

What is E2District?

CIT's Nimbus Research Centre, Ireland's largest Internet of Things (IoT) facility, is coordinating an EU Energy Efficient Optimised District Heating and Cooling (DHC) project, E2District. This Horizon 2020 project, which has received €2 million in funding, will be instrumental in transforming the future of energy consumption in Europe.

The focus of E2District is to develop an innovative cloud based software infrastructure and people engagement strategy to manage and support smart energy usage and decision making for DHC systems.



OPTIMISING DHC PRODUCTION & DISTRIBUTION ASSET USAGE

ANALYSING & INFLUENCING BEHAVIOURAL DEMAND



DEVELOPING NEW DHC BUSINESS MODELS TO ACHIEVE ENERGY EFFICIENT DISTRICTS

DEMONSTRATING AND EVALUATING INNOVATIVE E2DISTRICT OPERATIONS SYSTEM



E2District aims to make DHC systems more efficient, intelligent and cheaper. To achieve these goals, not only is it necessary that advancements are made on the technical side but, also, end-user behaviour has to be integrated into the whole system. Therefore, CIT campus will serve as a testbed for both aspects, the technical and the behavioural.

The project will create a replicable model that will be promoted under the EU Horizon 2020 framework and adapted for other similarly managed industrial or domestic sites - whether local, national, or international - with a view to delivering energy efficiencies and measurable cost savings.

Who is E2District?

Key stakeholders within the European District Heating & Cooling (DHC) value chain working together with the aim of developing an innovative set of tools for the optimisation of energy efficiency in the DHC industry.

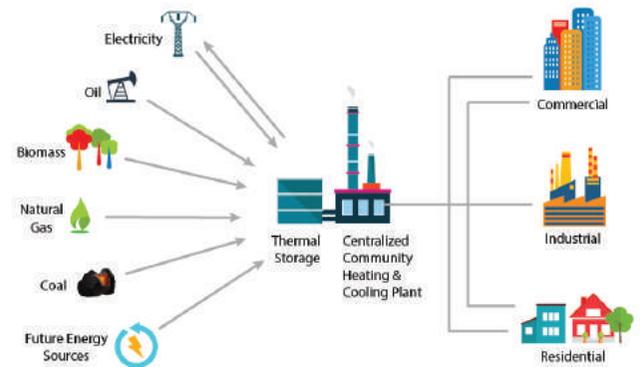


What are district heating & cooling (DHC) systems?

District energy systems, which pipe steam and hot or cold water around a district from a central location, are being used in a variety of cities worldwide because of their higher energy efficiency which can significantly reduce the green house gas emissions of cooling and heating.

District energy systems can result in improved air quality and, where the systems use renewable power sources, reduce reliance on fossil fuels and energy imports, thus increasing the resilience of cities to fuel price shocks.

District Heating & Cooling System



E²District 2017

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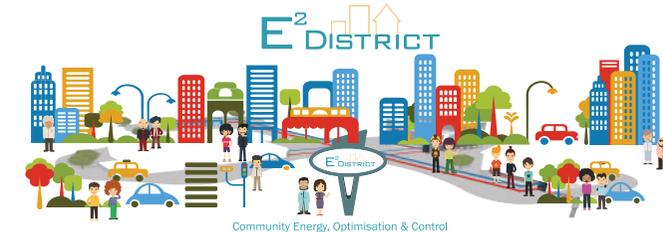
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People Behaviour & Technology Integration

BEHAVIOUR STUDY

Evaluating and Influencing Energy Efficiency Behaviour



Community Energy, Optimisation & Control



Call Identifier: H2020-EE-2015-RIA
Project Acronym: E2District
Project Full Title: Energy Efficient District Heating & Cooling
Project Duration: 2016-2019



Background to the study

The impact of behavioural aspects on environmental solutions has received more and more recognition over the last number of years. There has been a general change of thinking away from purely technical approaches towards integrated and holistic concepts which particularly take the end user into account.

Many studies have shown (e.g. Abrahamse et al., 2005; Perri & Corvello, 2015; Sauter & Watson, 2007) that technical improvements and innovations may not necessarily cause the desired outcomes due to inadequate communication with the actual end users. For instance, improvements of house insulation or the use of LED bulbs, caused paradox behaviour, sometimes also called “Jevon’s paradox” or “rebound effect”, where the technical improvements are eaten up by the increasing demand they caused (Schleich et al., 2014). Such examples highlight the gap between new developments in environmental sustainable technologies and the actual behaviour shown towards these innovations from an end-user’s perspective.

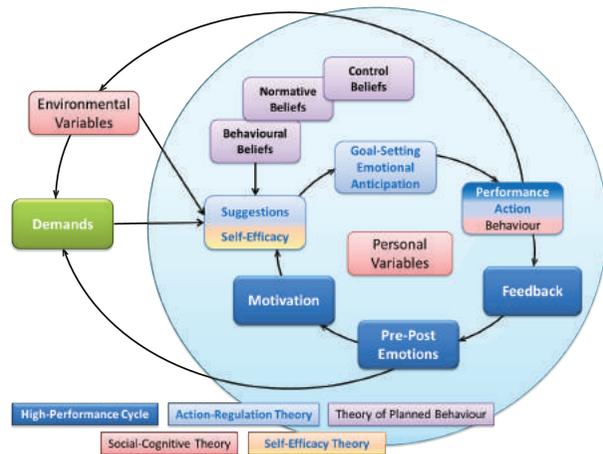


Fig. 1 Integrated Behavioural Model (Julia Blanke, 2017)

This study is based on a well elaborated behavioural model (see Fig. 1) which is also the foundation for our purpose built mobile application. Hence, the technical model/application will be able to evaluate certain traits that influence human behaviour, such as environmental aspects and personal factors.

While environmental aspects (including location) are essential to ensure that the system knows what kind of influence can be asserted, personal aspects regarding norms, attitudes or intention to show a certain behaviour are also important as they make it possible to personalise suggestions and advise what a person in a specific setting can do.

About the study

Aim

To assess and influence people’s behaviour in relation to (energy) heating.

Purpose

In the context of the EU Horizon 2020 energy project, E2District, this study will build on traditional theories in the area of pro-environmental behaviour. However, this study is taking a new approach, differentiating it from other studies in the field which, in general, are focused on how people act in a more desired way as long as an incentive is given. In several prior well executed studies all the various aspects of human behaviour have been replicated, however, none of these studies on their own were able to solve the problem of motivating people to change their behaviour also in the long term. So, instead of reinventing the wheel over and over again, the study we are conducting is based on a well-elaborated behavioural model, (see Fig. 1) which is also the foundation for our purpose built mobile application.

Data Protection

What data do we collect?

- Data from surveys conducted among testbed participants.
- Data from technical equipment installed for the study such as temperature gauges, window opening/closing monitors, monitored radiator valves, monitored electric heater plugs, people counters, light intensity gauges and air quality monitors.

How do we restrict access to the data?

The data collected will not be accessible to anyone other than key study administrators who will sign non-disclosure agreements. Other CIT staff, including Building and Estates personnel, will not be permitted to access the data.

Testbed participants will not incur any expense.

It is possible for participants to disengage from this study at any time and personal data will be deleted on request.



What will the study entail?

Winter 2016-2017?

The establishing of a research baseline by fitting technical sensors and collecting and evaluating heating behaviour of CIT staff and students in a number of specifically selected classrooms and offices in the CIT testbed areas.

Winter 2017-2018?

Implementing a purpose built mobile application to improve heating behaviour through contextualised and personalised suggestions e.g. if there is excess energy available in the energy grid, a message could be sent to suggest that now is a good time to turn on or turn up radiators in the office or classroom.

What technical changes will be implemented?

Technical equipment such as temperature gauges, window opening/closing monitors, monitored radiator valves, monitored electric heater plugs, people counters, light intensity gauges, air quality monitors and BLE beacons will be installed in selected classrooms/offices to determine and measure behavioural patterns.

What will the mobile application entail?

The app will incorporate features that enable study participants to contribute to the control of their environment in an intuitive and personalised manner based on the previous winter’s research data. We will be emphasising the development of a concept of pro-environmental behaviour through smart phone user engagement and interactive information kiosks. We hope this approach will enable the developed user engagement tools to be placed as a well defined part of behavioural theory.



We are also introducing useful features into the app that will benefit people as they go about daily tasks at CIT. Such features will include:

- Localisation system and 3D map of the campus that will enable CIT staff and students to navigate the campus more efficiently and to find classrooms, schedules etc. with ease.
- Carpark space monitoring to alert people to available parking.
- Useful news and information relating to CIT daily activities.

The app will be supported by an interactive information kiosk located in the main CIT foyer.