8 Digital devices

Knowing material culture

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Introduction

This chapter explores the anthropological significance of contemporary digital devices as forms of material culture. Digital devices, from smart phones to fitbits, sleep-monitoring apps to air-quality monitors, are an increasingly important aspect of people's way of relating: to their friends, family, bodies, and environments. Such devices offer a new focus for material culture studies (MCS), extending key questions about the role that objects play in social relations, how they are interpreted and given meaning, and how they mediate relations (Appadurai 1986b; Harvey et al. 2013; Miller 2005b, 2008). However, they also raise some challenging questions for MCS, particularly as regards the relationship between their status as objects and their place as generators of information, data, and knowledge. The ability of digital devices to not only be *subject* to human interpretation, but also to *produce* their own ways of seeing and knowing, demands an approach that goes beyond the usual forms of material culture analysis to consider how devices operate, not just as objects, nor even as agents, but as empirical or knowledge-producing entities.

Prompted by the challenge that this aspect of digital devices poses to anthropological understandings of human/object relations, this chapter explores how such devices might fruitfully be studied by drawing on anthropological and philosophical approaches that have considered, not the sociality of objects, but the materiality of knowledge. There is a resonance between this chapter's attention to knowledge and the critical focus paid to technical agency in Chapter 4 by Ludovic Coupaye. To explore these lineages, further detailed below, and to look at how existing understandings of knowledge and expertise might help us understand the informational qualities of contemporary digital devices, the chapter draws on ethnographic research that I have been conducting in the UK with people who use and engage smart-energy monitors to explore their relationship with energy, houses, and the global environment.

The chapter explores how digital devices like smart-energy monitors come to participate in social relations by drawing attention to their role as knowledge-producing entities. In order to operate successfully as knowledge-producing

entities, digital devices must be able both to *sense* material relations to which they are oriented and to communicate this sensory information to other entities (including human beings) who are invited to respond to the formal outputs of these devices displayed as numbers, images, text or electronic signals. Understanding the part that digital devices as producers of knowledge play as participants in human social worlds demands that we pay attention to not only their materiality as static objects, but also to the way they work through sensors, communication protocols, and symbolic representations to forge a relationship between environments and people. Digital devices, I argue, are thus revealed to be not only *products* of knowledge, nor objects of *interpretation*, but also *active participants* in the formation of social imaginaries and material worlds.

Digital devices

On the grassy banks of the River Rune stand twenty-seven two-storey white terraced houses. Wide windows flanked by tomato plants, and balconies sporting pots of garden herbs give a bucolic aspect over the water, which tumbles and bubbles over glass-brown pebbles and swaying green water weeds. The houses are part of an English co-housing site, an eco-community established to provide an alternative, more communal, less resource-intensive way of living.

It is a wet Tuesday morning, and Tom is walking a group of visitors from an EU-funded smart community energy programme around the co-housing site, explaining how the place is powered. We start our tour at the clubhouse, which is shared with a local fishing club. A fine drizzle of rain gathers on eye lashes as we blink upwards to look at the three solar panels installed on the clubhouse roof and on the roofs of houses on the other side of the riverside path. Then, we turn en masse to follow Tom and, trudging along the path by the river, he tells us about the history of the place as a nineteenth-century dye factory.

At the end of the path, a grassy space opens out as we stop in front of a large shed. High, heavy double-doors hide the hydro-powered generator, though we can hear it whirring inside. A cut-out in the side of the building reveals a computer screen showing information about the energy that the generator is creating and a graph of its generation over the past week (Figure 8.1). Inside the stone building we climb up onto a platform above the generator, which is all servers and computers with wires and monitors, with photos of the grand opening day for the generator pinned to the wall next to newspaper clippings of local and illustrious visitors. The hydroelectric generator itself quietly hums away below us, encased in a leaden-green iron shroud, while we glance at the computers around counting kilowatt hours.

The monitors in the hydro-generation room are the most visible to us on the tour, but we discover that there are many other devices busy counting energy and materiality around the site. Each of the houses has an electricity

meter ticking up a register of energy used. Four electric cars are charged at another point, attached to a separate meter that counts their electrical charge, data used to calculate costs of hiring them out. An industrial unit housing several small businesses that are organisationally linked to the housing cooperative also draws electricity from the solar panels and water generator as well as being heated by a biomass boiler. At the moment, the data from each of these sites of activity accrues on individual analogue meters, while the whole site sits 'behind' an energy company meter used to bill the co-housing group for the difference between the energy they produce and the energy they use as a collective. It is Tom's job to work out the bills for the households and the businesses on-site.

Currently, Tom has to copy the details from each meter into a spreadsheet and manually calculate everyone's annual energy bills. The visitors he is showing around today are part of a project that is exploring whether smart meters that use sensors and collate and display data using online monitors might be able to transform energy communities, and how they might be of use to this particular co-housing group.

Detecting digitally

The digitisation of monitoring and metering is a ubiquitous, if underappreciated, part of contemporary life. While there has been considerable attention paid to data analytics and surveillance technologies that track and trace people's activities online (Amoore 2018; Amoore and Piotukh 2015; Boyd and Crawford 2012; Zuboff 2018), the more mundane kinds of ubiquitous monitoring upon which digital devices rely for their functionality are rarely given much attention in anthropological research. Nonetheless, everywhere we now find digital devices we also find sensors and monitors. On mobile phones, motion sensors collect traces of information about the movement of the user that are translated into data on steps taken and sleep quality, and used to power haptic gaming experiences. Combined with apps that monitor the GPS signal emitted by handsets, movement data is used to detect a type of activity being undertaken by the phone's user (e.g. walking, running, cycling, travelling by train). Digital augmentations of a more extended range of mundane objects, from cars to fridges to clothing, are referred to by technology developers and business enthusiasts as ubiquitous computing (ubicomp) or, more recently, the Internet of Things.

What, then, are we to make of the sensory and epistemological capacities that characterise these devices? In much anthropological work on the digital, digital objects have to been seen as equivalent to, or extensions of, other kinds of material culture, different only in the fact that they are made of 0s and 1s, which is often seen as no difference at all (Miller et al. 2016; Miller and Horst 2012). The importance of the augmentation of objects through sensors and monitors that display and collate information has remained for the most part sociologically and anthropologically irrelevant, hidden by rich user interfaces

through which people engage in relationships with one another at the level of symbolic meaning, with the materiality of the devices and the relations they engage in themselves fading into the background (See, for example, Boellstorff 2008).

Yes, while the focus on the social and symbolic importance of digital devices and platforms has constituted the main focus of anthropological interest in the digital to date, I contend that it is in fact the ordering of the sensorial, informational, epistemological relationality of digital devices that most significantly differentiates *digital* devices from other kinds of material culture (see Coupaye, Chapter 4, for a more extended discussion of the role of 'sensors' and 'effectors' in object relations). Indeed, it is these sensors and the monitors that display and collate digital information from such sensors, that turn objects from things into seemingly 'empirical' technologies (Marres 2015, 2017) capable of participating in social relations, not as mute things, but as knowledge-producing entities. I argue that, as scholars of material culture, once we notice these apparent knowledge-producing qualities of contemporary digital devices, it becomes incumbent on us to explore what the implications of object-knowing might be for the way in which we conceive of the relationship between objects and human social life.

Until now, the main options for looking at the role of objects in everyday life have been to either look at the social shaping of objects, that is, to attend to the ideas and concepts that go into and are carried by design (Latour 1991; Schwartz-Cowen 1985; Winner 1986) or, alternatively, to look at the way in which objects are used to carry social meanings in particular cultural settings (Appadurai 1986b; Bourdieu 1984a). The concept of 'Actor-Network Theory' put on the table the notion that objects also have agency (Latour 1999; Law 1999; Law and Hassard 1999), but although this extends agency to objects, this approach has tended to stop short of attributing these same objects the capacity to 'know.' Indeed, in a critique of overly humanistic accounts of how social effects come into being, actor-network theorists have located the value of their method more squarely on the 'ontology' side of an ontology/epistemology divide, preoccupied with how things or assemblages come to *be* (Latour 2005). But what if we were to extend the teachings of ANT even further to ask not only how do objects have agency, but how might objects also figure as forms of non-human *perception*? When objects take on capacities for measurement and description, I suggest that this opens up the possibility that objects are now able to create not only new kinds of relations but also new ways of what we might call 'knowing' (Küchler 2008; Thrift 2014) due to the way they materialise methods of social and physical analysis into their design (cf. Coupaye, Chapter 4). Just as ANT's attention to object agency has led to a refiguration of the idea of human agency, so I suggest that an attention to 'object-ive' perception holds the potential to opens up new ways of thinking about and locating the nature of knowledge.

Knowing with devices

Several months after the initial tour of the co-housing site, I return with Tom from the community smart-metering project to explore, with residents of the co-housing site, how smart-energy monitoring might help them understand and manage their energy use. Each of the homeowners is going to have a smart meter installed. This will take the form of an 'extension' that will be attached to their existing electricity meters. This SMX (Smart Meter eXtension) has an electrical pickup that detects the electrical current and voltage passing through the wires that lead from the houses into the non-smart meters. This signal will be converted into data and sent to a server, where it will then become available for the co-housing residents to look at on their computers or phones. Tom explains that, as well as SMXs being put on the individual household energy meters, these devices will also be installed on the meters that manage electricity generation via the solar panel and the water mill.

Tom shows everyone a mock-up display of the energy graphs they will see via the user interface. It is still in development, so a little glitchy, and people take a while to adjust to the graphs. However, as Tom begins to explain the meaning of the numbers displayed, people become more interested. Looking at the data, people start to raise questions and engage with the graphs. These include queries about such as the terminology used to describe what the meters are measuring (What is a baseload? What is causing it? Is there any way of using data to interrogate this?); the referentiality of the information displayed on the graphs (Is there a time delay in the feed or is it real-time data? How can the data differentiate energy from different sources?); and the relationship between the smart metering and the existing energy grid on-site (Is the washing room currently on the same meter as the lighting? Does anyone know how much energy is being generated from the solar panels versus the hydro plant? What is the relation between the amount generated by the co-operative and the amount drawn from the grid?). As people begin to engage, even with just these hypothetical read-outs from an imaginary meter, they start to read into these digital traces new possibilities for their relationships with each other, the environment in which they live, and the technical object itself.

While everyone in the room already had an electricity meter that clocked up ever-accruing numbers that registered the energy they used, this information was located on the meter itself in the form of a clicking analogue dial. To know how much energy one had used required physically going to read the numbers that were being displayed at any point in time. To make sense of this information required organising into a temporal array in a spreadsheet or database in order to allow rhythms and patterns to emerge. The work of turning these occasional numbers into streams of information that could be organised into stories that travel as knowledge was currently done by Tom, who read the meters at regular intervals and put the numbers into a spreadsheet in order to calculate their electricity bills.

Before the possibility of smart metering, then, the passive analogue meter was made active and participatory because Tom went around all the houses

with his laptop and manually compiled the data into a spreadsheet, typing in each reading one by one. This was time-consuming work and intrusive – requiring that Tom knock on people's doors and enter their houses. Tom was particularly interested in what the smart-meter extensions could offer – initially because they promised to operate as a digital proxy for his labour, allowing him to 'delegate' (Latour 1994) the labour of organising data to a machine. Just as Tom had done before, the smart meter would turn these clicking numbers into a stream of data that could be displayed, collated, and arrayed in another form.

The smart meter here promised to take on Tom's agency in digital form. But, interestingly, it also promised to do more than Tom could do. For, while he could only transcribe the numbers that indexed total energy counted, the smart meters promised to provide a more constant stream of this indexical data and new ways of visualising and interrogating it. Moreover, this new set of data was to be not only visible to Tom for the purposes of billing, but would also be displayed to the homeowners and, Tom imagined, might potentially become a public resource that the co-housing residents could engage with as a collective. The sensory capacities of the meter, combined with techniques of information transfer, collation, and display, promised to turn the meter from a mechanical counter into an entity with the capacity to both reproduce and also extend existing ways of knowing energy.

In a 2010 working paper by Savage et al., the authors set out to explore what is new about digital devices (Savage, Ruppert, and Law 2010). Analysing a wide range of emerging digital platforms, objects, and datasets, Mike Savage, Evelyn Ruppert and John Law suggested nine characteristics, or 'theses,' that they saw as relevant to understanding the sociality of the digital. They suggested that digital technologies do not represent some kind of epochal shift in social relations, as articulated famously by grand sociological theorists from Jean-François Lyotard to Manuel Castells, but that the digital transformation of social life is primarily to be found in the digitisation of often already-existing empirical methods. Discussing digital processes from big data analytics to transactional data production, from visualisations to the mobile tracking of goods and objects, they argue that the digital is characterised by a heterogeneous and non-coherent reappearance of pre-existing methods of enumeration, inscription, visualisation, measurement, analysis, and representation in new configurations and formations.

This has resonance with Tom's experience of digital-metering technologies, which were not a complete break from prior empirical methods he had used, but a material transformation of these methods from non-digital to digital form. If, in the work of Bruno Latour, material objects have frequently been shown to operate as delegates for human action – the sleeping policeman for an actual policeman, or the door key fob for a written sign – here, the digital device appeared to operating as a delegate, not only for acting, but also for knowing. This raises the questions of how the social production of knowledge has been theorised and understood in existing literature, and how this might help us as we seek to consider in what sense digital devices might be said to be coming to operate as knowing objects.

In arguing for attention to the way digital devices build on previous methods of empirical practice, Savage et al. draw attention, in particular, to the importance of the key social theorists of knowledge, including Michel Foucault and his analysis of the techniques through which governmentality is performed (Foucault 1977, 2007, 2008; Foucault and Gordon 1980), those working in the tradition of the social studies of scientific knowledge (SSK), and laboratory science and its explorations of the emergence of objectivity and nature as a realm of knowledge (Latour and Woolgar 1979; Law 1986), and sociologists who have studied the emergence of disciplinary knowledge forms (such as Abbott Andrew 2001). We might add to this list the important work of Ian Hacking (1990) and his study of the emergence of statistical probability as a form of knowing that continues to shape data analytics; the work of Timothy Mitchell (2002) and his analysis of the material and social techniques by which 'the economy' became formatted as an object of governmental attention; and the interventions of anthropologists the likes of Anna Tsing (2005) and Marilyn Strathern (1991), who have shed new light on the specific histories and trajectories of knowledge forms, such as scientific 'universals,' interdisciplinary knowledge, and the network as an imaginary of social relations (See also Barry and Born 2015; Jasanoff 2002; Riles 2001).

These lineages help us locate the empirical qualities of emerging digital devices as part of a long history in the development of techniques and methods of knowing, such as counting, enumeration, calculation, and abstraction. This literature also draws our attention to the way these methods have widely been used as instruments of power – for example in attending to how methods of constructing and stabilising knowledge have been key to the way states, corporations, and economies have come to gain power and know citizens, customers, and users as social entities in the world. This literature highlights how the question of knowledge is always also a matter of who or what can be conceived as an entity with the capacity to make decisions, frame problems, and shape worlds, and with what effects. Turning this understanding back on digital devices, then, suggests that we might need to consider, not just how devices become delegates for human ways of knowing, but what the effects of this delegation is for the location and enactment of power.

Back at the co-housing site, the SMX was, as we have seen, promising to create new kinds of knowledge for the residents. As methods of empirical observation were moved from a practice of manual enumeration to the device, data's potential uses seemed to proliferate. The proliferation of data as a material to be worked on and ordered in turn created an opening for a new kind of social role for Tom and for others with whom I spoke who were interacting with these devices and the empirical methods they embodied. This new role for the person *using* the digital device emerged between the device and the person, as people came to learn from, and relate to, the device's representations, incorporating and coming to understand new connections and in turn forging new relations with the version of the world that the displayed and collated data denoted. People subsequently incorporated the

methods of data description, collation, and analysis out of the digital device and into their own practices and modes of imagining – for example with talk of how to better 'balance' electricity supply and demand, or how to indicate or flag modulating grid intensity so as to be able to be better citizens in their energy use. The device thus became a tool through which practices of everyday control, management, and negotiation were being rethought and re-enacted.

Interestingly this reworking of practices of enumeration, collation, and analysis in the device, and their subsequent incorporation into the social imaginaries of those using the devices, seemed to create the possibility that the person who now had data-analytics tools at their fingertips might come to take on some of the qualities of the public figures previously associated with similar empirical methods – the manager, the bureaucrat or, in the case of energy, the grid controller. The relocation of methods onto the user of the device simultaneously served to relocate the expertise necessary to use those methods from offices and laboratories into other spaces and relations.

A key lesson that seems to emerge here about digital devices as empirical technologies, then, is that when they carry with them methods developed in other spheres, they bring with them not only the method but also a residue of the expertise and status that method confers. For anthropologists interested in studying digital devices, our first focus might therefore be to try to understand what social, relational, and political possibilities are opened (or closed down) when empirical methods move from the offices and infrastructures of corporations and governments into technical artefacts like the smart meter.

Materialisations of knowledge

If social studies of knowledge have shown that epistemic techniques have histories and politics, those interested in the way that methods come to have social lives have also demonstrated that such methods not only describe and order the world but also have often unintended world-making effects (Bowker, Star, and Press 1999; Merry and Conley 2011; Strathern 2000). We only have to consider the way statistics and indicators are 'gamed,' abstractions are subverted, or accounting creatively reinterpreted to realise that methods unfold the world as much as they describe and contain it.

This has taken on a more radical tenor in the work of scholars who have been studying the relationship between scientific methods and the creation of scientific knowledge, and who have become aware of the problem of analytically setting up an opposition between a stable world 'out there' *studied* by science and the representational practices that scientists use to bring that world to light. Karen Barad's (2007) philosophical engagements with the realisation by quantum physicists that the outcomes of their experiments are affected by the presence of the devices used to measure that outcome, led her to develop a social theory that tries to break down the opposition between objects and representations to focus instead on what she terms the 'intra-actions' of people, devices, and things. Similarly, Isabelle Stengers (2010),

in her study of chemistry, has used the concept of 'cosmopolitics' to denote the interplay between material properties that, she argues, do not just feed representations but, through their formal qualities serve to 'force thought' in scientific settings. In both the work of Barad and Stengers, matter, method, and thought are complexly entangled and co-emergent (see also Coupaye, Chapter 4, for further discussion of how technical objects combine materiality and thought). Following from this, they argue for a new approach in the social sciences – one that no longer simply studies the social construction of scientific knowledge but, instead, repositions methods – devices, enumerations, calculations – as techniques that work to bring the world into being at the same time as they do the work of describing it.

The focus of this work on methods as world-forming processes as well as knowledge-creating practices, suggests a second lineage in our analysis of digital devices – that is work that has previously focused on the relationship between matter and mind. This traces a lineage of thought that incorporates Henri Bergson's materialist philosophy of memory (Bergson et al. [1911] 2004) and surfaces in Gregory Bateson's work on the ecology of mind (Bateson 1972) and in the work of continental philosophers Michel Serres, Gilles Deleuze, and Félix Guattari and their interest in the co-emergence of forms of being and forms of thought (Brown 2003; Deleuze and Guattari 1987). Within anthropology, attention to the interplay between matter and thought has recently appeared in work in environmental anthropology by the likes of Marisol de la Cadena, whose *Earth Beings* utilises Stenger's notion of cosmopolitics to attend to Andean ways of being with, and knowing, mountains (Cadena 2010, 2015), and Eduardo Kohn's *How Forests Think*, which draws on the work of Gregory Bateson and Terence Deacon to argue for a need to extend the capacity for thinking from humans to non-human forms of life (Kohn 2013). In the work of each of these scholars the processual, emergent, and transformative aspects of social life are highlighted through their attention to the co-relationality of non-human materials and humans, reconceived as a relation of meaning or intersubjective thought. By attending to how people and things exist in a sensorial set of sign relations, these scholars provide us with a further set of resources for understanding, not only how digital devices detect the world around them through empirical techniques of ordering, but how in doing so they bring about its very emergence. In the final section, I turn to the way smart meters, in the act of trying to represent electricity's relationality, also come to bring into being the very gridded relations that they aim to describe.

Productive devices

I returned to the co-housing site six months after the workshop to talk to Tom's wife, Maria, about how the smart-meter installations have gone. She has been the project contact and helped with the installation of the meters in the each of the houses. My intention was to talk in more detail to her and

some of the residents about the data they have been using and how they have been relating to it, but as I try to arrange the interviews it turns out that, while the meters have been installed, they keep turning themselves off, and no data has been collated. Maria installed 21 meters and at first they were all up and running, but one by one they went down. We meet anyway to talk about the process of trying to get the meters to work, about what she still hopes for the smart-meter devices, and why she was interested in them in the first place. Here, loosened a little from the form of the data itself, Maria begins to tell me what it was that these particular devices promised for her, and how it was that she had hoped they would become participants in the life of the co-housing site.

Digital monitoring devices were brought in to the site as a way of monitoring electricity in order to support the ends of communal, semi off-grid living. When we were being given the tour of the site in the rain, Tom told the group about a time a few years earlier when the city near the co-housing site had lost power for three whole days due to a storm that had caused flooding that knocked out the city's substation. Pointing to the roof of the clubhouse, Tom showed us how high the water from the river was running at the time, but he also told us that they had their own generator on-site and were able to get it up and running, providing them with energy when the nearby city had none. To be on a local grid was a way of being resilient and 'energy-independent' from the socio-technical entanglements of infrastructure and the breakdowns that might result from social or ecological unrest.

Or at least this was the hope. In fact, the traces of electricity data coming through all the meters was raising new questions for the co-housing group about just what independence should look like. For, as electricity was being monitored and tracked by digital devices, its peculiar properties were, to quote Stengers, beginning to 'force thought' in previously unanticipated ways.

Take, for example, an observation that the site produced slightly more electricity than it used. This raised the question of why they would need to be billed at all for electricity from the national grid. To answer this question required a sensitivity to the material properties of electricity itself. Electricity is produced by the movement of electrons as they leave and join atoms. For the national grid to operate effectively, it has to create an almost perfect balance between the amount of electricity being produced and the amount of electricity being consumed at any one time to balance the whole system. If there is supply without demand, or demand without supply, then the grid breaks down, either through overheating or lack of flow. The co-housing site was connected to the national grid, but also had the potential to operate independently if sufficient electricity were being produced on-site. If there was a lack of local electricity, their connection to the national grid would balance the system out by simply drawing more electricity. Conversely, if they produced excess electricity this would be pushed up into the national grid, and they would be compensated for this excess electricity through payments via a feed-in tariff scheme.

Realising this, one of the concerns of the co-housing group was how to keep more of their electricity on-site when it was being generated, and how to minimise their need to use the electricity grid at times of low energy generation. As a proto-grid controller, Tom was being drawn into questions, not only of social organisation, but also of electrical possibilities that emerged out of, and constituted an energetic milieu for, imagining what social transformations could look like. On the one hand the aim of the housing group to be increasingly self-sufficient was one of the reasons they had been chosen as a test site for the smart-meter pilot project, for they were seen as a potential future model of a micro-energy community that would be able to help to balance out the imbalances produced by a renewables-based electricity grid through local grid management. But, as they had learnt more about electricity, they had come to realise that smart metering and smart grid technologies more generally might allow local communities like theirs to become more energy self-sufficient, not only by knowing energy better and reducing their own energy use, but by rethinking the very idea of what an energy grid could be.

The capacity of the smart meters to pull into view the proclivities of electricity's materiality not only taught the co-housing community about the already-existing organisation of eco-communities, but was also creating new ways of imagining electrical power as a medium of social transformation. First, there had been some discussion about whether the co-housing site down by the river might provide some electricity to the village at the top of the hill. The co-housing group wanted to be energy-independent, but they were also keen for others in the nearby area be able to participate in this independence. However, not being 'behind the meter' like the co-housing group, other households in the village were not able to draw on the electricity produced by the co-housing group and had to get their electricity direct from the national grid.

The possibilities and limits inherent to the form that is electricity, as evidenced through metering and, in particular, the move towards smart metering, materialised a condition of possibility for imagining present and alternative kinds of electric collectives. This is not as simple as saying that the materiality of electricity was a determinant of social practice. Nor was it as straightforward as saying that the representation of electricity in meters and grids was a 're-de-scription'[1] of an already existing reality that was simply being 'seen' differently. Rather, the lineage of work that has highlighted the interplay between materiality and mind attunes us to how the knowledge-producing capacities of digital devices like smart meters work with, bring into view, and open up possibilities for transforming both the materialities they describe and the socialities that these material configurations enable.

I return, finally, to the failure of the energy monitors mentioned in my final interviews at the co-housing site. One of the failures was that the monitors kept switching themselves off, meaning that they did not fulfil their promise

of providing a stream of continuous data to Tom or the residents. No one had the time to keep going to turn them on, so they just there lay dormant, as objects, but ineffective as empirical devices. Talking to Tom about why this was the case, he explained to me that one problem with the project was that it was run as an electrical-engineering project and not a community energy project. Here, he pointed to an interesting dimension of what we have been exploring here: what happens when methods are expected to be transferred from laboratories to devices, from idealised delegates of human knowing to active participants in ecologies of knowledge. In this project, the system had been tested first in a laboratory. But this had been done without engagement or conversations with the potential users of the devices like those in the co-housing site. The smart meters worked perfectly as knowledge-producing devices in the lab, but they had never been connected to the user interface and it turned out that even when working, the data was not being sent to the server in a way that the interface could interpret.

The failure of the meters for the co-housing group was, however, more than just a technical glitch. Having become sensitised to the entanglements of electricity, community, and the local grid, the residents were very keen to pursue new kinds of energy generation, distribution, and storage as a way of extending their aims as a community-energy group. The failure of the meters produced not just a gap in their knowledge, but created a block on the possibility of remaking themselves as a community through the materiality of electricity, its potentials, and its demands. Here, the energy monitor as digital device with empirical possibilities had created an opening to a newly materialised imaginary of a social and collective future. The question now was how to realise this emergent energetic imaginary, and whether functioning digital devices could support them in this endeavour.

Conclusion

This chapter has explored how we might approach the study of digital devices as empirical technologies. What we have uncovered in this brief exploration of digital devices is not only material artefacts that have social meanings ascribed to them, but world-making devices that are generative of a materially informed mode of social and collective imagination.

To help us think about how to approach the epistemological qualities of objects, I have drawn on the work of scholars who have long concerned themselves with the question of how thinking and the imagination shape social worlds, and others who have considered how thinking might be reconsidered in ways that do not reproduce the divide between the realm of materiality and the realm of ideas. Rather than seeing objects as material and representations as matters of knowledge, this chapter has suggested that objects can also be knowledge-producing entities, meanwhile the representations they create can in turn be analysed as forms of material culture. As Coupaye also argues in his chapter, this demands taking into account, not only the function or use

of digital devices, but also attending carefully to what he terms their 'actual functioning.'

Building on, but also pushing beyond the idea that objects have agency, I have suggested that acknowledging digital devices as knowledge-producing entities allows us to entertain the possibility that when technologies take on the world through sensors, and in doing so transform the indexical traces of material properties into signals, images, texts, and visualisations, these devices become capable of becoming active participants in the making and remaking of the processes by which the social world becomes knowable. Here, digital devices bring to the world not only object agency, but also the possibility of alternative formations of thought, further challenging any simple opposition between human beings and material artefacts, and raising profound questions about where we as anthropologists should turn our attention as we seek to understand the material formation of social imaginaries and their role in the reproduction of social life.

Note

1 Playing on Madeleine Akrich's (1992) notion of the description of technical objects.