

Determinants of adopting technological feedback devices and water conservation behaviors

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Abstract

Background and Aim

With regard to water scarcity in many parts of the world as well as the energy used for water heating in countries where water is abundant, the use of ICT for providing feedback and promoting (hot) water conservation has gained increasing attention. Insights into how consumers can be motivated to adopt technological feedback devices and intensify their water conservation efforts at home are crucial for a successful and effective distribution of such ICT devices. To the best of our knowledge, there is no substantial psychological literature on the adoption of technological water consumption feedback devices. The present study addresses this gap in the literature by investigating psychological factors that may influence consumer adoption of feedback devices as well as current water conservation behaviors.

Theory

Based on a literature review, we chose the norm-activation model (NAM) [Sc77], which is one of the dominant theoretical models in psychological research to explain environmental behaviors. With regard to its predictive power for different types of environmental behaviors, the NAM has been shown to be particularly helpful in explaining behaviors that involve low individual costs. Buying a feedback device can be considered a low-cost environmental behavior, as it may pay off over time through reduced water and energy bills. Following to the NAM-paradigm, the predictive qualities of the following explanatory variables were investigated: *personal norm* (here: feeling morally obliged to conserve water), *problem awareness* (being aware of environmental problems related to water consumption), *ascription of responsibility* (feeling personally responsible for water conservation and the environmental consequences of water consumption), *response efficacy* (being aware of means to effectively monitor and

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reduce water consumption at home), *self-efficacy* (believing that one can personally monitor water consumption and behave in ways to effectively conserve water in one's home), and *social norm* (believing that important others such as friends and family members expect one to conserve water). As outcome variables, consumers' *intentions to adopt feedback devices as well as current water conservation* were investigated.

Method

A questionnaire was developed which consisted of separate sections, one for each of the explanatory and outcome variables mentioned above. In addition, one section included general instructions on how to fill out the questionnaire as well as questions to assess socio-demographic information, including participants' age, gender, level of education, the household's total monthly income and size. Another section provided information on smart shower meters, their functions and how to install them. This information was presented after participants had provided their socio-demographic information and before they completed the sections measuring the NAM variables.

The questionnaire was sent out to a total of $N = 1000$ individuals aged 18 to 65 years who were randomly selected from the population registry of Darmstadt, a medium-sized German university city. The total sample of participants, after one reminder had been sent, added up to $n = 243$ individuals, resulting in a response rate of 25.18%.

Findings

Correlation and regression analyses were conducted to analyse the data. A general finding of this study is that all of the explanatory variables were positively associated with at least one of the outcome variables: adoption intention or water conservation. However, according to the results of the bivariate and the multivariate analyses, the relative importance of the explanatory variables differed depending on the outcome variable. In connection with the intention to adopt feedback devices, social norm showed the strongest association, followed by response efficacy and personal norm. In connection with water conservation, personal norm showed the strongest association, followed by self-efficacy.

Problem awareness and ascription of responsibility were positively associated with both the intention to adopt feedback devices and current water conservation in bivariate correlation analyses. However, when adjusting for common variance in multivariate regression analyses, these explanatory variables did not turn out to be significant predictors.

In sum, the regression model for adoption intention explained approximately 29% of the observed variance, while the regression model for water conservation explained 38% of the observed variance of the outcome variable.

Conclusions

Efforts to promote the adoption of smart shower meters and the conservation of warm water should target those variables that turned out to be closely related to the outcome variables in the present study.

In connection with the intention to adopt feedback devices, the findings suggest that initiatives to strengthen social norms should have strong potential to change consumers' intention. One way to increase social norms is by informing consumers about other people's interest in adopting feedback devices or actual adoption of such devices. Response efficacy could be strengthened by communicating the results of empirical studies that illustrate the effects of feedback devices (or other feedback strategies) on household water and energy conservation.

In connection with water conservation, the findings suggest that initiatives to enhance self-efficacy should have strong potential to reduce water consumption. One way how self-efficacy could be strengthened is by improving the public's knowledge of feedback technologies and how these can help monitor and reduce daily water and energy consumption.

Campaigns aimed at strengthening personal norms could target problem awareness (e.g., through information about unsustainable levels of water consumption) or ascription of responsibility (e.g., through prompts or commitment strategies). Strengthened personal norms should help promote adoption intention and water conservation behaviors.

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Literature

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