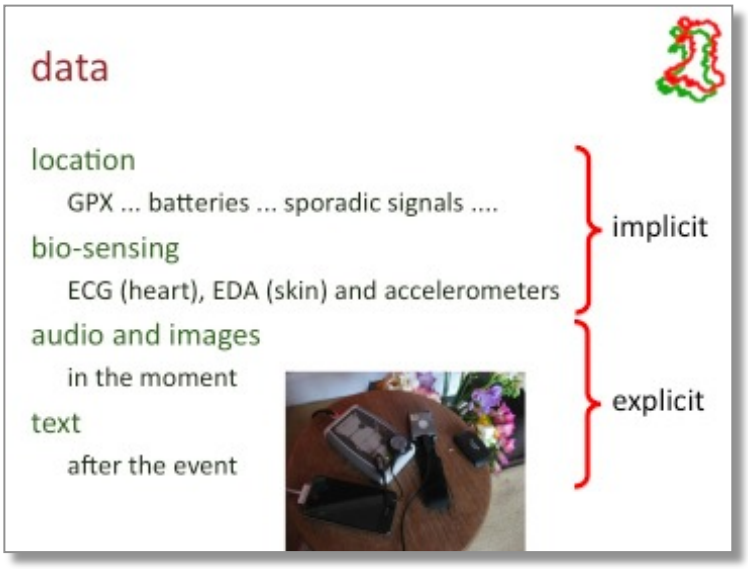
- *There for emergencies / occasional use* – mobile phone there in case of need, or maybe to be available to others if they need to contact you, the SPOT device had an SOS button, which would call emergency services if needed.

- *Used during breaks* – often this may be in places with better connectivity and under cover, for example, I used an iPad mini extensively for writing if I stopped in a cafe. People may use mobile Internet (where available) to book accommodation, or may use a rest gap to post statuses to social networks (signal allowing).

- *Used outwith the walk* – some technology is used before walking for planning, or afterwards for reminiscing, uploading photos, etc.

When I asked the question "what technology do you use?", and when I said that I rarely used technology, it was the first of these which was the focus of the negative response, but all of the above are important aspects of technology use.

Data gathered



I gathered a substantial amount of data, some for my own purposes, some more for others to use. Some of it is quantitative, some qualitative. The quantitative data was implicitly gathered, by automatic sensing, whereas the qualitative data involved some conscious action and deliberation.

Location – There are GPX traces from multiple devices (Garmin stand-alone GPS, ViewRanger app on phone), and some GPS tags on images. This is real, messy data: sometimes batteries ran out, or I forgot to turn on the devices until a short way into the walk, or forgot to turn them off and so have extraneous data points while on public transport or driving. In addition there are sporadic apparently random GPS signals, many miles off the actual position, I assume an artefact of the GPS location algorithms. Unfortunately GPX files do not seem to include the accuracy figure generated by the GPS sensor. I intend to combine these into a definitive data source at some point, but there doesn't appear to be an off-the-shelf tool to do this. When combined there are lots of interesting issues to do with provenance (e.g. whether the data is from Garmin, ViewRanger, or manual editing), and the notion of a track. The GPX format has either routes, which have points with no timing, or tracks, which have points with timing for every point, but a hand edited track will have some points with no associated timestamp.

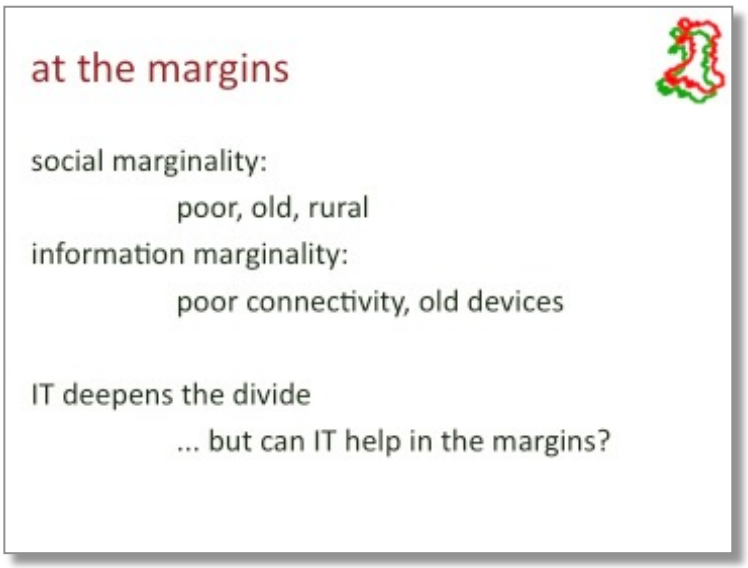
Bio-sensing – I wore a full ECG device (heart activity) and also an EDA monitor (skin conductivity). Both of these also include three-axis accelerometer data. The first of these is particularly voluminous sampling heart electrical activity at 64Hz, giving rise to a 50Mb binary file for a 2 day recording, which expands to 300Mb in a more easily usable CSV format. The ECG data typically includes two-day periods with overnight wearing in between to give rest heart rate and pattern. With around 60 days worth of recording, over 100 days this is believed to be the largest publically available longitudinal ECG data set. The bio-data can be cross-correlated with the GPX data and images (below) to be able to see what terrain gave rise to what kinds of heart activity.

Audio and images – As noted the camera and audio recorder were the most commonly used technology. There are typically 250 photos a day with one day having 643 photos. As well as simply things of interest, I also tried to photograph the path ahead when the terrain changed (e.g. grass to earth) and other things that I felt might be useful to help interpret the quantitative data as well as things relating to qualitative concerns such as signage, or off-path destinations. Audio recording was more sporadic, but typically there are about a dozen audio logs per day, with a wide variety of topics. Again there is a lot of curatorial work to do; it would be good to transcribe the audio logs, and tagging 19,000 photographs is a major undertaking. There are substantial life-logging research challenges here.

Text – I have blogs of typically 2000-3000 words per day. Some were done straightaway, some as 'catch up' later, and some still to complete. This is already more reflective, and mixes description of the walking itself, anecdotes about people met along the way, or things seen, childhood reminiscence and discussion of topics arising form any of these. Again there is a substantial process of semantically annotating this corpus of rich text and a major design challenge to find ways to extract 'threads' about various themes without losing the richness of integrated accounts.

Crucially all of this data is being made available to the research community to use. As noted there are various challenges arising and I am sure many that I have not thought of. As data provider there is a not insubstantial curatorial role in documenting the data so that others can use it independently, although I am also very pleased to work with others to interpret or enrich the data.

At the Margins



One of the core themes of the walks was 'the margins'. Walking the periphery of Wales is clearly traversing the physical margins of the country. This includes most of the major towns and cities of Wales, as they were typically close to the coast from the days when the sea was the easiest way to travel. However, it also passes through many of the most deprived ex-industrial areas of the North and remote rural areas of the West.

Often those at the physical margins, the remote rural areas, are also at the social and economic margins of society with a greater proportion of elderly and a lower average wage than the cities. However, in some ways the physical margins of the walk highlights marginality in general whether you are in furthest edge of Wales, or the heart of London. This is very clearly also true in India, where rural poverty is a major issue, but so also is the vast differences between rich and poor within the city.

Those at the physical margins and those at the social margins are also typically technologically disadvantaged. Free market telecoms infrastructure follows money, so those at the outer margins have poorer mobile coverage, poorer fixed Internet connections and, because they are also likely to be economically poor, old or low-quality devices.

In the UK an increasing proportion of government services are provided through the Internet and commercially the cheapest way to get goods is often online. The poor and those in remote areas are likely therefore to be cut off from eGovernment and pay more for their goods. IT deepens the divide.

However, we can turn this round. Can we envisage IT that serves the margins? A growing number of researchers and designers are addressing just this question, led by pioneers such as Gary Marsden in Cape Town [Ma08, MM08]. While IT development for the well off will happen anyway due to commercial profit, IT for the margins needs those who care to act.

I visited Bangelore a few years ago as part of UKINIT exchange project. One of the things that struck me after that first visit to India was the commonality

of issues between rural communities in India and rural communities back in the UK [Dx09,Ds10].

Sometimes there are lessons to be learnt from the UK's past as we went through industrialisation 150 years ago, and with hindsight maybe it is possible to ameliorate some of the problems left in the wake of the industrial revolution; for example, the breakdown of the sense of extended family and local roots.

Sometimes there are positive examples from developed to developing economies.

One example is in the hand textile industry in India, which is suffering from factory competition. Textile production was the driving force of the industrial revolution, and, for reasons of control more than efficiency, weavers who used to work autonomously within their homes were forced into factories. However, the exception to this is Harris Tweed. Presumably *because* of its remoteness, tweed continued to be woven by hand in the outer isles of Scotland. Now the brand 'Harris Tweed' is protected and can *only* be used for cloth woven in the weavers' own homes.

Lessons can also go in the other direction from developing to developed world.

Mitra's 'hole in the wall' project has achieved international acclaim [MD05]. However, Mitra later went to Newcastle in the UK and did similar work in the poor areas of that city. It was not identical, the British climate and urban vandalism would preclude an exact copy, but similar principles were applied.

About a year ago at one of the Tiree Tech Wave events I organise, the youth worker from Tiree was giving a short talk about the particular problems of youth work on an island. One problem she mentioned was that, due to the distances and dispersed population, it was hard to communicate effectively. One of the attendees suggested Frontline SMS, a system developed for NGOs in Africa. While the interface was not suitable the youth worker was extremely enthusiastic about the underlying idea of using broadcast SMS messages and a dedicated portal, TireeConnect, was built which enabled her to send messages to SMS and social media from the same interface.

One of the ideas that has been on my mind since the early 1990s (pre-web) has been the demise of the village shop, and for that matter local shops in cities. I don't know if this has become a problem yet in other countries, but in the UK village shops and small shops in general get squeezed by larger supermarkets. They are not able to sell as cheaply and so those who can easily travel to large supermarkets do the majority of their shopping there only going to the village shop for 'emergency' items: a forgotten loaf of bread or bottle of milk. The village shop's sales drop, it is even harder to make a profit and many close.

As well as being sad for the shop-keepers, those who do not have cars, the elderly and the poor, suffer both before the shop closes from higher prices

on already stretched incomes, and more so after when it can become exceedingly difficult to shop at all, with difficult and costly journeys by public transport ... and of course buses in rural areas are infrequent when they run at all.

The question I have pondered for many years is whether IT could help, perhaps bring new forms of business (e.g. as email box for the elderly), to allow 'just in time' ordering, or be the drop off point for other forms of postal deliveries [Dx08, Dx08b, DS10].

The solutions I considered 20 years ago are very different to those that might apply today, then it would have been dial-up connections but now broadband, then it would have taken radical changes to logistics, but now Internet shopping means that many delivery systems are already suited to small-run picking.

I never took the action 20 years ago that was needed to turn concept into reality and it may well be that this is an idea that has passed its time. The crucial question is what are the similar issues today?

Community and Identity

One of my 'concerns' in walking was the local issues that matter to communities and indeed the whole nature of community 'at the margins'. Living in a small island and having lived in other rural areas in the UK, I have some idea of important issues, but areas differ and so I wanted to get some idea of the commonalities as well as differences between communities.

It maybe that I would learn nothing beyond whether the issues I was already aware of would apply more generally. However, my hope was that I would learn new things, not so much new answers, but new questions.

My first taste of this came in the first week of the walk.

An interstitial community

I was using my campervan as a base vehicle and so it needed to be parked somewhere when I was using bed and breakfasts. As a first staging post the van was parked in a small campsite near the heart of the old county town of Monmouth towards the southern end of the Welsh-English border. The van was in the campsite for 10 days, but I only slept there for two nights.

The campsite consisted of small holiday touring caravans, the sort that can be towed behind quite a small car. However, it was evident from the small 'gardens' with flowerpots and other things around many of them that they were sited semi-permanently. Many campsites offer 'season fees' that are a lot cheaper than the nightly fee, and I assume many of the caravans are parked for the entire season from April to October.

The small clubhouse had a bar and provided meals. It was itself run by one of the people staying in one of these small caravans. It was open five nights a week, the other two nights were when the proprietors went 'home'. However, the idea of 'home' was problematic, for seven months of the year, they spent five nights of the week on the site. Other owners had similar patterns; one woman said she needed to go 'home' to do clothes washing as she had been several weeks on the site, but would be back after a couple of days.

The site was set within the middle of the local community of Monmouth and yet had an identity of its own, a community in the gaps.

In some ways they have similarities to gypsy communities, except if this had been a gypsy encampment it would be rapidly broken up by the police and moved on.

However, unlike gypsies, these people had a parallel life somewhere else. In a way they form a virtual community, like academic communities, or

professional communities of interest, but differ in having a very well-defined physical location.

Certainly this interstitial community, sitting between the cracks, challenges simple notions of locality and community, with multiple communities co-existing in the same locality and individuals belonging to multiple simultaneous 'local' communities. Demands of work are creating increasingly itinerant lifestyles for both city professionals (I live 350 miles from my place of work!) and migrant workers, so rather than being an extreme case, in some ways this small caravan community epitomises broader patterns of changing life styles.

Community and cohesion

The north east coast of Wales has some of the most depressed communities in the country. Rhyl functions as the dustbin of Liverpool. It is a run-down seaside town with a surfeit of old bed and breakfast accommodation. When families and individuals are too difficult to place in Liverpool (and there are some pretty rough areas of Liverpool), they are sent to Rhyl. Drug abuse and poverty are high and it is the most depressed 'ward' (local authority unit) in Wales.

The reasons for Rhyl's problems are not hard to see. However, I was also struck by the way different communities facing hardship seem to cope differently.

Connagh's Quay is a small ex-industrial town on the Dee Estuary. The industries that gave employment to the area have all closed and it is visibly run-down; even the pubs have closed, usually the last thing to survive in a British working-class area.

Further along the coast are other coastal villages that lost their industry. Penmaenmawr used to have large limestone quarries. There is still some quarrying, but now using modern machinery and employing a tiny number

of people. Furthermore a road and railway cut the town from the sea destroying any potential for seaside tourism. There is a tiny area called the 'Promenade', barely 50 metres long, and reached through a tunnel under the railway and road. It has nothing going for it, and yet the promenade is one of the best kept that I saw in my travels, with a small beach cafe that has local heritage books to read while you eat. Local notices give a sense that there is a vibrant living community here.

Why does one community decay from within and another retain its heart? Is it the physical circumstances, the open sea lifting the spirits compared to the grey mud of an estuary? Is it simply distance from Liverpool? Or is it the difference between a past rooted in the ground beneath you, literally connecting you to your locality despite hardship, compared to the smell and filth of chemical production?

Language and culture

In Wales, language, culture and national identity are intimately linked, even for those who do not themselves speak the language. In the UK, as in other areas of the world, regional languages are constantly under threat.

This has changed in my own lifetime. When I was a child Welsh was not apparent with the exception of a Welsh version of the TV news (it was fun seeing the same images with different commentary). However, following many years of campaigning by the non-violent language movement (and the activities of paramilitary groups, whose role is usually downplayed [Cl13]), there was a substantial change during the late 1970s and 1980s, with dual language signs, and most important S4C, the Welsh language TV station.

In contrast to the 1920s when children were punished for speaking Welsh in school, now there are a large number of schools where the teaching is all done in Welsh, with substantial numbers of English speaking parents sending their children as well as Welsh speakers. As I walked through the west of the country, people of all ages spoke Welsh as their main language

and in Monmouth (in the east) I met an Englishman who had learnt to be a fluent Welsh speaker and recently addressed a local council meeting in Welsh.

However, in the last census the proportion of Welsh speakers in the core Welsh counties dropped slightly, after many years of increase [BB12]. One reason is incomers and retirees who can (if they don't learn the language) dilute the local language and culture, as well as price-out the young people from the housing market. Another is media. When S4C was founded it was one Welsh channel with three other TV channels. Now it is one amongst hundreds of English language channels on satellite TV, with the majority of web materials also in English. This is of course a common story across the world, not least India with hundreds of languages under theat.

In principle, IT can help *long-tail* communities. The term 'long-tail' arose in the business community [An06], but became one of the defining features of Web2.0 [OR05]. Most traditional large businesses and early web sites focused on satisfying some broad interest shared by a large number of people, for example, people who like action movies, or the latest pop star. However, Web2.0 sites used the global reach of the Internet combined with web personalisation, to cater for smaller groups of people, for example, those interested in pet ferrets, or 1980s Newcastle-based Rock and Roll bands. In principle, this ought to also apply to minority-language groups, but this promise does not seem to be materialising. Can we help make this potential into reality?

One promising example of this happening is the translation of Code Club materials into Welsh [CC13, CD13]. For older children programming language translation is probably not a big issue. However, for the youngest children, being able to not only read work cards., etc, in their own language, but also program in Welsh not only reduces barriers, but also says that Welsh is a language of the future, not just the past.

Tourist towns often have maps: either paper maps to carry around or 'you are here' maps on boards. Some of these are 'standard' maps in terms of shape, but may have different things on them compared with route map: emphasising local businesses and accommodation, main shopping streets and historical attractions, but de-emphasising residential areas where tourists are not expected to go (and may not be wanted). Sometimes they also differ in shape, maybe making the centre larger in a fish-eye effect, or drawn in semi-perspective, as if viewed from a hill rather than directly overhead.

Digital mapping has never been easier with Google Maps, OpenStreetMap, and in the UK, the Ordnance Survey making some of their mapping open data. However the ease of using 'standard' maps runs the risk of replacing the more locally meaningful maps. As Barbara Bender said:

> "*Post-Renaissance maps cover the surface of the world with an homogeneous Cartesian grip*." [Be96, p.41]

In Cardigan in West Wales a centenary was celebrated by knitting a giant cardigan (as in the kind to wear) that was a map of Cardigan. In the Dysynni Valley I saw a 3D community map, that was based on the 'standard' map [Wh96], but made out of fabric and stitch, like the "Land of Counterpane" in Robert Lois Stephenson's "A Child's Garden of Verses" [St85].

Is it possible to retain the richness of local mapping in a digital age?

As an attempt to hold on to some of this richness, *Frasan*, the Tiree island mobile heritage app uses digitised versions of hand-drawn maps of Tiree for its 'zoomed out' view, only dropping into 'standard' maps when you zoom into detail [An13]. It uses 'rubber sheeting' algorithms to map from the GPS coordinate system to locations on the map to plot the locations of archive items and the user's current location [Dx13].

Health and Well being

When I started the walk I had not walked any serious distance since I was 18 years old, and even then never day-on-day walking such as this. The fact that I was starting at such a low point will hopefully make the ECG data particularly interesting for health and well-being researchers.

In fact, walking for research is far from a stress-free contemplative experience! As well as spending eight to ten hours a day on my feet, I was writing approximately 2000 words a day and spending at least an hour 'tending technology' (charging devices, copying files from one device to another, etc.) and more when on WiFi and uploading data. In addition, I had to either plan bed and breakfasts with virtually no Internet connectivity and/or plan public transport back and forth to campsites with, often, virtually non-existent rural bus services.

One consequence of this is that the ECG trace very clearly shows my heart rate soar at 5am, at first light, when I start to stir and yet while still asleep begin to mull over the day ahead. Indeed during this 'worry time' the heart rate peeked as high as when I was doing the most strenuous walking. No wonder people die at night!

Physically, after a few weeks I was a mountain goat, becoming one of those really annoying people, who walk up steep hills effortlessly passing everyone on the way. However another month in and long-term exhaustion and damage started to set in with various aches and pains and deep, deep tiredness. Happily this too eventually passed, except for the soles of my feet, which took a month to recover after I finished.

I had expected that my legs would strengthen while walking, but that maybe my upper body would atrophy a little without similar exercise. I had intended to deliberately do exercises in the evenings, but never had time. When I got back I decided to try a few press-ups, and, to my astonishment, I

could do 30 press-ups effortlessly when before the walk I could mange 10-20 with effort. In succeeding days I found I could regularly do 50 press-ups at a time, and indeed have once done 100.

This is not upper body strength, but the fact that walking has both strengthened my core muscles (stomach and back) and also improved general cardio-vascular fitness. If you are strong enough to do one press up you are strong enough to do one hundred, it is getting oxygen and fuel to your muscles that is the limiting factor.

Walking is in fact one of the best forms of exercise, with little risk of injury (well unless you walk 1000 miles at a go!), and many health benefits; even cancer recovery is significantly improved by walking.

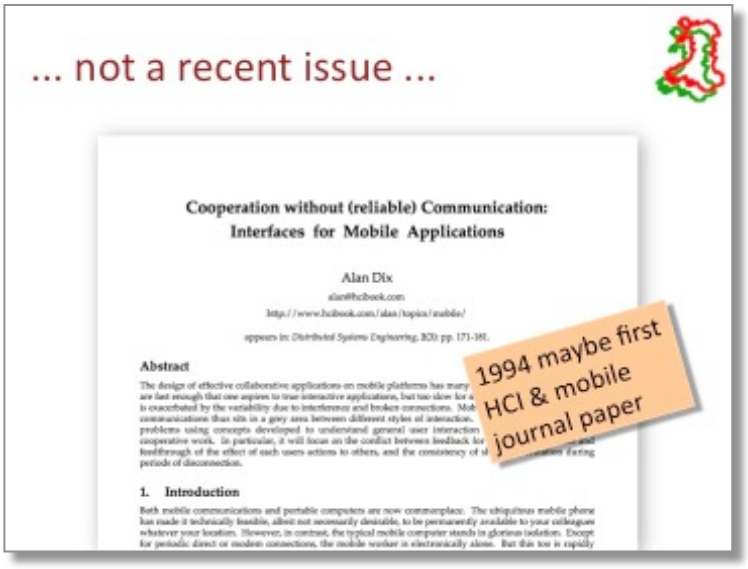
In the UK, childhood and adult obesity is an increasing problem, as it is across much of the developed world, and I believe this is even true now amongst the more prosperous in India. In the UK, the biggest problem is amongst the poor; calorie deficit is rarely a problem, just that the cheapest foods are 'junk foods', so a poor person's diet is usually a poor diet.

Sadly, while walking seems 'free' actually many are put off walking because of the need (in the British climate) for expensive rain gear, boots etc. – fitness is big industry. I spoke to a taxi driver who was severely overweight, and loved walking, but couldn't as he was not able to find affordable rainwear in his size XXXL.

These equipment problems are compounded by expensive and infrequent public transport, which makes it hard to get out of the city unless you have a car. I recall when I was a child, I couldn't afford busses, and it could take an hour or two to get clear of the city before I walked in the countryside. I did it because (at that point!) I was already fit, but what about those who are taking their first tentative steps at exercise?

However, there are positive signs too. In Llanelli, where long-closed steelworks used to border the seacoast, the land has been reclaimed into nature reserves and waterside parkland. It is one of the poorer areas of South Wales and yet there appears to be widespread pride in this urban-edge land that is designed for walking and cycling. As is common, the residential developments are 'executive', but the parkland is open to all.

Connectivity

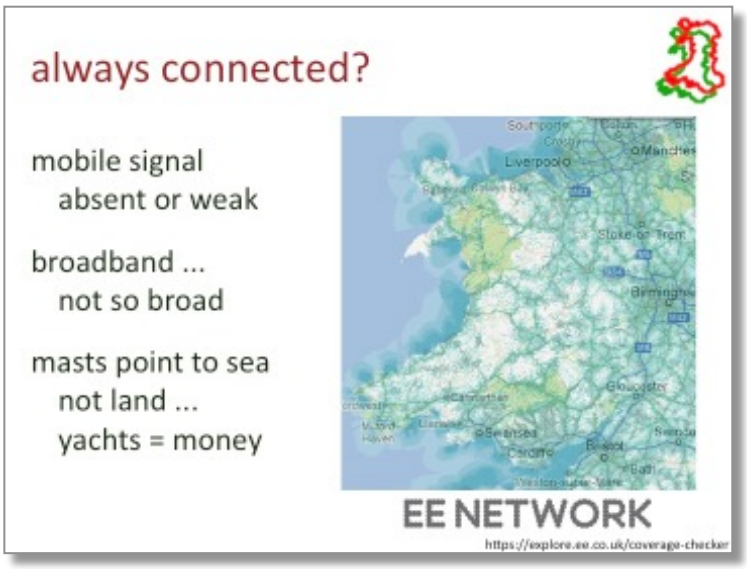


I have been interested in timing issues in the user interface throughout virtually my entire academic career. In 1995 I wrote, what I believe to be the first journal paper on HCI issues for mobile systems [Dx95]; the topic was not about screen size, but connectivity and disconnection.

I live on an island with virtually no mobile signal and limited broadband, so I thought I was prepared for connectivity problems during the walk.

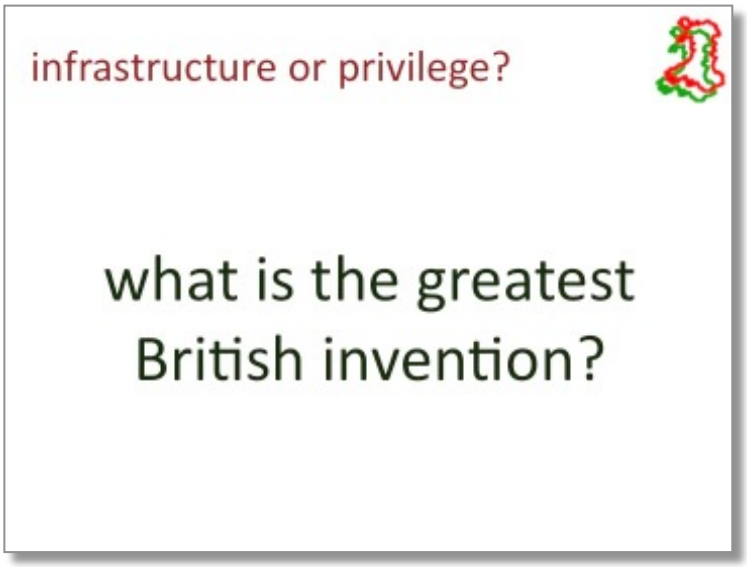
I was wrong.

It was far, far worse than I had imagined. For mobile signal I rarely had more than two bars of GSM and often no signal at all, especially in places I stopped overnight. The best signal was on hilltops as they are more likely to be in line of sight of masts. This was compounded because WiFi and wired Internet connectivity were equally difficult. In hotels and guesthouses, even when they had WiFi, the technical setup was problematic (this is the same in the middle of cities also!); it is still remarkably difficult to simply set up a reliable WiFi hotspot. Furthermore, the underlying Internet in outlying areas tends to be relatively low bandwidth, and, more critically, sporadic, with occasional drops for a few seconds or half minute.



The reasons for this are not hard to tell. First the physical conditions are hard for both mobile and wired connectivity: long distances in sparsely populated areas with deep valleys and high hills. However, this is compounded by economic factors, basically signal follows money. If you look at mobile operators coverage maps of the country they at first appear to have relatively good coverage at the coast. However, if you look more deeply you realise this is relatively good coverage just *off* the coast, mobile masts point to sea, not land.

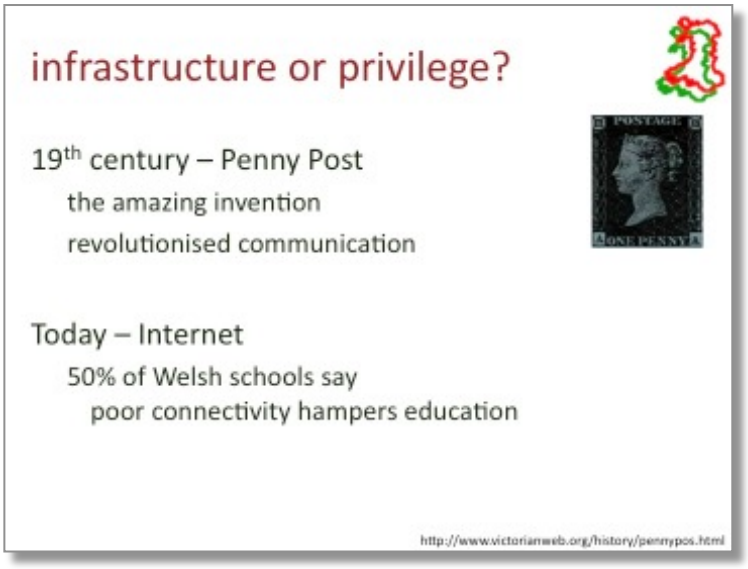
The reason is simple, at sea are yachts, and yachting people tend to be well-off, whilst those living in remote coastal areas tend to be poorer.



Infrastructure or privilege

During my talk, I asked the audience, "what was the greatest British Invention?" I got various answers, including the World Wide Web. The Radio Times have a list of "The 50 greatest British inventions" [RT13] from telephone to television, hovercraft to hip replacement, photography to

programmable computer; interestingly the article is illustrated with an image of Tim Berners-Lee. The Daily Mail has a shorter list of ten inventions, which includes many of the same inventions as on the Radio Times list [BM11]. However, it is the last item on the Daily Mail list, which does not exist at all on the larger Radio Times list, which gets my vote: the Penny Post.



In the early years of the 19th century postage depended on the route and carriers taken and was often paid on arrival by the recipient. The fixed cost prepaid 'Penny Black' stamp changed this. There were already Penny Post systems in some cities, charging a single penny for delivery anywhere. Following proposals by Rowland Hill this was extended to the entire country and later the Commonwealth [BP13].

Hill fully understood the importance of this postal revolution for an informed and educated citizenry. In language, reminiscent of recent commentary on the web and the Open Data movement he writes:

> "*how much the religious, moral, and intellectual progress of the people, would be accelerated by the unobstructed circulation of letters and of the many cheap and excellent non-political publications of the present day, the Post Office assumes the new and important character of a powerful engine of civilization*" [Hi37]

Indeed within 20 years the volume of post had quadrupled, easing not only the communication of ordinary people, but also business.

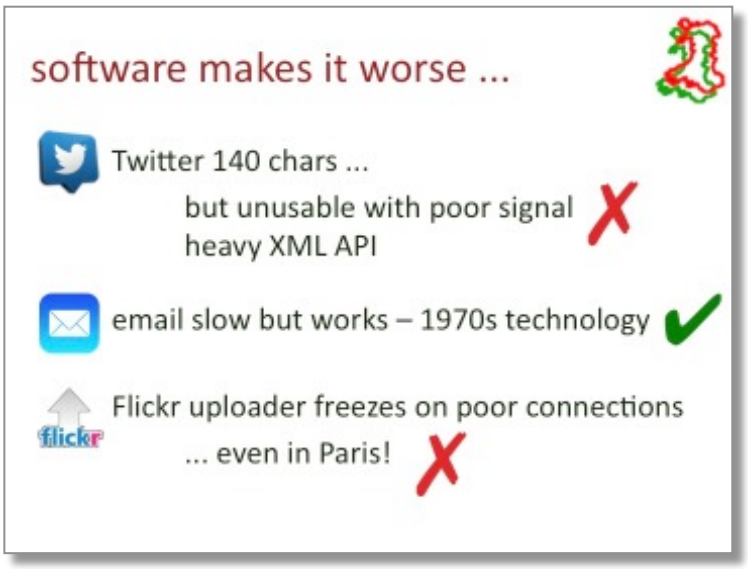
Now, the Internet has in many areas taken on the mantle of universal communication, not least in government services. However, this is predicated on universal access. A small business recently won a case against the UK Inland revenue, who were seeking to impose an Internet-only system for the payment of VAT (purchase tax). The business successfully claimed that lacking a computer, for religious reasons, it was unfairly discriminated against [Gl13]. At an individual level, the UK's Universal Credit system is being introduced which brings all forms of welfare benefit into a single system. However, it too is a to be an Internet-only system. Pilots for the

scheme have found that half of all claimants did not have home Internet and half lacked sufficient IT skills to use the system [Sh13, CA13b]. Given that those on welfare are disproportionally elderly, ill, disabled or poorly educated, this news is not altogether surprising; indeed a report prior to the pilot suggested that only 8% of potential claimants had all the requisite skills [CA13].

It is easy to think of web and Internet access as luxuries or optional, but it is clear that in so many ways it has become a necessary part of 21st century citizenship. While I was walking a report was published that revealed that 50% of Welsh schools said that poor Internet speed was a major obstacle to education. This is a whole generation who are being brought up disadvantaged relative to those in more well provided areas.

Of course, while this situation is problematic in Wales, similar patterns can be found across the world. In India, with high levels of illiteracy and poverty, no one assumes universal access to the Internet, but differential access to information and services will intensify existing socio-economic divisions within the country as well as between India and more wealthy parts of the world.

Connectivity problems do not just affect the poor and those directly lacking access. Current PC and phone operating systems and applications periodically update themselves. However, these software updates or not infrequently hundreds of Mbytes, or several Gigabytes in size. These can be impossible to install over slow or intermittent networks. The un-updated PCs are then running older software with potential security flaws, fertile ground for malware to create bot-farms to attack financial, government or military institutions.



Software makes it worse

However, on top of poor access to both mobile and fixed networks in rural areas, software makes things worse.

I had expected to heavily use Twitter during the walk, making semi-poetic tweets at beauty spots. Instead I found mobile Twitter virtually unusable, typically freezing on a white screen with a blue top banner, not even getting so far as to say 'Twitter'. I believe there are three problems causing this:

1. While actual Tweets are just 140 characters , when delivered over the data API each one is wrapped in vast quantities of meta-data in XML or JSON. The example feed in the developers' documentation [Tw13] for accessing the timeline has one tweet with 74 lines of JSON taking 2 Kbytes and another with 108 lines taking 3 Kbytes. The sizes for XML format would be even larger.
2. The default download count for the timeline is 20 items, but it is clear that many apps access 50. A small number of large accesses is more efficient for the Twitter servers, but can lead to large results and hence very slow responses on mobile networks. At some point these can become so slow that some part of the system times out.
3. The Twitter mobile appears to be synchronous, downloading the timeline before showing the rest of the interface. This means that you cannot simply start the app and set a status.

Finally, if you are fortunate and patient enough to be able to set a status but in the meantime the network has dropped, several third party apps, and the Twitter mobile site simply lose the status. Happily the Twitter app is slightly more resilient saving the un-sent status as a draft.

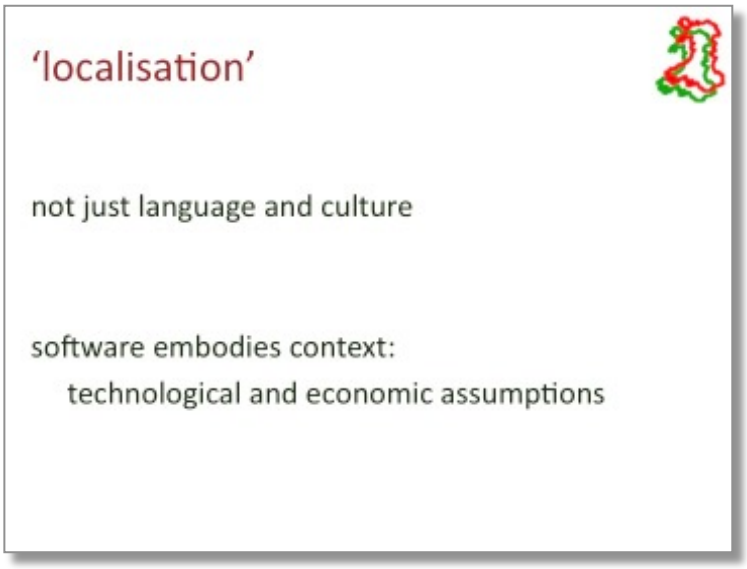
In contrast, email works slowly, but useably on just a few bars of GSM connectivity. Emails are much larger than tweets, but email is 1970s technology and so designed from the outset for slow and often intermittent (e.g. dial up) networks.

Problems with software are not confined to mobile apps. Flickr uploader is particularly problematic when the Internet is at all intermittent. As noted, rural Internet often drops for a few seconds, even if it is otherwise able to provide usable bandwidth. I assume this is due to contention problems, or maybe parts of the network simply loose connectivity and have to re-establish handshakes. This can cause Flickr uploader to 'hang' in the middle of an upload. Even when the Internet returns the uploader still stays frozen with some images uploaded and others not. Two things compound this:

1. It does not keep any track of what has been uploaded successfully, meaning you have to attempt to work out by looking at the web site what has and has not been successfully uploaded.
2. This comparison is made more difficult because the uploader does not add tags or add the images to sets until after they have all been uploaded. This means that all the images that have been uploaded before the failure are uncategorized.

Note that these freezing problems are not confined the rural margins of Wales or the remote islands of Scotland, but anywhere where networks become temporarily unreliable. During the walk I took a short period off-path when I went to Paris for the CHI conference. I was staying at the hotel attached to the Le Palais des Congrès, the largest conference venue in Paris. However, from about 7am–9am in the morning and pretty much all evening, the network behaved very similarly to Tiree Internet on a bad day, just the pure volume of demand stressing the network leading to occasional 'outs', and, yes, Flickr uploader failed!

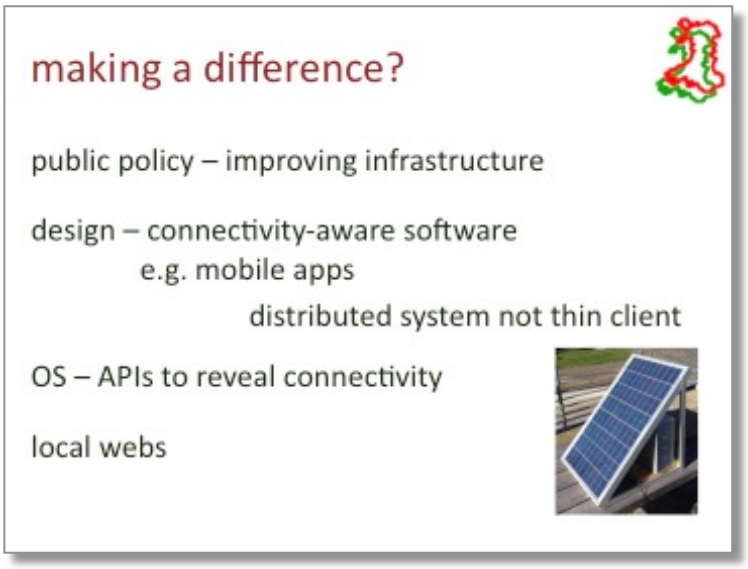
Both this and Twitter's behaviour are simply bad engineering, but bad engineering due to an implicit assumption that networks everywhere are the same as those found in Silicon Valley.



Software companies have understood the need for localisation, making interfaces more appropriate for individual contexts, in terms of language and (to a lesser extent) culture. However, this is not enough.

Software embodies technological and economic assumptions about context, which, when they fail, can effectively disenfranchise large swathes of the population.

These assumptions are very deeply entrenched, not just in app design, but in the underlying TCP protocols where 'slow start' behaves particularly badly with mobile or other 'gappy' networks.



Making a difference?

There are various ways these problems could be addressed:

Public policy – It is not inevitable that rural and poorer areas are poorly provided. Some countries prioritise coverage over money when auctioning 4G space, or have had policies of subsidising broadband in outlying areas. However, this does need to be informed; for example, UK government is promoting 4G coverage as a panacea for improving rural broadband, but experience of 3G and 2G coverage makes this extremely unlikely to be effective.

Software design – many of the problems mentioned for Twitter and Flickr are due to poor engineering and failing to take into account that network operations may be slow or fail. One simple approach is to design mobile apps as distributed systems rather than thin clients, effectively making intermittent access the default assumption, with better connectivity simply yielding better experience.

OS and platform design – Underlying operating systems and app platforms need to pass on information about connectivity up the stack to applications to enable them to modify behaviour. For example, the mobile phone knows the level of signal, but it is not easy for, say, a simple web app to access this. As well as coping with presence of signal, it is also important to know whether bandwidth is metered as those on lower-cost plans often have limited total download sizes or pay per megabyte.

Local webs – There are solutions for providing local web access even when there is little or no network connectivity; for example, 'Qraqrbox' uses a combination of cached web sites, local DNS redirection, and solar power to provide micro-access points far form fixed infrastructure [Qr13]. However, it is still more commonly the case that communicating between two computers in the same local area relies on 'tunnelling' through the telecoms operator's infrastructure to ISPs hundreds of miles away.

Research Looking Out

I have described how I offered myself as a living lab for others to give me instrumentation of various kinds. This worked more or less well in different cases.

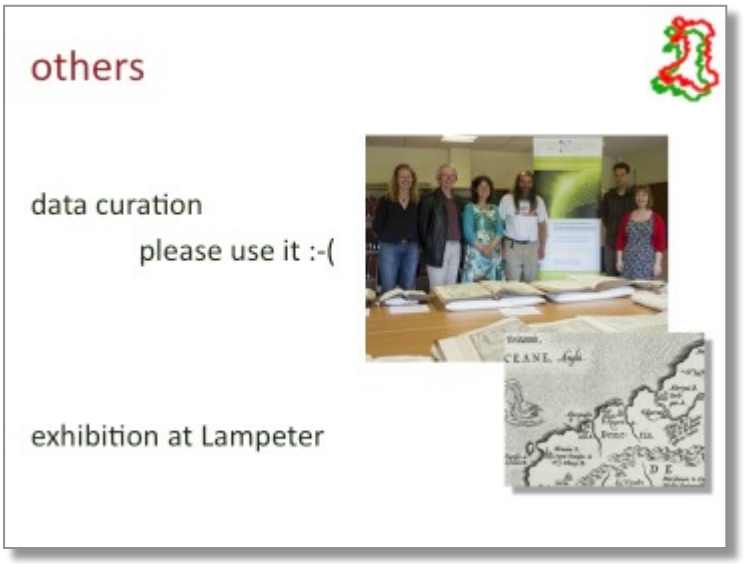
Mobile-based applications suffered due to general problems with signal and battery power, and custom hardware struggled to survive days on end bumping around in a rucksack with constantly changing levels of temperature and humidity. These are classic problems when coming out of the lab into the field where the researcher is not on hand to tweak and nurse their technology.

On the other hand, the biosensors worked well providing a unique dataset and, despite a busier than expected walking schedule (due to overestimating my walking speed!), I was able to look out for evidence on a number of 'concerns' from others that I hope will feed back into their research.

In HCI we normally treat every enterprise as a one off, with the researcher's individual (or a group's) goals investigated. In contrast to this solipsistic research model, I treated this expedition more like a deep space mission,

supplying the launch vehicle (me!), but opening myself up to others' research agendas (and equipment).

This is not a common way to do research, and, not unexpectedly, not everything worked out as planned. However, I have learnt a lot about the reasons for this, and in general how to work in this more outward facing mode of research. We are at a time when open access and open data are hot topics, but this kind of 'open research' is still uncommon.



Despite its difficulties, I believe more open 'research for others' is important if HCI is to develop as a discipline [Dx10]. Whether it is experimental or qualitative work, we see large amounts of effort expended collecting data that is then discarded. Some disciplines now demand that raw data is published alongside experimental results, but this is rare in HCI, even in areas, such as Fitts' Law experiments, where there are few issues of anonymity or consent.

As noted, I have advocated previously that we should create more sharing points than the simple published paper, which does a bit of everything (often badly), instead allowing those with different expertises to apply them at appropriate stages of HCI research life cycle [Dx10].

As a personal step towards this I am learning how to curate and document the data I gathered, quantitative and qualitative, so that it can be of use to others. In addition, I need to learn how to publicise the availability of this data. In HCI we normally publicise the results of analysis of data, through conferences, and publications, but not the data itself, so this is also a new art for me.

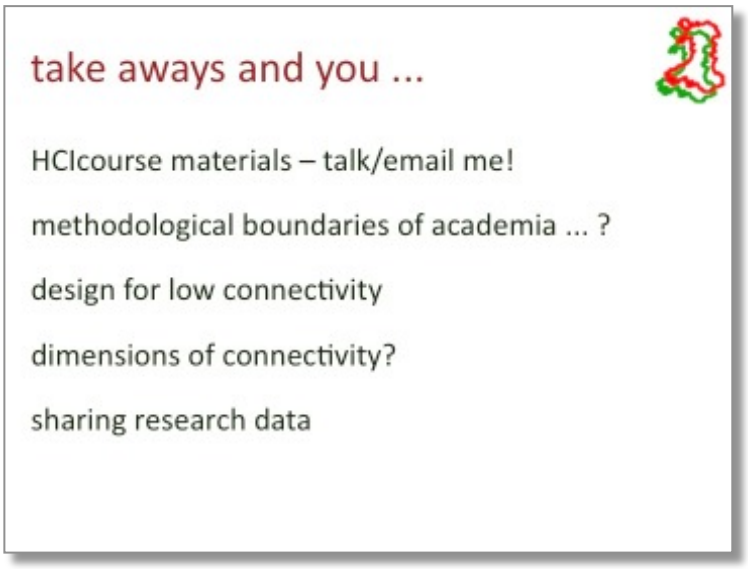
As well 'outward facing' work that I am directly involved with, I have seen a number of outcomes which are in a sense inspired by, or prompted by, the walk, but not 'my' outcomes.

While planning the walk I found myself developing a new contact network of people interested in various issues connected with walking from health and

well being to tourism, arts, media studies and spatial cognition. This has led me introduce people who did not know of each other's work, but clearly have much in common. Only time will tell how productive these will be, but there is certainly the potential for some long term outcomes, of which I will probably never be aware.

At a more concrete level, when I visited the University of Wales Trinity St David at Lampeter, the archivist at the Roderic Bowen Library and Archives produced an exhibition especially for my visit. A table was spread out with documents, some dating back to the 12th century, all opened on pages related to walking, maps of Wales and related topics. This exhibition has now been translated into an online form that is permanently available, an outcome 'due to' but not 'out of' my research [RB13].

'Take aways' and the future



The talk and these notes cover a wide range of areas. The very idea of walking as research stretches the methodological boundaries of HCI. This is clearly not appropriate for all situations and to some extent as an experienced and successful researcher I have both the freedom to be more methodologically risky and also the experience to balance, mitigate and benefit from these risks.

From a design perspective those at the margins whether geographic, or social have different and special needs. There is often less money available so that appropriate design has to be smarter design. Often those already at the margins are further marginalised by digital technology; can it be designed to be part of the solution not the problem?

I focused on connectivity as an issue as it is one I have studied for many years. It is safe to assume that, in the foreseeable future, those at the margins will always have poorer access to mobile and fixed Internet. This inevitably means that applications and services will be slower or in some way degraded, but crucially they should be designed so that this is a gradual degradation not leading to complete failure, as is evident in much commonly used software.

As well as being a societally important question this is also an academically interesting one, with challenges for interaction design, software architecture and network infrastructure.

One area in which I would particularly appreciate input from others is in understanding the ranges and types of connectivity barriers. My experience is that low bandwidth is less critical than intermittent service, but different areas and different parts of the world have different issues. In some places cost is more of an issue, in others digital literacy. If the core issue is cost, is this based on per megabyte data transfers or connection hours? Maybe it is common to have cheaper/faster periodic access with periods of total disconnection, in other areas permanent but low-grade access. Understanding these dimensions of connectivity is important if we are to be able to deliver appropriate guidance to designers and developers.

Moving back to HCI as a discipline; I am certain that academic maturity should involve more fine grained use and reuse of each others research data and materials. The World Wide Web was conceived as a way for physicists to share data from CERN, can we in HCI learn to use it in similar ways?

And finally, I am often asked, "what next?

I'm still not sure of the answer, but there will be something.

Early in the walk I noticed people had started to talk to me as if I was one of the *kind of people who do things*. I found this strange as I always thought of other people as the *kind of people who do things*; I knew some of them, but

that wasn't me. Only gradually did I realise (my goodness how late in life), that there is no *kind of people* who do things, just *people who do things*.

And having started I will do more.

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