Energy Consumption 2.0 – The Contribution of Smart Metering to Sustainable Energy Use

N. Exner & N. Döring

Ilmenau University of Technology, Ilmenau, Germany

Introduction

With regard to climate change an increase in renewable energy resources in the general energy mix of energy providers is widely discussed. The leaders of the European Union went one step further and endorsed the "EU climate and energy package" with the aim to increase energy consumption from renewable energy resources up to 20 % until 2020. Because power feed-in from those resources is hard to forecast and storage is still inefficient, real-time consumption is one way to make the integration of renewable power resources more cost efficient. Smart metering supports this approach by making real-time pricing and feedback possible. Smart meters record energy consumption every 15 minutes and send this information every hour to the utility for billing purposes.

Theory

One question that arises is which factors influence the continued use of smart metering and time flexible tariffs that contribute to a more sustainable energy mix. The LIMA (Longterm Intelligent Metering Adoption) model has been developed to answer this research question. It is based on the Unified Theory of Acceptance and Use of Technology (UTAUT) by Venkatesh et al. (2003) and integrates research regarding energy consumption. UTAUT was chosen because it is a synthesis of 8 established theories, like Theory of Planned Behaviour. Prose and Wortmann (1997) have shown that lifestyle is one factor that can explain differences in sustainable behavior. The LIMA model integrates a lifestyle typology into UTAUT and develops it further with regard to continued use of smart metering and associated products, like time flexible tariffs and an internet platform.

Method

A convenience sample of 212 participating households is used to test the validity of the LIMA model by multiple regression analysis. These 212 households participate in a two-year field study that tests how smart metering and associated products, like a time flexible tariff and an internet platform are accepted in Germany. The field study follows a panel-design with four waves including a baseline survey. The presented results are from the first wave.

Results

The LIMA model was for the most part confirmed by the empirical data. The main factors performance expectancy (β=0.21, p=.001), effort expectancy (β=0.38, p<.001) and facilitating conditions (β=0.18, p=.001) were supported and the integration of lifestyle research proved valuable. One of the two ecologically orientated lifestyles was among the strongest predictors (β=0.24, p=.001; β=0.16, p=.004) of intention to use (R^2=.55). Intention to use is operationalized as intention to comply with tariff prices and use of an internet platform that visualizes smart meter data.

Discussion

These findings are in accordance with results from other studies. The fact that social influence did not play a significant role is surprising. Results from the second wave will have to show if these results are valid for continued use of smart metering data and time flexible tariffs.

References

Prose, F., & Wortmann, K. (1997). Die sieben Kieler Haushaltstypen - Werte, Lebenststile und Konsumentenverhalten (WELSKO) (The seven Kieler Household types - values, lifestyle and consumer behaviour). Kiel: Christian Albrechts-Universität.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *Management Informations Systems Quaterly, 27(3),* 425-478.