



# The value of social networks in the diffusion of energy-efficiency innovations in UK households

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## HIGHLIGHTS

- ▶ Case study research suggests social capital is important for home energy innovations.
- ▶ One-third of respondents indicated a preference for speaking to people they know.
- ▶ Those who sought information were up to four times more likely to adopt innovations.
- ▶ Results varied by innovation and by each community case study.
- ▶ Tailoring campaigns to communities' communication channels is imperative.

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## ABSTRACT

The UK Government has policy goals for increasing energy efficiency in existing homes. However, there are doubts that standard technology and behavioural innovations will be adopted widely enough in time to achieve the targets. Diffusion of innovation theory states that the communication of information on innovations through a social system encourages adoption. Social capital theory states that interpersonal communication is a key means of gaining resources, such as information on energy-efficiency innovations, for attaining certain goals. Case study research of three British communities was conducted in 2009 in order to understand the influence of social capital on information diffusion regarding the adoption of household energy-efficiency measures. The findings show that while standard campaigns may account for two-thirds of information-seeking behaviour, they may not be addressing up to one-third of information-seekers who would prefer to speak to people they know. Findings also indicate that seeking information amongst personal contacts is often associated with adoption of energy-efficiency innovations, increasing the likelihood of adoption by up to four times, but that there are important differences between types of innovations and communities. Tailoring campaigns to communities' communication channels is therefore imperative. These findings have important implications for informing community-based energy-efficiency programmes.

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## 1. Introduction

Current UK energy policy places a large emphasis on tackling the long-term challenges of maintaining a secure supply of energy and reducing the country's impact on global climate change (Department of Energy and Climate Change (DECC), 2009). A key priority area in achieving these goals is reduction of energy use and increase in energy efficiency (DECC, 2009). For the UK domestic sector, this often means encouraging energy efficient design and construction of new buildings, as well as an increase in efficiency in existing dwellings. New buildings are expected to be

more energy efficient, but as existing homes are anticipated to still account for two-thirds of homes in 2050 (DECC, 2009), they present particular challenges. It was estimated that in 2003 the UK's existing 25 million homes made "up one of the oldest and least efficient housing stocks in Europe" (Boardman et al., 2005, p. 38).

The Department for Environment, Food and Rural Affairs (Defra) "... estimate[s] that there is potential to reduce emissions from households by around a quarter, using established technologies available today" (Defra, 2007, p. 18). The diffusion of innovations assumes that there is a process by which these innovations are accepted or rejected by groups of people. Various institutions are trying to encourage the adoption of technical and behavioural energy-efficiency innovations through policy, building regulations and other measures such as direct engagement

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with communities and constituents. Effective local, bottom-up initiatives have included the use of energy service companies (Kellet, 2007) and energy-company sponsored competitions between communities (Lockwood and Platt, 2009). However, evidence broadly points to slow diffusion (Jaffe and Stavins, 1994).

One social aspect that is rarely empirically examined in the diffusion of energy-reducing innovations is the influence of interpersonal communication channels (Darley and Beniger, 1981; Weenig and Midden, 1991; Rambo and Feldman, 2003; Fell et al., 2009). In particular, social capital, which is defined here as “access to and use of social resources embedded in social networks” (Lin, 1999, p. 30), has not previously been considered with regard to energy reduction in homes. For the purposes of this research, actively seeking information about household energy use is considered a means of accessing and mobilising a specific form of social capital. It is posited that, in addition to facing deterrents such as financial costs, householders often lack information to reduce household energy consumption (Defra, 2007). In light of this, the over-arching hypothesis for this research is that information on energy innovations which is gained by householders from people they know can facilitate the decision processes of adoption and may ultimately lead to faster adoption of energy-reducing innovations.

This paper is structured as follows: Section 2 gives background on residential energy demand in the UK as well as the theories of the diffusion of innovations and social capital, and concludes with the three research questions. Section 3 explains the methods of data collection and analysis. Section 4 presents the findings according to each research question. Section 5 discusses the policy implications and Section 6 concludes.

## 2. Background

### 2.1. Residential energy demand

The UK government has made the reduction of greenhouse gas emissions a priority in energy policy, along with the other key concerns of national energy security and the abolition of fuel poverty (DECC, 2009). The government has also made commitments to international agreements (such as the Kyoto Protocol) and established national policies on climate change over the past few decades (Department for the Environment, Transport and the Regions (DETR), 2000; Defra, 2006). In 2008, the Climate Change Act indicated a commitment to reducing carbon dioxide emissions by 80% on 1990 levels by 2050 (DECC, 2009). Further, the ‘UK Low Carbon Transition Plan’ indicated a commitment to reducing emissions from the non-transport domestic sector by 29% on 2008 levels by 2020 (DECC, 2009).

In 2010, the non-transport domestic sector constituted 30.5% of final energy consumption (MacLeay et al., 2011). Energy conservation and energy-efficiency initiatives have been asserted to be the fastest and most cost-effective means of making significant contributions to CO<sub>2</sub> reduction (Defra, 2007). Despite successes in meeting interim energy-efficiency goals through policy and supplier obligations (e.g. Office of Gas and Electricity Markets) (Ofgem, 2008), a variety of efforts are necessary to meet the ambitious target of 29% reduction in household emissions (DECC, 2009). Social scientists posit that the slow rate of adoption of energy-efficiency technologies and behavioural changes thus far has perhaps been due to the “blind spots” in policy with regard to human behaviour (Stern, 1986), and encourage a greater role for behavioural research alongside economic and engineering research in the creation of energy policy (Dietz et al., 2009; Vandenbergh et al., 2010). Behavioural research on energy efficiency and sustainable

consumption has emphasised the need for integrative social and technical perspectives, as well as the importance of the role of community (Jackson, 2005; Faiers et al., 2007). As well, the UK Government and Parliament have recently examined behavioural issues such as energy efficiency in more depth, recognising the importance of consumers’ behavioural and purchasing decisions in influencing their energy use (Cabinet Office, DECC and DCLG, 2011; House of Lords Science and Technology Select Committee, 2011).

### 2.2. Diffusion of innovations

The diffusion of innovations, or “the process by which an innovation is communicated through certain channels over time among members of a social system” (Rogers, 2003, p. 5), can be applied as a theoretical framework for understanding the technical and social processes of the adoption of energy-efficiency technologies and behaviours which are associated with achieving household energy reduction. The four main elements encapsulated in the diffusion of innovations are: (1) the innovation, i.e., any “idea, practice or object that is perceived as new by an individual” (Rogers, 2003, p. 12), (2) the time frame in which it takes place, (3) the social system, e.g. an organisation or nation, and (4) the communication channels through which the diffusion takes place, e.g. interpersonal networks or media. This paper focuses on the latter: communication. However, it is still not enough to simply communicate information. Householders must use the information (and other factors and influences) to help them make a decision as to whether or not they adopt an innovation. This process—the ‘innovation-decision process’—is “essentially an information-seeking and information-processing activity in which an individual is motivated to reduce uncertainty about the advantages and disadvantages of an innovation” (Rogers, 2003, p. 172). There are five stages of this process, which are generally considered to be temporally linear: (1) knowledge of an innovation; (2) persuasion toward using it; (3) the decision to adopt or reject; (4) implementation and use; and (5) confirmation of the decision (Rogers, 2003). Communication of the message of the innovation from external sources is important throughout this innovation-decision process (Darley and Beniger, 1981; Ball et al., 1999; Rogers, 2003).

Communication regarding household energy reduction can occur through several methods: the media and mass marketing; personal referrals from friends and acquaintances; or more formal referrals from people in organisations. There tends to be a focus on the former—media—as it can be more cost effective for reaching a wider audience (Wallace et al., 2010). There is also much support in the UK for energy-efficiency organisations, which may communicate messages on a one-to-one basis, or through publications or leaflets, but often also rely on media such as websites (Wallace et al., 2010). However, whilst general media messages can be effective, particularly amongst those who tend to be the innovators or early adopters (Darley and Beniger, 1981), there is evidence to suggest that these messages are more effective for the majority of adopters when they are verified through personal contacts (Ball et al., 1999). Coltrane et al. (1986) indicate that “people adopt innovations only after their effectiveness has been demonstrated through the experience of friends and acquaintances” (p. 142). Information-seeking in this way is often regarded as a means to reduce uncertainty by “search[ing] for evaluative judgments of trusted and respected others” (Dearing, 2008, p. 100).

The diffusion of innovations theory has provided a model for studying and describing aspects of energy conservation and efficiency innovations (Darley and Beniger, 1981; Ball et al., 1999; Fell et al., 2009) and provides a systematic framework for

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