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How to assess involvement of electricity end user in energy efficiency improvement - analysis of survey results

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Abstract

It have been demonstrated that by providing better information and feedback on electricity consumption to households, it is possible to achieve a considerable level of energy savings. However, factors that influence the decisions of households to engage in energy saving activities often are not clear. This study uses the goal-framing theory to examine the diffusion of energy efficiency measures in society. Based on a survey, logistic regression analysis was performed to determine a combination of factors that would explain the intention to engage in energy efficiency activities. The model which combined normative, gain and hedonic goals, as well as other variables, explained 51.37 % of deviance and 13.05 % of adjusted deviance that is lower if compare with similar studies on intention to adopt eco-innovations. Even though there was no clearly dominating goal identified in the goal frame, the normative motivation was slightly more dominant.

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Keywords: energy efficiency; goal-framing theory; energy saving behavior; households

1. Introduction

Energy efficiency is defined as one of the main targets of the EU to reduce dependency on energy imports, saving on primary energy resources and limiting climate changes. Final household energy consumption is still on the rise and in 2010 accounted for 29.7 % of total electricity consumption in the EU-27 [1]. Therefore efforts to promote energy efficiency in electricity usage are especially important.

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In electricity supply, it is important to provide consumers with information on their consumption in a timely and informative manner. This feedback will make energy consumption visible, thus establishing knowledge among residential consumers about how much energy they consume and how much they actually pay for energy. Feedback about usage enables consumers to reduce their electricity demand through energy conservation activities that include changing behavior or making energy-efficiency investments in lighting or household appliances. There are a number of pilot projects and research works exploring potential energy savings by providing better information and feedback to households on consumption. For example, Vaasa ETT's report that involved collecting and comparing results from about 100 pilots has shown that immediate feedback resulted in highest energy savings at 8.7 %. The remaining channels for feedback produced almost equal consumption reduction levels. The average saving results by providing detailed invoices were 6 % but providing access to a webpage feedback 5.1 % [2].

The findings from a smart metering study carried out in Latvia have shown that smart meter roll-out and provision of appropriate feedback information can provide potential energy savings at around 11.4 % on average with 8.6 % for a median extrapolating the savings to a general distribution of households [3]. During analysis of factors influencing energy efficiency in this pilot, no correlation was found between energy saving results and such characteristics as general demographic properties, income, education, prior knowledge of energy efficiency measures, interest to be engaged in energy efficiency activities. However, it was identified that respondents who identified before the pilot that it might be possible for them to save energy, did in fact save more during the pilot [4]. This has identified that it is not enough to have knowledge about energy efficiency options but the customers should form an attitude and reach a level of awareness regarding energy efficiency options from their own perspective. This could be analyzed in the framework of innovation diffusion.

One of the well-known frameworks of diffusion of innovation has been developed by Rogers [5]. Five stages are identified on how an individual adopts innovation:

- gains knowledge of an innovation through social networks;
- forms an attitude towards it;
- decides to adopt or reject it;
- implements it; and
- confirms the decision.

In order to promote energy efficiency measures, the generally used practice is to inform the public about possible solutions that can be adopted such as more energy efficient lighting or white appliances. At the same time, in spite of relatively well disseminated information, the implementation of recommended activities are lagging behind. This fact could be explained by the framework of innovation diffusion which states that, after gaining knowledge an individual has to form an attitude towards it. There are a number of theories that are regularly used as a framework to study pro-environmental intentions and behavioral aspects that are relevant during this process.

One of these theories is Azjen's [6] theory of planned behavior or on its variations, which was building on Fishbein and Ajzen's theory of reasoned action. The theory defines that the best predictor of actual behavior is the intention to perform such behavior. It is assumed that the intention is to capture the motivation factors that influence actual behavior in the end. The behavioral intention is described as an indication of how hard people are willing to try or how much an effort they are planning to apply in order to adopt the behavior. There are three main determinants of the intention which are defined as– attitude towards behavior, subjective norms and perceived control. An attitude towards the adoption of a particular innovation is determined by an individual's beliefs about the consequences of adopting this behavior that will result in a favorable or unfavorable attitude towards the innovation. At the same time, an individual's subjective norms or normative beliefs are determined by his or her perceived expectations of social groups such as family and society and by the person's motivation to conform to these expectations. Perceived control is an individual's view on how easy or difficult it is to perform particular behavior. One of the most important factors in the adoption of pro-environmental innovations is cost.

The theory of planned behavior focuses more on an individual's rational choice in the decision-making process. At the same time, pro-environmental activities are often also studied from an altruistic viewpoint. Value-belief-norm theory is one of the frameworks that investigate altruistic intention and behavior and puts more focus on moral

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