Environmental Modelling & Software 104 (2018) 188–198

Contents lists available at ScienceDirect

Environmental Modelling & Software

journal homepage: www.elsevier.com/locate/envsoft

Smart metering: A water-saving solution? Consider communication strategies and user perceptions first. Evidence from a French case study

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ARTICLE INFO

Article history:
Received 12 May 2017
Received in revised form
30 December 2017
Accepted 11 February 2018

Keywords:
Smart water meters
Household survey
France
Social representation

ABSTRACT

Smart water meters are increasingly being installed by French water utility companies and made available to users free of charge. However, households are not taking advantage of this technology in spite of the benefits it theoretically offers. This article investigates factors that may explain this technology low adoption rate, focusing on the first two steps in the process of adoption: providing information and fostering good intentions. It describes a natural field experiment conducted in a residential suburb in which 261 households were officially informed about the new smart metering service and 77 of them were then surveyed to identify potential barriers to the adoption of smart meters. We analyse the prevailing social representations of the words "water" and "smart metering". Although respondents seem more interested in, than opposed to, this new technology, its adoption rate remains low, particularly among heavy water consumers and flat renters.

1. Introduction

In a context of increasing water scarcity, France's "Grenelle" environmental laws strongly encourage water authorities to improve network efficiency and reduce water leaks. Some authorities divide their water networks into sub-areas of water distribution, and equip them with smart meters. Water authorities are then able to read them remotely and in real time. Some water authorities go further by providing all water subscribers with smart meters. In this last case, authorities can keep information given by smart meters; but, in some cases, they add a customer application, permitting water users to monitor (free of charge) their daily water consumption and set up alerts (sent via SMS or email) to inform them when water consumption exceeds a pre-defined threshold.

When this customer application is provided, it might appear to offer a win-win solution: smart water meters are able to provide water managers and users with information on real-time consumption (Kendel and Lazaric, 2015), allowing them to both detect leaks and save water. Indeed, smart meters are viewed as a "promoter of environmentally significant behaviour" (Midden et al., 2007). For instance, Davies et al. (2014) found that in Sydney (Australia) households with in-home displays installed had achieved lasting reductions in their water consumption compared to the control group (initially by an average of over 6.8%, and after three years, by 6.4%). There are also a number of other advantages for both water users (reduced cost, fewer disturbances) and water managers (productivity gains, ability to determine water pricing by taking into account water scarcity and other management constraints) (Commission de Régulation de l'Energie, 2011; Darby, 2010; Tyszler and Bordier, 2013).

All these reasons could prompt water demand modellers to predict high take-up rates for the new smart meter service: a standard cost-benefit analysis at a water user level suggests the service would have substantial benefits for users while costing them very little, and only in terms of their time (time taken to register, set up alerts, and monitor water consumption).

But the results show that this technology, at least in France, is not being widely adopted by water users, as demonstrated by the very low registration rate. For instance, only 2% of the 23,000 water users supplied by Syndicat Mixte Garrigues Campagne (SMGC) (a water authority located in the south of France) had signed up for the service. Moreover, when municipal users are not included, this

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https://doi.org/10.1016/j.envsoft.2018.02.006
1364-8152/

rate is closer to 1%. A similar rate has also been observed for a big public water authority supplying 150 municipalities around Paris (SEDIF: Syndicat des Eaux d'Ile de France). The town of Mulhouse in the north-east of France had the highest adoption rate (8%).

This article aims to explain why this rate is so low by exploring the factors determining smart meter take-up: could it be explained by the fact that users, and households in particular, are not being well enough informed, or that they have misgivings about this new technology? To find out, a natural field experiment was conducted in a residential suburb of an urban area (Montpellier, in the south of France).

The first part of this paper presents the framework chosen to analyse the adoption of smart meters. The second part describes the methodology and the case study. The third part details results and discusses the main findings. The last part offers some conclusions.

2. A framework with which to analyse smart meter adoption by households

The initial adoption of a new service can be broken down into three steps (Fig. 1): information is provided, favourable intentions are created, and finally, users proceed to the behaviour itself. In this article, we focus on the first two steps in this process: the information and intention creation phases, assuming that households will register only if they have been informed of the characteristics and potential benefits of the service, and have developed a positive attitude towards the service and the possibility of using it.

2.1. Information: a prerequisite condition

Informing users is a prerequisite, but often overlooked, condition for take-up. Water managers too frequently assume that sending a leaflet describing what a newly installed smart meter can do is enough to prompt the action required to allow for its proper use (registering over the internet, for instance). This information step has to be done well if it is to have a significant impact and encourage a higher sign-up rate (short-term objective), or allow a lasting change in behaviour (long-term objective). Following the Lasswell communication model (Lasswell, 1948), five questions have to be answered carefully: "Who *[the communicator]* says What *[the message]* to Whom *[the receivers]* in Which channel with What effect"?

- Who? The message communicated needs to be conveyed by a legitimate person (Fischer-Lokou et al., 2004). Users may be concerned about how an institution might use the information it collects on them, how legitimate this data collection is from a legal standpoint, and whether their data will be protected, as well as a number of related issues. As a result, the French public are generally mistrustful of the private companies that manage water provision in certain areas. Anything they try to communicate is met with a certain amount of scepticism. It then becomes problematic for these companies to market new services, as users will tend to question their motives and may suspect that this boils down to financial gain (Capel, 2003).
- What? The message should clearly state that the new system is intended to help households detect leaks when these occur inside private properties (houses, gardens, apartment buildings), and better monitor their water use with a view to reducing their consumption, and thus their bill. The message should highlight what the benefits are for the manager as well as for households. On the technical side of it, the information communicated should present the smart meter device, as well as the related service provided through the internet platform, in a simple and practical way, explaining how to use it and answering users' main questions and concerns.
- In which channel? Face-to-face communication is usually more effective than written communication especially where disseminating information and winning people over to a concept are concerned (Fischer-Lokou et al., 2004). Fischer-Lokou et al. (2004) also note the interest of non-verbal means of communication. Especially in the case of written communication, inclusive language (for instance using "we" rather than "you") allows communicators "*to link a social identity to a new behaviour by stressing that this new behaviour is a normative part of 'who we are'*" (Seyranian et al., 2015). This is generally considered to be a helpful technique for improving the likelihood of producing the desired behaviour, in spite of the fact that in some cases no differences in behaviour were noted, as occurred during the Seyranian et al. (2015) experiment.

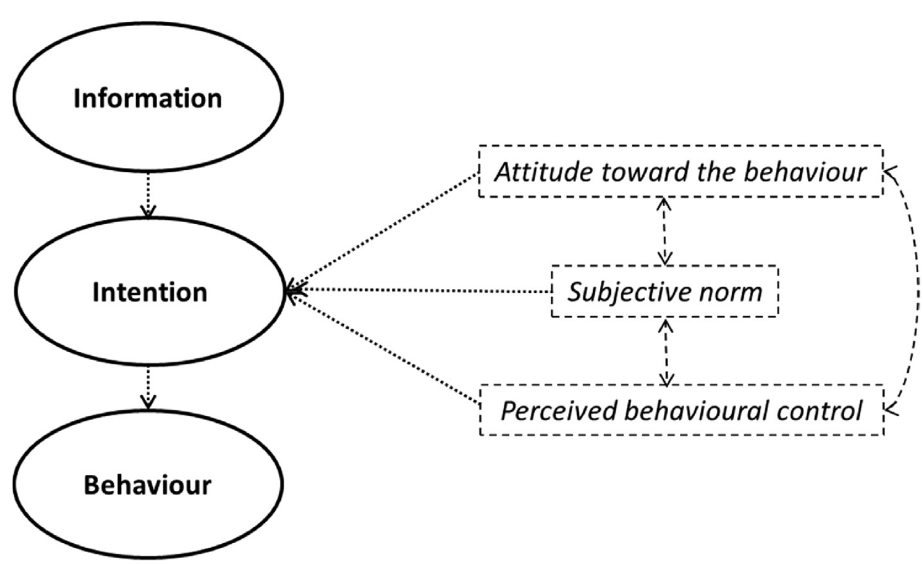

Fig. 1. Theory of planned behaviour, adapted from Ajzen (1991).