11. Digital technologies in the transition to a sustainable energy system: knowledge-related challenges from everyday life

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INTRODUCTION

Over the last decade digital technologies have developed very quickly and their widening use is fuelling visions of networks of intelligent objects, all connected to facilitate everyday life and give feedback to users, providers, and officials, so that resources are used more efficiently, and citizens in some Western countries feel engaged, willing to take more active roles as consumers, and thus enabling creative and smart solutions for current sustainability problems (Verbong et al. 2013, Beaulieu et al. 2016, Hyysalo and Juntunen 2018). A transition to energy-efficient and low-carbon systems is one of the most pressing of these problems, as it would help to reach climate change goals, as well as improve the security and reliability of energy supply. A wide range of information and communication technologies, from smart grids to smartphones and "smart building solutions", are expected to enable energy savings and reduce carbon emissions.

However, this transition poses many challenges, the needs for government agencies, utilities, and companies to engage individuals being some of them. Since the growing pervasiveness of these technologies raises questions regarding privacy and individual rights, and possible consequences are difficult to foresee, the increasing acceptance and adoption of digital technologies are uncertain. Moreover, although digital technologies may empower citizens, their complexity is likely to widen the divide between groups – between those with and without the skills to use these technologies (in the ways prescribed by developers), and also those who ignore such technologies. Individuals' knowledge is thus a critical issue, which has been considered even more important than access to technology. Notwithstanding the relevance of social inequities in access to digital technologies, several authors have argued for the need to go beyond the study of access in order to capture nuances to the digital divide that are related to the ways in which individuals use technologies (Ragnedda and Muschert 2013). This seems even more pertinent regarding rich Western societies, which are the focus of this chapter.

Research on the forms of knowledge related to individuals' dispositions to interact with information and communication technologies is needed. However, the mainstream view on the role of digital technologies in the transition to sustainable energy systems is based on the assumption that individuals need more knowledge about these technologies (Hargreaves et al. 2013), in accordance with the long-standing supposition that the public is ignorant of science and technology and therefore needs to be informed (Irwin and Michael 2003). That is, given more information, and with the appropriate skills, individuals would be more likely to engage and take personal action toward sustainable solutions. This view does not account for the diversity of ways that knowledge is part of individuals' everyday lives.

In accordance with recent strands of research that emphasize the need to investigate forms of knowledge that go beyond traditional sociological standpoints, this chapter explores how individuals deal with these technologies in their everyday life and, in particular, how they deal with what they do not know, do not want to know, as well as how they strategically use ignorance in the pursuit of benefits unanticipated by developers and policy-makers. Thus understood, this chapter is part of the emerging field of *ignorance studies* that does not treat ignorance or nonknowledge as the mere absence of knowledge, but as a realm with a social and political life of its own (Gross and McGoey 2015).

The chapter starts by presenting the mainstream view of how digital technologies can contribute to a sustainable energy transition, with a focus on the role attributed to householders' information about these technologies and how this has been narrowly discussed as a deficit of knowledge. Technological determinism and rational choice are influential frameworks in the mainstream discourse on the topic, but have led to a utopian perspective on energy transition. The chapter deconstructs this utopia by referring to the complexity of relations between users and technologies, focusing in particular at the household level. The concept of non-knowledge is then presented as a necessary element in understanding individuals' involvement with these technologies. Not knowing does not necessarily mean a barrier to social acceptance of digital technologies – it points to the uncertainty and unpredictability of ways users can deal with these objects. By presenting several empirical examples of different forms of non-knowledge of digital technologies, as well as diverse types of information and communication technologies (not just the so called "smart energy technologies"), the chapter contributes to an understanding of how interactions with these technologies take the forms they do in order to shed light on the challenges that may hinder the transition to a sustainable energy system.

DIGITAL TECHNOLOGIES AS KEY IN A SUSTAINABLE ENERGY TRANSITION: FROM UTOPIA TO USERS' REAL WORLD

Energy has become an essential element in discourses about sustainability. Although implicitly until the 1960s industrialized western countries had policies based on the assumption that their economic growth depended on access to cheap and abundant energy, debates around the limits of growth and peaks in oil production, beyond which oil would be scarcer and extracting it would be more expensive, have questioned this "cheap and abundant" energy paradigm. In recent years several problems have contributed to put the energy system and its sustainability in political agendas. Besides geopolitical and economic issues – including increasing global energy demand and insecurity about access – combined with concern over climate change, growing investments in renewable sources of energy have also been pressuring the conventional models of energy distribution.

The idea of a transition toward a sustainable energy system has become appealing, as it announces a process of gradual change in which political decision-makers, with the involvement of key stakeholders, steer socio-technical shifts along desirable visions of the future (Meadowcroft 2009). In the European Union, for example, "the clean energy transition" is envisioned as a way to modernize the economy, speed growth, and create jobs, as well as lower carbon intensity. It is also expected that this transition will benefit all consumers, who "should feel involved" (European Commission 2016, 3). These goals are to be achieved through more energy efficiency, investment in renewable sources, and empowerment of consumers - by providing them better information about the energy market and thus "enable them to be more in control of their choices" (European Commission 2016, 10). As part of this transition toward a low-carbon economy, the European Union has been promoting a greater integration of new information and communication technologies (ICTs) in the economy. Also, energy companies have been increasingly investing in digital electricity infrastructure and software as these facilitate management and monitoring (IEA 2017).

Along these lines, widespread integration of digital technologies in home appliances, services, or energy grids is considered key to enhance energy efficiency through remote control and automation, as well as by allowing utilities to adjust to energy demand in real time through smart meters. Information and communication technologies are also expected to enhance a more active role of consumers, including as "prosumers" of renewable energy. Smart energy technologies – such as meters that monitor energy usage in real time, sensors embedded in devices throughout buildings that predict how much lighting is needed, or programmable thermostats that preheat the home before occupants arrive – are being developed rapidly. Together with artificial intelligence, ambient computing, the Internet of Things, automation, and the electrification of vehicles, these innovations are expected to be implemented at large scale soon. Overall, in mainstream discourses these developments are expected to enable a smarter future. Based on this scenario, digital technologies have been considered a crucial feature in the transition to sustainable energy systems. As an illustration of this thinking, the Global e-Sustainability Initiative, which includes over 30 world leading ICT companies, argues that "ICT can help break the link between economic development and resource depletion, with emissions savings close to ten times those generated by the ICT sector itself" (GESI 2015, 4). The transition to a sustainable energy system is thus taken for granted.

However, the possibilities offered by these new technologies depend on the adoption and actual modes of use by individuals, as well as on the socio-technical contexts in which these technologies are embedded. By itself, having access to digital technologies does not necessarily mean use, or meaningful use, or engagement (Selwyn 2004).

The technological determinism according to which new technologies unleash changes in society has been refuted and shown to be oversimplistic by science and technology studies as well as sociology. Indeed, there are important processes of appropriation of technical objects, and although technologies define frameworks of action in which they are supposed to act, users can redefine them (Akrich 1992). Furthermore, the processes of how digital technologies are appropriated and integrated into everyday life are subject to constant negotiation, as socio-technical contexts are dynamic (Berker et al. 2006). Besides influences from wider socio-technical contexts, such as technological infrastructures and policies, economic models and multinational marketing strategies or cultural frameworks, embodied dispositions and micro-interactions between people, as well as between humans and materials, either at households, workplaces or other settings, also have a critical role in shaping the ways technologies are integrated in everyday life. Meaningful use and engagement with digital technologies thus depend on multiple processes and cannot be considered straightforward.

Yet, although acknowledging the relevance of consumers, a common assumption in discourses on smart energy technologies is the idea that by providing access to information on individuals' own energy consumption (through smart meters, for example), consumers will engage in the potential of these technologies and take control of their energy use in a rational and efficient way, without compromising their lifestyle expectations (Strengers 2015). Indeed, these mainstream discourses expect that the integration of digital technologies in everyday life will enhance the active participation of individuals in the energy system. The Global e-Sustainability Initiative, for example, states in its 2015 report that in order to realize the potential of the ICT-enabled world, "consumers have to take an active role", and what they "should do" is: pressure governments to have access to reliable broadband infrastructure; mass-purchase ICT-related products and services; and adopt "a mind-set that recognizes the opportunities the digital economy can bring to them" (GESI 2015, 98). Also, the Smart London Plan set out as first priority for the future citizen engagement in the development of digital services (Mayor of London 2016).

Only some kinds of social possibilities are examined in these visions. As in other writings that can also be considered technological utopianism, here digital technologies are the central enabling element of a vision of the future that is presented as desirable for everyone. In this genre of discourse, important possibilities that are likely are not discussed (Kling 1996).

Utopian views around information and communication technologies are not new (May 2003). However, in recent years this vision is becoming increasingly central in the thinking on the transition to energy sustainability as if there were no alternative, this pathway could not fail, no unintended outcomes were foreseeable, or there were no contradictions in the relationships people establish with technology. As noted by Yolande Strengers (2015), the assumptions underlying this "smart utopia" have not been sufficiently problematized.

The consumer envisioned in these discourses is "a data-driven, information-hungry, technology-savvy home energy manager, who is interested in and capable of making efficient and rational resource management decisions" (Strengers 2015, 51). Yet, social science research on energy consumption has shown that approaches focused on individuals as if their actions were driven only by information and feedback on their energy use, are not able to fully explain actual practices (Shove 2010; Buchanan et al. 2015; Frederiks et al. 2015; Horta 2018). Even among "early adopters" of smart meters with displays that provide real-time feedback on energy consumption, only some of them are motivated by a desire to gain more information, and many face numerous issues that limit their ability to change their home energy consumption, including the relevance certain appliances have for them or discussions between household members (Hargreaves et al. 2010, 2013). Indeed, as these technologies enter the private sphere of the home, household dynamics and cultures shape a variety of ways how technologies are appropriated.

In accordance with household's values, interests, daily practices, and the meanings of these objects, technologies are continuously negotiated and redefined in the domestic sphere. However, information and communication technologies pose specific problems since (unlike many other objects) they provide links between the household, individual members of the household, and the world outside – and this is problematic because it may challenge the household's sense of security and control (Silverstone, Hirsch, and Morley 1992). Furthermore, the fact that information and communication technologies can be used to provide detailed information on how individual members of the household use energy (whether, when, or for how long they turn on specific appliances, for example) may be quite problematic since energy use is critical for individuals' comfort and well-being (e.g. room temperature, lighting, or entertainment, for instance), but its cost is often considered a significant burden for the household, and thus subject to control and discussion.

The connection between information and communication technologies and energy use thus raises privacy issues – not just between household members, but also between the household and whoever might have access to data on householders' practices. These concerns have been considered one of many obstacles in the path to realizing the benefits of widespread digitalization in buildings (IEA 2017).

While those mainstream visions on digital technologies take too narrow a view of social reality, a possible unplanned consequence of this pathway may be the emergence of "energy-intensive 'smart' lifestyles" (Strengers 2015, 3). In fact, a historical perspective shows that earlier rounds of integration of ICTs into everyday life led to higher electricity consumption (Røpke et al. 2010). As admitted in a recent report by the International Energy Agency (2017), rebound effects from automation and further electrification in the transport sector could result in more travel and therefore more than double current energy use. With regard to buildings, since smart devices and appliances need to maintain their connectivity, energy consumption in standby mode can increase significantly (IEA 2017). In fact, the sum of electricity consumption of communication networks, personal computers, and data centres has been growing at a rate of nearly 7% per year (van Heddeghem et al. 2014). Even the environmental impact of devices designed to monitor and help manage domestic energy consumption may not be positive, since the energy saved through home energy management systems may not outweigh the overall energy needed for production, use, and disposal of these devices (van Dam et al. 2013). It has also been observed that current policies at the base of the ongoing transition to broadband internet need to focus more on the development of long-term sustainability (Røpke 2012). Thus, not only have the assumptions around individuals' relationships with these technologies been overly simplified, as pointed out by Andrés Luque and colleagues (2014), the possible consequences of smart technologies have not been sufficiently scrutinized and, as often in the past, claims made for the potential of "smart", instead of being realized, may actually reinforce business as usual.

Given the complexity of the range of actors involved and framework conditions governing technological innovation toward societal change, transition processes to sustainable energy systems can be considered real-world experiments, which in many respects means that outcomes cannot be anticipated precisely (Gross and Mautz 2015). In spite of the relevance of understanding how different actors help to socially construct the many unknowns in this process of energy transition, in this chapter we focus on householders. These are often blamed for their "ignorance" or passivity, although actually having limited autonomy (Southerton et al. 2004) and nonknowledge may be among their simplest resources.

In the following sections we focus on knowledge-related challenges affecting the adoption and use of digital technologies, as both energy consuming devices and as "smart energy technologies", i.e. objects designed to provide feedback on energy use and facilitate demand side management. We start by referring to the theoretical background of ignorance studies, which is a novel approach to this area and, we propose, allows us to further understand the new digital unknowns.

NOT KNOWING ABOUT DIGITAL TECHNOLOGIES

Although not named as such, ignorance studies is a relatively old field that extends back to at least the 19th century, if not indeed to the well-known saying attributed to Socrates: I know that I know nothing. In 2002 the terms known and unknown unknowns received some media attention via Donald Rumsfeld's statement about evidence (or lack thereof) of weapons of mass destruction owned by the state of Iraq. Indeed, the concepts of known and unknown unknowns existed long before Rumsfeld, since much scientific research has been conceptualized as investigating known unknowns or, as Robert Merton (1987) called it, "specified ignorance." In this spirit Michael Smithson's now classic monograph *Ignorance and Uncertainty* (1989) showed that deliberately imposed unknowns can be understood as socially constructed in both ordinary action as well as strategic manipulations. Nevertheless, for the most part, the topic of ignorance has suffered from a lack of scholarly attention. It is only relatively recently that academics have begun to rediscover some of the classical concepts related to ignorance and have addressed it as a subject worthy of investigation in its own right as well as regarding its relationship to decision making in everyday life.

However, as with other terms, streams of ignorance studies have their own conceptual frameworks that are discipline based and therefore often in opposition or completely unrelated to one another (Smithson 2015). In the following we focus on notions of ignorance that we render important toward a better understanding of the way digital technologies in the transition to sustainable energy systems in everyday life are handled. In so doing our approach departs from the view that ignorance must necessarily be rendered as something negative in order to deliver an understanding of how ignorance can serve as a productive resource. In order to be able to act, actors need to agree on what is not known and take this into account for future planning. They often decide to act in spite of (sometimes) well-defined ignorance – or what has more recently been called nonknowledge, a term used to refer to knowledge of what we do not know (Gross 2012). Unlike the term ignorance, nonknowledge points to symmetry between accepted positive knowledge and ignorance that is adequately well-defined. Whereas the term ignorance has many meanings – with connotations ranging from actively ignoring something to not even knowing that something is unknown – nonknowledge is a specified form of the unknown, and it is this greater precision that makes it more suited to the task of analysing decisions. As a generic term, ignorance can be defined as knowledge about the limits of knowing in a certain area; but it can also include unknown knowledge gaps that actors recognize only with hindsight. The latter can be referred to as nescience, which constitutes a different epistemic category from nonknowledge or ignorance given that no one can refer to their own current nescience because it is not part of their conscious nonknowledge (see Table 11.1 for an overview).

The aim, then, is to specify ignorance so that users of new technologies frame it in a meaningful and constructive way. Our thesis is that in order to use novel digital technologies users need residues of ignorance. This is in accordance to debates on preventive genetic diagnostics and the right not to know that becomes relevant since options for treating and healing possible "diseases" are often very limited (Andorno 2004). The right to nonknowledge is therefore an example that demonstrates that nonknowledge is not necessarily a detrimental state but needs to be understood as a right that should be protected in order to cushion the impacts of the risks, indeterminacies, and uncertainties of using digital technologies.

Research on nonknowledge seems particularly valuable for the understanding of energy use in everyday life. It has been observed that energy consumption is very often invisible or inconspicuous to users as its use is not always as apparent as when someone lights a room, and it is even more unnoticeable to users since they are in fact consuming services provided by energy (such as space heat, cooling or conserving food), rather than electricity itself (Wilhite et al. 1996; Wilhite et al. 2000; Shove 2003; Burgess and Nye 2008). In addition to individuals' low awareness of some forms of energy consumption, knowledge about energy use (such as how much electricity is consumed by each appliance, how it can be measured, or what exactly does

Table 11.1 *Types of ignorance*

Nescience	Unknown ignorance can only be known in retrospect, but can also be things people are not aware of but in fact "know" (e.g. intuition)
General nonknowledge (broad ignorance)	The acknowledgement that some things are unknown but are not specified enough to take action (e.g. knowing that devices on standby are using energy but not knowing how much)
Active/Positive Nonknowledge	Known and specified ignorance used for further planning and activity in the pursuit of more knowledge (e.g. getting ICT tools to know their energy consumption and make informed decisions about their tariff options)
Passive/Negative Nonknowledge	Known and possibly specified, but rendered unimportant and/or dangerous for the pursuit of new knowledge at this point in time (e.g. "What you don't know won't hurt you.")

Adapted and amended from Gross (2016).

a kilowatt hour stand for), as well as understanding of energy bills, cost, and prices also tend to be low (Kempton and Layne 1994; Attari et al. 2010; Pierce et al. 2010; Cotton et al. 2016). However, in spite of being acknowledged in the literature, these issues have been overlooked in research. The complex ways that knowledge is connected to behaviour have been reduced to a "straightforward link" between information and education, and change in action – albeit one of the most common policy tools, it has usually failed to achieve effective results (Goldblatt 2005, 90). Indeed, dominant approaches have simply prescribed raising awareness through more information, instead of analysing ignorance about energy as a social phenomenon, and view it as regular rather than deviant.

Since the increasing use of digital technologies in everyday life adds further technical complexity and uncertainty to the already difficult to understand domain of energy use, it is even more pressing to analyse how these new unknowns are dealt with. The approach proposed in this chapter may thus shed new light on the process of technological change toward sustainability.

In the following section we present five cases that illustrate how passive/negative nonknowledge and active/positive nonknowledge can be socially constructed as forms of dealing with digital technologies. The examples selected are meant to illustrate different but complementary situations. In the first four cases, not wanting to know and fear of the unknown (i.e. passive/negative nonknowledge) may hinder the acceptance and use of digital technologies in the transition to sustainable energy systems. The last case illustrates how active/positive nonknowledge can be used to successfully cope with digital technologies' energy consumption, although in an unexpected and not environmentally friendly way.

SOME EMPIRICAL EXAMPLES: FROM NOT WANTING TO KNOW AND FEAR OF THE UNKNOWN TO CREATIVE WAYS OF DEALING WITH IGNORANCE

Users interested in saving energy or money can resort to a variety of digital technologies that provide information on home energy consumption. However, after knowing more about their consumption, except for changing their tariffs and utilities or switching to more efficient appliances, most saving options will revolve around changes in everyday life practices. These changes can either be small gestures, like setting the washing machine to a lower temperature, or major alterations in daily routines, such as shifting the time of washing to an off-peak one. Given the complexity of elements and connections between elements involved in changing practices (Shove et al. 2012), users may find it difficult to make some changes. Knowing beforehand that they are not willing to change their habits, individuals may not be interested in getting new knowledge that would call into question their current practices, as shown in the following example. Moreover, they may even avoid getting into a situation in which such new knowledge may be a source of stress.

In a US-study, a meter (Kill A Watt) was installed that could assess the electricity consumption of the appliances it is connected to and calculate its cost by the day, week, month, and year. The meter was made available to every participant so that they could monitor their energy use if they wished. In a final interview with users researchers found that not a single participant had ever used the energy meter. When asked about why they did not use it, several participants replied that since they are not going to change their routines, they did not want to know about the cost. One of the answers given is particularly illustrative: "I know I'm not gonna change anyway, so I don't really wanna know" (Pierce et al. 2010, 4). This case of passive/negative nonknowledge illustrates that individuals may choose not to know if they perceive that it is more important for them to keep their energy consumption patterns – as these translate into services that they feel to be a need or convenience, for example. Knowing the cost of those services could create a cognitive dissonance or anxiety between a value such as saving and their actual practices, about which they may feel unable to escape. The new knowledge provided by the meter could thus constitute a threat to their well-being. Thus, not knowing was constructed as a shield against unease. Indeed, among the participants in this study, even those who routinely made an effort to save energy were not interested in using the meter. Just like in contemporary society more individuals are concerned about time pressure (Southerton 2009), digital technologies' information on energy consumption may represent a new source of anxiety for householders. Furthermore, the technology itself and the uncertainty of not knowing how to use it can also cause anxiety. Unlike businesses', policy-makers', and other stakeholders' expectations, digital technologies as a means of knowing more about home energy consumption can thus be rejected outright in situations where passive/negative nonknowledge emerges to potential users as a preferable resource.

Besides the issue of users' willingness to change their habits, smart energy technologies have been raising concerns about privacy since these devices, especially smart meters, may be used to identify the electricity consumption of individual appliances, and thus collect information about the devices being used at any time within a home. These detailed data may therefore reveal personal information on users' routines and activities (which can be a source of conflict within households, as mentioned above), or to identify when the house is empty. These technologies also pose security issues. Connected appliances may be remotely switched on or off through digital technologies and hence be subject to a variety of cyber threats, including from natural hazards such as geomagnetic storms. The expansion of these smart technologies in itself increases the risk of cyber-attacks in energy systems due to the massive numbers of potential users affected (IEA 2017). In all these cases in which householders are either not willing to change their everyday life or are concerned about their own privacy, security, or ability to cope with a new technology, not knowing about digital technologies has been a resource for not feeling too pressured, harried, or conditioned. Nonknowledge thus has become an asset to help preserve individual autonomy, freedom, and privacy. From this point of view, instead of damaging individuals' capabilities of possibly reducing their energy consumption (through the knowledge that would be accessed via those technologies), not wanting to know can be strategically used by individuals and hence constitutes a capability in itself.

All these issues increase uncertainty around the social acceptance of smart energy technologies. Yet, in spite of acknowledging the need for user involvement, interviews conducted with stakeholders related to smart grids and the energy sector in the Netherlands showed that these concerns have been overlooked by stakeholders. In fact, users are perceived as potential barriers to the implementation of smart grids, but in general stakeholders expect that energy will become a more prominent topic for users due to an increase in the proportion of income spent on energy. In a context of higher energy costs, stakeholders believe that changes in users' behaviour can be induced through feedback on the energy consumption of their appliances and some economic incentives (Verbong et al. 2013). It seems telling that several stakeholders said it has been difficult to find enough individuals to participate in smart grid experiments. From an ignorance-based perspective, the uncertainties related to the adoption of these technologies seem significant enough to lead to individuals' passive/negative nonknowledge, and thus indifference and nonadoption of these technologies. In fact, the implementation of smart meters has met severe resistance in the Netherlands, as users try to defend themselves against what they consider to be new modes of surveillance and commercial strategies of energy companies, while new forms of surveillance within the household are also at stake (Naus et al. 2014).

Another possible source of opposition to the adoption of digital technologies might be the health concerns about potential health effects of radiofrequency signals emitted by wireless smart meters. Although these health risks are not officially recognized by regulatory bodies in California, consumers and counter-experts have contested. As observed by Hess and Coley (2014), around 2010, when Californian utilities were installing smart meters in people's homes without giving them a choice, it triggered widespread public controversy – including the creation of the organization "Stop Smart Meters!", direct protests, and civil disobedience. A website launched to register individuals' complaints about smart meters showed that the highest level of concern was expressed for health and environmental impacts (especially sleep disturbances, stress, anxiety, irritability, headaches, ringing in the ears). Security and privacy risks was the second highest category of complaints. The extent of these health risks is unknown and scientific research on long-term effects will take decades. However, in the face of uncertainty, Californians advocated a full moratorium on smart meters.

Similar controversies have occurred elsewhere regarding potential health effects of the electromagnetic emissions of other digital technologies, such as mobile phone masts. In spite of utilities' expectations regarding the deployment of digital technologies in buildings, there has been significant consumer opposition in the United States. In a web-survey of 1,050 consumers, representative of the US population, which was conducted in 2011, respondents showed relatively strong levels of interest in knowing more about their energy consumption at home (through energy information displays), especially those with higher electricity bills. However, only 30% were very interested in or favourable to smart meters, and 32% were interested or favourable to demand response services (although these were described as energy savings plans). Among respondents not interested in smart meters, energy information displays, demand response services, or smart appliances, the most common reasons for an unfavourable opinion about these technologies were related to risks or uncertainties perceived by individuals, such as the concern that these devices would lead to an increase in electricity bills, and the concern that the electric utility would have "Big Brother" capabilities to monitor and control electricity usage within their home. Respondents also referred to their lack of understanding of how these devices would work and concern about losing control of their appliances and other devices (Vyas and Gohn 2012).

Although technological progress has been very appealing in promising technofixes for environmental and other problems, there is also some cultural skepticism of technology, and information and communication technologies in particular have been the objects of some movements of resistance (Bauer 1995). Growing criticism of scientific and technological achievements (Touraine 1995) might add to a fatigue of technocracy, rationalization, efficiency, and control, especially if felt to come at the expense of individual freedom, as it might happen regarding smart energy technologies. Passive/negative nonknowledge may thus constitute a disruptive resource for social groups resistant to technology pressure.

These cases illustrate situations in which fear of the unknown and resistance to potential threats or nuisances hinder the adoption of digital technologies as useful devices in increasing energy efficiency. The next case study illustrates a different situation: individuals not wanting to know about digital technologies' energy consumption, but creatively acquiring enough practical knowledge to manage their energy use in an instrumental way in order to maintain what matters most to them, and also have some advantage in the long run. This case is especially interesting as it concerns a young generation of supposedly technology-fluent users and simultaneously offers a glimpse of how their practices might develop in the future.

In mobile devices such as smartphones energy consumption is critical since usage of these technologies depends on their battery life, which is limited. Research on teenagers' energy consumption related to the use of electronic media (Horta et al. 2016) recently conducted in Portugal has shown that although they had developed strategies in order to make their phones' batteries last longer, most of them were not interested in searching for information on how to save energy or on how to prevent batteries from wearing out due to use. As one interviewee said, many of them do not "waste time searching" for information on batteries. Yet, as some of them admitted, they were not sure about what the best practices were, and often "myths" and jokes circulated among them, creating even more uncertainty about it. Although not knowing much about batteries, and how to make them last longer, through their everyday life experience and processes of informal learning, these teenagers had acquired the skills to manage their phone battery. These skills included, for example, estimating how much power would be needed until they could recharge the battery, curtailing unnecessary uses (like listening to music whilst walking), turning off functions and features (e.g. Wi-Fi) that were not necessary at the time, or turning on applications that allowed power saving (by lowering the brightness of the screen, for instance). Others always carried a charger with them so that they could charge the phone's battery anytime (e.g. at the school) or used another device (computer or MP3 player) that could provide the same services as the smartphone (checking social media or listening to music, for instance). In this way they were able to keep their smartphone on so that they could still use it to make important phone calls or send and receive messages, for example. However, their concern was solely to avoid draining the battery, not to save energy *per se*. For this reason some interviewees said they often used their smartphones while the devices were charging – from their point of view, in this way they were not running down the battery. Thus, although ignoring formal or technical knowledge about the energy consumption of smartphones and the functioning of batteries (which they could search for in instruction manuals or specialized websites, for instance), they had acquired practical knowledge about managing their batteries.

Secretly, however, as some admitted in the interviews conducted, not having well-grounded knowledge about battery use was a strategy for shortening their smartphones' batteries due to wearing out. Rapid product innovations together with marketing strategies have been leading to continuous releases of newer and improved smartphones and software. In addition, peer dynamics, and often also family, promote the rapid replacement of current devices by new ones. "To be updated" is very valued, not just by teenagers. And thus smartphones tend to be considered obsolete very quickly – even when they are still working well. Yet, most parents can be reluctant to buy a new smartphone if their child's is still in good condition – but not if it is broken (and not necessarily by accident) or the battery is worn out. This forced obsolescence (Horta et al. 2015) seems to correspond to a case of active/positive nonknowledge in which ignorance can be used in the pursuit of benefits, as not knowing how batteries should be handled allows teenagers to increase the speed of replacement of their current smartphones by more fashionable ones.

CONCLUSIONS

In this chapter we argued that strategic as well as accidental nonknowledge can be understood as a critical dimension to analysing novel forms of energy consumption. Since such an approach to energy consumption would allow us to understand the emergence and development of diverse forms of not knowing about energy use, and how these are socially, culturally, and materially embedded they also deliver insights into how they translate into everyday decision-making and action.

A possible way forward is to take ignorance of digital technologies and of energy consumption for granted and investigate the socio-technical conditions and transformations that contribute to it. Especially the case discussed of knowingly bracketing out sources of knowledge is a case in point that not knowing is not a detrimental state *per se*. We thus suggest that strategic nonknowledge should be used as an analytical device to frame user behaviour and everyday practices in such a way that the known and unknown are closely linked to each other. Even more so, when conceptualizing strategic nonknowledge as part of everyday life, it also invokes making some form of sacrifice in the present to hope for a gain in the future, i.e., to have newer smartphones despite not knowing how to take care of batteries. In short, the reflections presented above imply that additional areas of research can be informed and enriched by analyses of different layers of knowns and unknowns.

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