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Article

Sustainability through surveillance: ICT discourses in design documents

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Abstract

In this paper, I examine design documents from three different ICT design and development projects. I argue that they present intersecting visions of sustainability entailing the wide-spread use of ICT, describe the properties of users compatible with such ICT, and provide ways of judging the users. In the design documents, the inhabitants are made individually responsible for living sustainably, and surveillance is positioned as integral to this future with the help of ICT. Underlying the visions, I identify a translation process that captures the traces of the inhabitants' lives, classifies them according to different criteria of sustainable living, and returns them to the tapestry of everyday life to convince the users to behave differently. In the discourses of these documents, surveillance translates the traces, and the translations exert new pressures on existing power relations.

Introduction

> Just before they get home her youngest daughter asks her mother to stop in front of the public installation. They all stop and one of the daughters drags her card on the installation and sees their own household blinking. 'Mum our symbol is much bigger this week than last week. And it seems that our block is doing much better than my friend Milla's block' she says. 'That's good news' her mum answers.
>
> (SRS 2011: appx. III, 51)

The fictional conversation between Anne and her daughter Maria appears in a report that details how information and communication technology (ICT) can be developed to encourage sustainable living within a residential city district. As an example, the report describes a brief interaction between the inhabitants and a kiosk that visualises the energy consumption within the district. While using the kiosk, the characters reflect on their behaviour, guided by the signals that indicate the value placed on their energy consumption by the system. The fiction of Anne, her daughter, and the kiosk provides a window into a broad discourse on using technology to contribute to sustainable futures.

In current European Union initiatives for sustainable development, ICT plays a major role. The European Commission's recommendation report on the issue states that 'ICTs can enable energy efficiency improvements', and 'provide the quantitative basis on which energy-efficient strategies can be devised, implemented, and evaluated' (European Commission 2009: 3). In the report, the umbrella term ICT covers a range of technologies designed to monitor, sort, classify, visualise, and optimise. These technologies are defined as tools that can aid in overcoming environmental, social, and economic challenges. To promote them, the recommendation presents three measures: inviting the ICT sector to reach a common measurement methodology, to identify where and how ICTs can play a role in reducing emissions, and a

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call for the Member States to 'enable roll-out of ICT likely to trigger a shift in the behaviour of consumers, businesses and communities' (2009: 5). Partly due to vast financial resources that the framework programmes provide for scientific research, the motivations of a wide variety of projects combining ICT and sustainability are both echoed in and shaped by these measures.

In this paper, I examine three different ICT design and development projects with similar motivations. I argue that they present intersecting visions of sustainability entailing the wide-spread use of ICT, describe the properties of users compatible with such ICT, and provide ways of judging the users. First, the three projects share a vision where sustainability can be achieved through the employment of ICT. In the vision, the primary agents responsible for change are identified as the users of the technologies, and they are made individually responsible for creating sustainable lifestyles with the help of ICT. Second, the users are viewed as rational, technologically competent decision makers who are cooperative with the vision of ICT as an aid for behavioural change. Third, the users are judged according to different criteria that are established by the systems. In the reports, achieving sustainability through the use of ICT is expressed as the right way to live, and the users are provided with social and financial incentives to live in this way. Connecting these three issues, I identify a process of translation where values are inscribed into the systems, and the surveillance of energy use is positioned as integral to sustainability with the help of ICT.

Surveilling the smart home

A highly vibrant intersection of sustainability and ICT is called the smart home. While it seemingly refers to an isolated housing unit, it is physically connected to infrastructures as much as any other urban structure, and its information networks reach even further into central servers that collect data at the street, district, city, and nation level. In the smart home, a wide variety of surveillance systems gather sensor and usage data from the surroundings. The gathered data are used by system designers, managers, other technological systems as well as the inhabitants themselves to interpret the activities within the home and to manipulate the home environment. In this description, the home is smart because it is populated by sensor systems. However, it is also a home, because it is populated by the inhabitants. While they go about their daily lives, the sensor systems continually record the interior temperature, water and electricity consumption, and the movements within the home. These measurements are gathered to create representations of the inhabitants' behaviour over time using central databases and statistical methods for analysis. The data, collected from many smart homes simultaneously, are used to reconfigure the image of a standard home: how much energy is consumed, how much movement occurs in it, how many humans live together, etc. The data collection is made invisible, but certain results are communicated back to the inhabitants in the form of logs, graphs, and bills.

In the smart home and its surroundings, sustainability is linked to ICT through surveillance. Following David Lyon's definition, surveillance takes the form of routine attention to personal details with the intention to sort and classify (Lyon 2007: 14). Personal data are collected not only to make systems more efficient, but also to provide ways of creating categories, comparing different individuals, and sorting individuals into groups. The consequence of bringing ICT into the smart home resembles that of any other surveillance system anywhere else; it generates and expresses power (2007: 23). I refer here to the Foucauldian notion of power: it is immanent in all relations, inherently productive, and possible to resist, or rather, constitutes resistance (Foucault 1976: 92–96). The power expressed by surveillance links sustainability and ICT by making possible the formulation of knowledge about a population of smart home inhabitants. In the smart home domain, it appears as categories, groupings, and classifications. These can collectively be seen as normalisations:

> In a sense, the power of normalization imposes homogeneity; but it individualizes by making it possible to measure gaps, to determine levels, to fix specialities and to render the differences useful by fitting them one to another.
>
> (Foucault 1975: 184)

As Foucault describes the process, the creation of averages also provides a way of combining differences. The 'inhabitant' category is constructed by measuring the differences in consumption and linking them using statistical methods to produce a whole. In the case of energy consumption, those that consume less and those that consume more (themselves categories constructed through surveillance), can be connected to form a single category under the label 'smart home inhabitants'. With such a construction, the differences of the category are made useful in the quest for sustainability. For example, by regularly monitoring the events in and around the home, it becomes possible to translate traces of everyday life into values such as 'avoiding excessive consumption' that the inhabitants are encouraged to recognise and support in their lives.

Categories and classifications are imbued with values, because they make some things visible while concealing others (Bowker and Star 2000). Donaldson and Wood (2004) have emphasised the importance of categories by defining surveillance itself as a process of translating worldviews, denoting systems of categorisation, into materialities. Categories embedded into ICT have also been understood as attempts to control and discipline those who use the systems (Suchman 1994a), although as with any other expression of power, they can also be contested and resisted. In the case of the smart home, surveillance systems categorise and classify traces of consumption behaviour. However, the categories themselves have to be created somewhere. In this paper, I examine acts of category creation in design documents.

Designing ICT

In the projects I analyse, the design process is characterised by the occurrence of many meetings, the production of a large number of reports, and development of deliverables including the material form of the technologies. I use the term design documents to refer to all the texts written during this lengthy process. These design documents express a collective position derived from texts written by a large group of experts including system designers, project managers, developers, funding agencies, etc., who may have different or even conflicting goals individually. For the types of ICT under consideration, the majority of the design processes take place after the funding for the project has been secured, but before the technology has been developed. The things worthy of monitoring and analysing in the smart home are discussed, selected, and written down in this phase. The participants, methods, and the length of the process vary greatly depending on the requirements of each project and the configurations of their actors both geographically and organisationally.

Although the design process aims at prescribing the uses of technologies, the eventual uses cannot be inferred from it. Scholars in the field of Science and Technology Studies (STS) have demonstrated that technologies are often used in ways that are not intended or foreseen by the designers, and that no single, essential use exists for any technology (Albrechtslund and Glud 2010; Bijker and Law 1992; Oudshoorn and Pinch 2005). Furthermore, the designers constitute only one of many groups of actors that play a role in creating the technologies, and even the act of categorising designers or users as distinct groups tends to obscure the continually shifting boundaries of design and use (Suchman 1994b; Suchman 2002; Woolgar 1991).

In my analysis, I trace the discursive construction of the surveillance technologies in the design documents which precede their material form, with the awareness that once these systems are operational they are bound to be shaped and configured by a multitude of actors in many different ways that are impossible to predict. Although users actively co-construct the surveillance systems they encounter by appropriating, modifying, and resisting (Dubbeld 2006), the systems themselves are much more open to change, although by a smaller number of actors, before they fully materialise in their software and hardware incarnations. Starting from classifications, Bowker and Star highlight the negotiations that lead from decisions to technologies:

> Someone, somewhere, must decide and argue over the minutiae of classifying and standardizing. . . Once a system is in place, the practical politics of these decisions are often forgotten, literally buried in archives (when records are kept at all) or built into software or the sizes and compositions of things.
>
> (Bowker and Star 2000: 44–45)

The extended process of arguing over minutiae binds project managers, system designers, funding agencies, programmers, as well as software standards, keyboards, chairs, and compatible word processor extensions. Somewhere between stand the design documents, describing the decisions for those who will construct the systems. From a collection of discussions, decisions, and limitations both material and temporal, the designers craft texts in the form of project proposals, specification documents, and pre-study reports. In the construction of ICT, the design process is a bridge from discourse to materiality. Often, material is constructed discursively in use cases where fictional scenarios depict future users and usage. However, sometimes the bridge allows movement in the opposite direction; discourse is materially grounded in non-functional prototypes, objects that stand for the idea of a thing that is yet to be imbued with function.

The documents produced during the design process aim to describe the systems fully, to ensure that they can be developed in the future. Many choices that become invisible later when the system is operational are clearly described in the design documents. The ambition to produce a complete textual description aids the application of discourse analysis. Their discourses describe what is worthy of observation and contain valuable pointers when trying to critically analyse the consequences of living with the systems.

Material

I draw my material from three different ICT development projects with similar goals regarding sustainability. All three projects are contemporary collaborations between 15 or more partners, and the majority of these are European companies developing ICTs. Other members include universities, research institutes, and electric utility companies. These three projects were chosen primarily based on their goals to develop information infrastructures, particularly for residential areas, with the participation of a large number of organisations.

The first, Home Gateway Initiative (HGI), is a consortium of broadband service providers, and manufacturers of digital home devices, chips, and software (HGI 2012). HGI publishes guidelines and requirements on the digital home infrastructure. The report I analyse, 'Home Gateway Initiative—Use cases and architecture for a home energy management service' (HGI 2011), includes eight use cases that aim to reduce the energy consumption in homes.

The second, Future Internet for Smart Energy (FINSENY), is part of the Future Internet Public-Private Partnership Programme (FI-PPP) launched by the European Commission (FINSENY 2012). In the projects, partners from ICT and energy sectors aim to identify the requirements of smart energy systems. The report I use in this paper, 'Future Internet for Smart Energy—Smart buildings: Use cases specification' (FINSENY 2011), includes forty use cases that list the requirements for a smart energy infrastructure in five different contexts: homes, residential buildings, office buildings, data centres, and hotels.

The third, Smart ICT, is part of the Stockholm Royal Seaport (SRS) project. SRS is one of Europe's largest urban development projects, and its goal is to develop a new city district in Stockholm, Sweden (SRS 2012). Smart ICT, a much smaller sub-project within SRS, aims to detail a generic ICT infrastructure for SRS. A report from the Smart ICT pre-study, 'Stockholm Royal Seaport—Smart Communication', describes possible ICT applications that can be deployed within the district. It includes eighteen use cases, called demonstrators, that describe fictional events in which future inhabitants interact with the proposed technologies.

The HGI and FINSENY reports describe technologies that can be deployed, in theory, at many different sites regardless of context. The Smart Communication report, on the other hand, describes applications specifically designed for the Stockholm Royal Seaport district, and provides much finer detail about user interaction and the imagined futures of the proposed technologies. To avoid repetition, I use the terms 'HGI report', 'FINSENY report', and 'SRS report' when referring to the three documents.

Analysis

The analysis is divided into three parts: first, I describe the intersecting visions of sustainability in the three projects that entail the wide-spread use of ICT. I then list the properties of the users who are tasked with using the ICTs proposed by the projects within and around the smart homes. Finally, I illustrate the mechanisms that the reports propose to judge these users according to different criteria. Additionally, I identify a process of translation where values are inscribed into the systems.

Visions of sustainability

The three projects share the common goal to design and develop ICT to accomplish sustainability goals. These goals are defined under four headings in the SRS report: climate change, ecological sustainability, economic sustainability, and social sustainability (SRS 2011: 5). The HGI report only refers to the concept of sustainability in the abstract, favouring the terms 'energy efficiency' and 'reduction in energy consumption' instead (HGI 2011: 9). The FINSENY report motivates its focus through its understanding of the users, where the 'generic home dwellers' are willing to accept optimising technologies if the services are kept at the same level, and a few who are 'energy conscious' and thus more likely to be proactive (FINSENY 2011: 20). I return to the definition of the user in the next section.

In all three reports, similar future urban environments are described as being rendered more environmentally sustainable by introducing ICT. Many of the technologies rely on the wealth of sensors proposed for inclusion in smart homes. The properties of the inhabitants of these homes are made visible by the wide-spread use of surveillance systems in the form of sensor networks. Additionally, in the SRS report, the phrase 'the ease of doing the right thing' appears in several sections, denoting a specific right thing, a way of behaving sustainably with the help of ICT.

Regarding the evaluation of a population and the ordering of individuals through ICT, the HGI report cites the European Union directive 2006/32/EC in its introduction, which states that member states should ensure that energy distributors make available 'comparisons with an average normalised benchmarked user of energy in the same user category' (European Parliament 2006: 72). In accordance with the directive, the use case 'Visualization of historical data' proposes to allow the customers to 'compare their own energy consumption with other similar customer/communities types' (HGI 2011: 27). These comparisons are motivated in the 'business rationale' section of the HGI report:

> Environmental degradation and global warming are among the major challenges facing society. . . The most pressing challenge is to reduce the rate of increase of greenhouse gases in the atmosphere and ultimately to decrease the absolute level of these gases. . . ICT technologies can help reduce energy consumption and manage scarce resources,

> improve efficiency and contribute to cutting carbon emissions. . . Smart Metering, Smart Buildings and Smart Grids, are among the most important ICT-enabled solutions with the highest potential to reduce CO2 emissions.
>
> (HGI 2011: 15)

The HGI report constructs a particular society in which all inhabitants of the smart homes are compelled to act to counter environmental degradation through the use of technological solutions. By framing the reduction in the rate of increase of greenhouse gases as the most pressing challenge, and proposing management and efficiency as potential solutions, the report links ICT to environmental sustainability.

In the three reports I have analysed, energy is conceptualised primarily as a commodity to be bought and sold. The HGI report states that 'instead of measuring energy use at the end of each billing period, smart meters provide this information at much shorter intervals' and '[e]nergy companies will also be able to innovate and offer their customers new types of tariffs that will allow customers to take advantage of cheaper deals at off-peak times' (2011: 15). In the FINSENY report, the consumer is defined as having 'signed a contract with the electricity provider to access electricity' (FINSENY 2011: 23), and that 'for many customers, monitoring energy consumption is in fact monitoring the bill' (2011: 21).

In these proposals, sustainability is interpreted as something that can be achieved in the future and only through change. Since the ability to sell energy, and hence the structure of the participating organisations, is conserved, the partner that is designated as being compatible with change is users. After locating the potential of change in the users, ICT solutions are proposed to utilise that potential and to effect change. Viewed from this perspective, the status quo is preserved for the organisations that provide the energy, and the home dwellers become individually responsible for creating sustainable lifestyles with the help of ICT.

Describing the user

Alongside the descriptions of the proposed systems, the three reports also describe the users of these technologies. These descriptions necessarily refer to a group that does not exist at the time the documents are written, since the technologies themselves have not yet materialised. In other words, the texts discursively construct their users, and assign them certain properties that are essential for operating the proposed technologies.

The necessity of gathering and processing of personal data is a widely held assumption (Murakami Wood 2006). Building on the assumed necessity, the three reports describe a type of user whose data are always available for gathering. The following paragraph from the FINSENY report, describing the differences between the home domain and the residential building domain, illustrate some properties of this user:

> In the home domain use cases there is a single user or a number of users with commonly aligned interests (being members of the same household) so they can be assumed to be capable to make timely and coordinated economic decisions. . . In contrast, in the building use cases there is not a single agent who makes cost-optimising decisions so many such scenarios [sic] and use cases are not applicable. In other words, there exists a multitude of different economic agents with access to common resources, giving rise to situations where these individuals, rationally consulting their self-interest, might engage in what will ultimately be wasteful behaviour. Individualised metering can be used to maintain economies of scale while providing incentives to avoid waste.
>
> (FINSENY 2011: 38)

The user is viewed as being rational, willing to operate the interfaces provided by the projects, and ultimately, cooperative with the systems. In the 'home domain use cases', the user exists as part of a group of agents that coordinate and decide rationally. When the users' goals are identified as not necessarily overlapping with those of the systems, as in 'building use cases', the aim of the systems is stated as a way of steering the inhabitants' rationality towards financial decisions that align with the vision of the project. The user is characterised as homo economicus, a self-interested agent making decisions individually based on a personal utility function, and users compatible with the systems are constructed based on the assumption that a shared motivation mechanism is inherent to all individuals. While the reports do not describe how the proposed systems would interact with non-compatible users, scholars of surveillance have thoroughly documented systems that explicitly assume the existence of the non-cooperative user, and the complications that await such 'neoliberal deviants' (Gilliom 2001; Maki 2011).

The assumption that financial gain and self-interest guide the inhabitants plays a key role in the argument that ICTs for scheduling electricity usage to take advantage of lower electricity prices at night can contribute to sustainability goals. The rational cooperative user assumption is compatible with the existing commercial activities of the project partners because it does not challenge the practice of buying and selling electricity or other forms of energy. The SRS report extends the commercial frame even further with the following statement: 'Research is to use money to create knowledge. Innovation is to use knowledge to create money' (SRS 2011: 23). In the three reports, commercial interests of the project partners form the central pillar around which other concerns such as sustainability and comfortable living are structured.

The necessity of discursively constructing compatible users becomes visible primarily in scenarios that describe the interactions between the users and the systems. The HGI report includes an example:

> The system will provide the end user with an easy way to access the appliance configuration web page. When the end user opens the remote page general options to control an appliance are available (stop and start), and other more specific ones for various appliance (e.g. for a washing machine skip the spin cycle or use a lower temperature). The user will be informed of the current consumption and the impact of any configuration change.
>
> (HGI 2011: 32)

The user referred to in this scenario is both a technically competent individual that can operate the system, and one that wishes to operate the system. The proper functioning of the system depends on both: if the user cannot understand how the system works, or does not wish to invest time in its functioning, then none of the options provided in the application configuration web page accomplish any positive outcome (Darby 2010). The scenarios detailed in the reports emphasise individual choice, but the systems constrain the consequences of that choice severely. In most cases, the benefit to the customer is a lower energy bill, and possibly lower energy consumption. However, to accomplish the outcome, the inhabitants are expected to modify their behaviour to suit the systems, that is, to understand and configure them, while the practices of the energy providers remain largely unchanged. Even for the inhabitants who fit the described user profile and choose to cooperate with the systems, there remains the possibility that the financial gain of using the systems would not be worth the time they need to invest in it. Additionally, the emphasis on choice has a very significant consequence that remains undiscussed in the three reports: inhabitants might make the 'wrong' choice. Depending on the nature of the choice, this failure may lead to undesired, or unintended consequences for all actors involved in the system. The possibility of choice does not solve problems by itself, and even more critically, it places the responsibility for the wrong choices on the inhabitants using a narrative of consumer empowerment (Ottinger 2010).

Within the three reports, the users are also described as gendered. Anne-Jorunn Berg has criticised a much earlier incarnation of the smart home as 'unlikely to initiate any developments that would substitute or save time in housework' (Berg 1994: 312). While acknowledging the impossibility of determining the use of technology solely from design, she observes the gendering of design in the smart home. She argues that the smart home is 'gendered in what it leaves out—its lack of support for changes in the domestic sexual division of labour' (1994: 312). This argument finds support in the three reports.

The scenarios in the reports discuss running dishwashers and washing machines as examples of housework. The proposed projects make these tasks more energy efficient by scheduling them at different hours. The HGI report does not use any pronouns or names, the activities it describes are performed by 'the customer' or 'the user'. The majority of the FINSENY report follows the same pattern, but the scenarios that do include a user always use the masculine pronoun, and women are entirely absent. The pronoun 'he' is used in multiple descriptions to refer to the 'home dweller' category (FINSENY 2011: 21, 27, 39). The SRS report differs from the previous two by providing names for the users that appear in their demonstrators. However, the division of labour remains clear as the report describes women engaged in housework and care work much more often than men. For example, Beda and Bertil's daughter follows the updates on their health generated by the smart home (SRS 2011: appx. III, 15). Jimmy's daughter helps him adapt to changes in the smart home systems after he suffers a stroke (2011: appx. III, 19). Anna, in her role as Bertil's 'contact person', warns him to take a shower and hurry to the day centre using a speaker placed in the home (2011: appx. III, 19). Julia ensures that the stove is off and the washing machine is running using her mobile phone, and goes shopping for food while both Anna and Anne pick up their or somebody else's kids from school (2011: appx. III, 20, 51). In other examples, Charlotte and Anna use the car pool while Lars remains unconvinced about its benefits and drives to work (2011: appx. III, 32, 41), and Emil, aged 11, becomes an 'agent against power waste' in an activity at his school (2011: appx. III, 52). These constitute the majority of the characters that appear in the SRS demonstrators. As noted earlier, while the use of the technologies cannot be determined from their designs or descriptions, both still exert influence over how these technologies should be perceived by others, and what is expected of them as users.

The systems that make the home smart also describe the properties of the inhabitants that matter. The SRS report includes a detailed description of the site itself and the available tools for the surveillance of the inhabitants: sensors for monitoring water and electricity consumption, sensors for monitoring temperature in all rooms, near-field communication access control system in the outer door, light control system to monitor power consumption of all outlets (SRS 2011: appx. III, 23). Within the home, the everyday behaviour of the inhabitants is monitored continually, and the traces of their behaviour, relieved from their context by the sensors, are transported to databases for storage and further analysis. By generating measures such as the mean, the median, and the standard deviation, the similarity and the difference of the recorded instances are quantified (e.g., the average smart household consumes 21 litres of water per day). The statistical measures enable both the evaluation of the performance of a population collectively, and the ordering of individuals separately. They are used to create the smart home inhabitant category, where differences are fitted to one another to form a whole.

In describing their users, these project proposals also illustrate how the systems begin to translate the traces of energy consumption into a form of knowledge that is used to judge the inhabitants. The translation proceeds according to values inscribed onto the systems, emphasising technological expertise, rational choice, and individual responsibility, which are used to position the ICT-based surveillance of energy use as integral to sustainability in these proposals.

Judging the user

The translation process continues with the communication of the quantified differences back to the inhabitants in the form of usage logs, recommendations, and visualisations. This communication allows the judging of the users, both by the users themselves and by others, on the basis of different criteria.

In the HGI report, the mechanisms for judging appear only when the user engages in an activity that involves energy consumption. For example, the use case 'Alarms' describes a way of informing the user in case of 'abnormal appliance consumption (e.g.: possibly indicating a fridge with a door left open)' (HGI 2011: 28), and the use case 'Visualization of current energy and power data' describes how to '[i]nform the consumer of the energy implications of selecting different operational modes, in particular different washing machines cycles, before initiating the activity' (2011: 26). In both cases, the activities of the user are observed by the system, categorised according to the processes described earlier, and the final evaluation of the system is communicated back in the form of a judgement about whether the activity is abnormal, or with a list of consequences ('energy implications') of consumption. The latter stops short of delivering a final judgement, but in the report it is followed by the statement '[s]tudies have shown that an energy saving of 10-15% could be achieved as a result', implying that some users will choose to behave differently if the system judges the future activity as involving high energy consumption.

The SRS report broadens the scope of both the activities that can be judged and the judgements that can be delivered by stating that '[t]he overarching sustainability goals of SRS stipulate that it should be easy to do the right thing' (SRS 2011: 12). In the report, the right thing is assumed to be the same for all inhabitants, and the role of ICT in the district is interpreted as encouraging the doing of the right thing. One of the proposed projects, titled 'A sustainable community', illustrates the interpretation:

> We propose a set of mechanisms for increasing the social belongingness of a sustainable lifestyle. By applying a point based system on the use of resources (such as water and electricity), bonus points of active choices of transportation, and otherwise effective uses of green alternatives where others are available, this information can be used and presented in different ways. . . Furthermore publicly available top lists can be made available on a community web site, and also on public displays.
>
> (2011: appx. III, 47)

The proposal combines the data collected from the smart home with a categorisation of the activities by assigning scores and declaring winners. In the description, desirable behaviour is defined by the system designers, and the inhabitants are encouraged to participate in the vision with a promise of the public acknowledgement of their activities. Although this proposal only mentions 'top lists', the public acknowledgement of scores can also serve as a threat for those who do not score high. More broadly, 'increasing the social belongingness of a sustainable lifestyle' implies that the proposed systems are charged with making some lifestyles belong in the district. Conversely, the lifestyles that do not rank high in the categorisation are made to belong less. The passage continues by motivating the need for such systems: 'It is not enough that "it's easy to do the right thing"—it must also be shown what that this [sic], how one can do it, and why (incentives)' (2011: appx. III, 47). In the SRS report, the method that shows the inhabitants what the right thing is and how it should be done often takes the form of a visualisation. It is formed by processing surveillance data using statistical methods to categorise the inhabitants ('your energy consumption is below average'), and it provides a value judgement for the observers ('your energy consumption meets the sustainability goals of the city'). Starting from the traces of energy consumption, surveillance aids the creation of a social marker that can be reflected on, discussed, and connected to value judgements. A device used for these purposes appears in the demonstrator titled 'Participatory Installation':

> Input for the installation are peoples' environmentally related decisions, concerning registered [sic] on 'smart cards'. . . Output of the installation will give some kind of indication of the environmental effects of people's actions. This output will serve as feedback to participating people and visitors. Although individuals will be able to identify their own contribution in the installation, contributions of others will not be recognizable.
>
> (2011: appx. III, 50)

The demonstrator describes devices that can be placed in public spaces within the district to reveal the traces of consumption behaviour and the associated value judgements. In this case, the visual representation of the collected data is taken not only from the smart home, but also from the surveillance of other activities with the help of 'smart cards'. The results are displayed to the inhabitants to invoke reflections, as exemplified by the youngest daughter in the opening quote of this paper, taken from the same demonstrator: '[I]t seems that our block is doing much better than my friend Milla's block' (2011: appx. III, 51). The mother verbalises the value judgement provided by the system with her reply: 'That's good news'. In the fictional scenario, the inhabitants reflect on the graphical representation of the collective consumption of the neighbourhood with the help of surveillance technologies. The exchange between the mother and the daughter illustrates the final step of the translation where the inscribed values are inserted into the social fabric of everyday life in the form of value judgements.

The system proposed in the 'Participatory Installation' demonstrator sets up a way for inhabitants to monitor one another to encourage energy-saving behaviour. This type of activity where individuals are provided with surveillance tools to keep track of one another has been called lateral surveillance (Andrejevic 2005). In lateral surveillance, the populace is made responsible for monitoring itself, and everyone is 'invited to become spies' (2005: 494) for their own good. Another example of lateral surveillance appears in the demonstrator titled 'Educational Game' (SRS 2011: appx. III, 52). In the game, participants play the role of 'special agents' who are responsible for reducing energy consumption in their homes, which is measured by connecting their mobile phones to the electricity meters in their homes. They are organised into teams, and the example from the report describes one team as fifth grade students in a school in the district:

> The team competes with another team of agents located in another town. A successful player persuades everyone in the household to conserve as much electricity as they can during the mission, which on most days takes place between 17.00 and 22.00. Throughout the mission, the game monitors electricity consumption in the participants' homes. The winning team is the one who made the combined largest relative decrease in energy consumption.
>
> (2011: appx. III, 52)

In this demonstrator, surveillance is used as the basis of a competition, and the participants are encouraged to align their behaviour with the goals of the system to overcome their competitors. During the 'mission' hours, the players become responsible for the traces of consumption that originate from their smart homes. Once again, the consumption act is freed from its original context through surveillance, and translated into an orderable quantity that is associated with a player contributing to the performance of the team as a whole. The players in this educational game are placed under immense social pressure to either change the behaviour of other members of the household, or risk contributing negatively to the performance of the team.

The FINSENY report also includes a system that utilises social pressure to change the behaviour of the inhabitants. The project titled 'Support Online Community' describes a system where all the tenants in the building are invited to participate in the judging of consumption behaviour:

> The basic idea behind this use case is that energy conservation and a greener life-style can also be encouraged by facilitating the formation of an online community of like-minded people who can use the online platform to share ideas, experiences, know-how, or even participate in competitions. . . [T]he building can comprise ICT infrastructure that collects information / statistics of the various apartments, possibly also including the bills, and exports this information to a web front-end where it can be charted and visualized. This

> can allow the tenants to monitor the historical trend of their apartment in terms of energy and bills paid and also compare it against apartments of a similar profile.
> (FINSENY 2011: 42)

Although this system is meant to be accessed from private devices such as smartphones and personal computers, it shares the same goal as the public and semi-public systems described in the SRS report. It provides the inhabitants with methods of comparing themselves to others on the basis of the categories defined by the system designers, and to form value judgements about consumption behaviour. The quantified differences in the monitored traces are provided to the inhabitants who are expected to identify other apartments with 'similar profiles' against which to compare themselves. They are also encouraged to communicate with each other about the similarities and differences in the traces of consumption behaviour. The 'support online community' provides support for the construction of the smart home inhabitant category by the inhabitants themselves and allows the fitting of the differences within the group to one another.

Conclusion

In this paper, I examined a shared vision of a future society from three different ICT design and development projects where inhabitants are made individually responsible for living sustainably, and I argued that the surveillance of energy use is positioned as integral to this future with the help of ICT. Underlying the vision, I identified a translation process that captures the traces of the inhabitants' lives, classifies them according to different criteria of sustainable living, and returns them to the tapestry of everyday life to convince the users to behave differently. The systems described in the design documents make the differences in populations commensurable with each other, and aid the creation of new categories such as the smart home inhabitant and the sustainable city district. In the discourse of these documents, surveillance translates the traces, and the translations exert new pressures on existing power relations.

The examples of ICT-driven surveillance I analysed present an ordering of society where surveillance and sustainability are linked to one another. Moreover, echoing the findings of Graham and Wood (2003), they support processes of individualisation and emphasise consumption. A significant shortcoming of this vision of a future society is the invisibility of the institutional and systemic causes of the problems addressed under the banner of sustainability. Even if the necessary change is defined merely as reduced energy consumption and carbon emissions, holding the inhabitants individually responsible for effecting this change is not only unlikely to succeed, but also risks obscuring a deeper understanding of the problems.

As the design documents illustrate, ICTs do not materialise from thin air: considerable resources are expended to propose, design, and develop them. If they become operational, they require constant maintenance, and continue to consume energy. Any proposal to use ICTs to create sustainable or 'green' futures must weigh such costs against the theoretical gains. Additionally, the categories and the classifications that the proposed systems use to describe all users privilege a particular type of user that is already privileged within the context of ICT use. As Oudshoorn, Rommes, and Stienstra (2004) note, design practices to create ICTs for everybody remains 'an inadequate strategy to account for the diversity of users' (2004: 54).

If the challenge to be tackled is reducing energy consumption, or creating more sustainable ways of living, the answer does not necessitate the development of new technologies. ICT does not need to be everywhere, and it does not need to be involved in solving every problem. Sometimes ICT might be wrong answer. Even in cases where ICT development simply has to be involved in sustainability initiatives, it can be used for purposes other than the surveillance of inhabitants. For example, ICT can be used to understand how other technologies in residential spaces can be constructed differently to last longer, or to waste less energy, without falling back on the common solution of monitoring the users. Finally, if ICT simply has to be used for surveillance, that surveillance can be aimed at larger institutions rather than the individual inhabitants. It can provide ways for the inhabitants to hold accountable companies that develop wasteful technologies, or energy suppliers that attempt to classify and sort their customers using smart metering schemes.

Given the role of ICT design documents as plans for constructing technological systems, their descriptions of the envisioned users serve as a method of discursively constructing new categories such as the smart home inhabitant. In the texts, these categories serve to demonstrate to the reader how values related to technological expertise and rational choice fit into the visions of sustainability. Clearly, the consequences of living with these systems cannot be determined by only examining the design documents: once the systems are operational, they are likely to be used, resisted, and configured in ways never intended by their designers. However, their influence on the agencies of the inhabitants, and how they encourage certain uses and discourage others, remains worthy of attention, because the development processes of these technological systems are much more open to change before they assume their material forms.

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