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Methodological and Ideological Options

Smarter than metering? Coupling smart meters and complementary currencies to reinforce the motivation of households for energy savings

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ABSTRACT

A crucial argument in the debate around smart meter deployment in the EU is the potential for households to save energy. One strand of research in this field has investigated the effects on household energy consumption of the feed-back provided by smart meters. However, another aspect that deserves attention is the motivation for households to use the feed-back to save energy. This paper explores how the emerging trend of using complementary currencies for sustainability policies could translate into new interventions adapted to the smart meter deployment and capable of promoting more autonomous forms of motivation compared to interventions using official currencies. Three systems designs (rewarding, regulatory and hybrid) are presented and discussed within the framework of self-determination theory. Because the rewarding system S1 can contribute positively people's basic needs for autonomy, competence and relatedness, it could lead to more autonomous forms of motivation. The conclusions regarding the regulatory system S2 are less clear, although the hybrid variant S3 that integrates mechanisms from the rewarding system into the regulatory system could be perceived as more consonant with people's basic need for autonomy.

1. Introduction

Household energy consumption and efficiency are important targets for policy makers. Households represent 25% of the European energy consumption (EEA, 2013) and are thus considered as a sector with high saving potential. The Building Performance Directive (2010/31/EU), the Energy Labelling Directive (2010/30/EU), the Energy Efficiency Directive (2012/27/EU), and even the Third Liberalisation Package (2009/72/EC) aim at achieving part of the potential savings by considering households as responsible consumers that ought to be committed to reducing their energy consumption. These Directives are based on the rationale that householders' behaviour will change if they are provided with additional information (energy labels, campaigns, etc.), energy tariff structures and additional feedback. Smart meters play an important role in this strategy as the technology that will provide feedback to households on their energy consumption. Indeed, it assumed that the additional feedback will lead to energy savings in the household sector. For this reason, the deployment of smart meters has been strongly promoted since 2009 and, following the recent estimation of the Joint Research Centre of the European Commission (JRC, 2013), at least 170–180 million smart meters will be installed by 2020 for a total cost of €30 billion.

Feedback on energy consumption can be direct, in which case the consumption information is immediately provided to the consumer, or indirect, if some processing is required before reaching the energy user. Direct feedback requires adding various types of real-time in-house displays, possibly linked to smart meters. Indirect feedback is more often implemented by the utility company that provides the customer with more detailed bills.

The effect of feedback on behaviour has been tested in many pilot projects and has given rise to an extensive literature (Abrahamse et al., 2005, 2007; Anderson and White, 2009; Darby, 2006; Fischer, 2008). Darby's (2006) review allowed her to estimate "Savings have been shown in the region of 5–15% and 0–10% for direct and indirect feedback respectively". Ehrhardt-Martinez et al. (2010) and Fischer (2008) stated figures of the same order. More recently, large scale research projects, such as the Energy Demand Response Project (Ofgem, 2011), the Smart Metering Project (CER, 2011) and Intelliekon (Schleich et al., 2011), conclude that potential energy saving through smart metering resides somewhere between 2 and 4%. These figures are well below those of prior studies and tend to indicate that the potential of smart meters *per se* to trigger energy savings in households is rather limited.

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This limited potential comes as no surprise, considering the fact that persistent efforts to move towards conservation-oriented behaviours require what Osbaldiston and Sheldon (2003, p. 349) have termed "high-quality" motivation. However, the role of motivation remains largely unexplored in these studies. To our knowledge, none of these surveys have, for instance, clearly evaluated the initial motivation of households to save energy as an explicative parameter on the effectiveness of feedback—just as if there was an implicit and widely accepted hypothesis that feedback alone can trigger behavioural changes. This weakness has not escaped the notice of prominent researchers in the field: "The installation of the enabling infrastructure (smart meters, in-home displays) and provision of detailed information alone will not be sufficient to involve consumers." (JRC, 2013 p.77), "Information on consumption will not work without a motivation to conserve, which may be provided by other instruments like financial incentives, goal setting or personal commitment" (Fischer, 2007), "Information without motivation goes nowhere" (Anderson and White, 2009). As more positively stated by Darby (2006), "using feedback in this way [regularly reading standard gas or electricity meters] requires a level of commitment to reading the meter regularly […]. The potential savings, with motivated participants, can be in the region of 10–20%".

Consequently, motivation—defined as what moves individuals to act towards an end—deserves much attention, especially when trying to link feed-back and energy savings. Besides, it is also a timely preoccupation, as linking motivational tools to the smart meter infrastructure is likely to imply specific technical standards and requirements regarding communication ports and data interoperability for instance. If those requirements are not taken into account before the massive deployment of smart meters takes place, it could hamper for decades the possibility to develop such motivational tools in the future.

The Self-Determination Theory (SDT; Deci and Ryan, 2000; Ryan and Deci, 2000) provides an excellent model for understanding the different forms of motivation. In SDT, much attention is given to the orientation of motivation, or, put in other words, "the underlying attitudes and goals that give rise to action" (Ryan and Deci, 2000, p. 54). Besides, SDT also has an attested use in the field of pro-environmental behaviours and interventions (Koestner et al., 2001; Lavergne et al., 2010; Moller et al., 2006; Osbaldiston and Sheldon, 2003; Pelletier et al., 1998; Webb et al., 2013). Most importantly for this paper, SDT sheds a new light on the impact of different types of interventions on the quality of motivation (Moller et al., 2006; Webb et al., 2013). We have therefore chosen SDT as a theoretical framework to discuss policy interventions from the perspective of motivation in the context of smart meter deployment.

Indeed, for the massive deployment of smart meters to deliver important energy savings, we suggest that the related interventions should include provisions directly aiming at increasing consumer's motivation. Amongst the range of usual interventions, incentives (or penalties) are widely used interventions that can lead to desired behaviour changes in the short term (Abrahamse et al., 2005). However, seen from an SDT perspective, both incentives and penalties are controlling policy approaches that do not favour the kind of motivation necessary to internalise regulation and maintain behaviours over time (Moller et al., 2006). But can alternative incentives or penalties be designed in order to preserve the quality of motivation?

The underlying rationale of our research is that using complementary currencies instead of official currencies could provide the necessary alternative. This paper explores how the emerging trend of using complementary currencies for sustainability policies translates into new interventions adapted to the smart meter deployment and capable of promoting more autonomous forms of motivation compared to usual policies based on official currencies. After a short presentation of motivation seen in the light of SDT, Section 2 is dedicated to complementary currencies used for sustainability policies. Section 3 then presents three possible system designs to couple complementary currencies and smart meters. Based on those system designs, the impacts in terms of quality of motivation are then discussed in Section 4 before the paper concludes by highlighting implications for policy-makers, showing limitations and providing suggestions for further studies.

2. A Theoretical Framework and an Effective Tool to Tackle Motivation

2.1. Self-Determination Theory

Self-Determination Theory is a prominent theory of human motivation that gives much attention to the origins of motivation. Indeed, as is argued by Deci and Ryan (1985, p. 228) "In general, cognitive theories begin their analysis with what Kagan (1972) called a motive, which is a cognitive representation of some future desired state. What is missing, of course, is the consideration of the conditions of the organism that makes these future states desired." This consideration comes thus in contrast with cognitive theories, such as the Theory of Planned behaviour, (TPB, Ajzen, 1991) that are also used to explain pro-environment behaviours (Abrahamse and Steg, 2011; Bamberg and Schmidt, 2003). In the case of TPB, intentions are central and "are indications of how hard people are willing to try" (Ajzen, 1991, p.181), but SDT provides complementary insights by looking into the origins of this willingness to try. As suggested by Hagger and Chatzisarantis (2007) in their meta-analysis, SDT can offer complementary insights on the origins of beliefs and expectations that are used in cognitive theories.

Besides, SDT has also made a major contribution to understanding the quality of motivation that arises in different conditions. As underlined by Ryan and Deci, once early childhood is passed, most of our activities become extrinsically motivated (2000, p. 60). This means that they are performed for their instrumental value and not for the enjoyment of the activity itself. It is not difficult to argue that most activities aiming at energy savings fall into that category as it can hardly be expected that switching the light off or lowering the thermostat, for instance, will procure a true sense of enjoyment in itself.

SDT further differentiates extrinsically motivated action on the basis of the level of control vs. autonomy perceived by the individual. In the most controlled form of extrinsic motivation, the motives to act are perceived as being external to the self. This form of behavioural regulation is called "external regulation". Typically, behaviours that have been prompted by incentives (or penalties) fall into this category. But individuals have the potential to internalise values and regulations.

The first step in this internalisation process results in 'introjected regulation'. In this case, the values underlying the action have been introjected and contingent self-esteem is playing a major role. In the energy saving context of this paper, this would be typically the case when people feel an obligation to save energy and guilt when they forget to turn off the light.

The second step leads to 'identified regulation'. It corresponds to a more autonomous form of motivation when the activities start to be consciously valued and the individual can identify with them.

The third and final level of autonomy is called 'integrated regulation' and occurs when activity is fully integrated to the self and meaningful (Moller et al., 2006). This type of "integrated regulation" could be met, for instance with a person who has adopted a low-carbon lifestyle as one of his or her life goal. In this case, turning off the lights or lowering the thermostat is perceived as actions to reach a personal goal. Integrated motivation shares many similarities with intrinsic motivation. However, the main difference is that with integrated motivation, the action is still done for an instrumental value.

Individuals move along the continuum of increasing (or decreasing) autonomy/self-determination. As they internalise values and regulations, individuals can move in the direction of more self-determined/autonomous forms of motivation. But backward moves are also possible, for instance, when the external pressure is perceived as too controlling. In such a case, individuals no longer perceive their actions as being rooted in their own choice.