Provision of personalized information on energy, IEQ and health leading to energy efficient behaviour and habits
1. Current EU approach:
   – Energy efficiency at the heart of EU

2. MOBISTYLE approach:
   – Understanding user behaviour

3. First findings based on social science aspects:
   – What is the main driver for users to change their behaviour towards more cautious building energy use?

4. Ongoing work and recommendations for future engagement with users
DIRECTIVE 2010/31/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
of 19 May 2010
on the energy performance of buildings
(recast)

(3) Buildings account for 40% of total energy consumption in the Union. The sector is expanding, which is bound to increase its energy consumption. Therefore, reducing energy consumption and the use of renewable sources in the buildings sector are important measures needed to reduce energy dependency and greenhouse gas emissions.

Buildings - European Commission
https://ec.europa.eu/energy/topics/energy-efficiency/buildings

Buildings are responsible for 40% of energy consumption and 30% of CO2 emissions in the EU. Write new buildings generally need fewer than three to five...
DIRECTIVE 2010/31/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
of 19 May 2010
on the energy performance of buildings
(recast)

(3) Buildings account for 40% of total energy consumption in the Union. The sector is expanding, which is bound to increase its energy consumption. Therefore, reducing energy consumption and the use of renewable energy sources is of the utmost importance.
Policy implementation

- Energy labelling
- Smart metering
- Numerous sensoring services
- Different types of building data

Who understands this information?
Actual and theoretical energy consumption per m² of detached housing per energy label

Actual and theoretical energy consumption per m² of detached housing per energy label

Let’s change perception from

‘Buildings consume energy’...

...to the fact that

‘People use energy.’
MOBISTYLE project

‘Motivating end-users behavioral change by combined ICT based modular information on energy use, indoor environment, health and lifestyle.’

‘People use energy.’
The building ecosystem......

......is efficient if all the components are mutually conscious.........
One of the major factors influencing building energy consumption.
Contributing to uncertainty between energy use prediction and reality.

We should understand the users and their needs ➔ anthropology experts

Main MOBISTYLE research questions:
- What is the lasting motivating factor for users to change their behavior?
- How do they use existing ICT based solutions? What is needed to make these solutions user-friendlier?

MOBISTYLE demonstration cases with different user groups:
- 2 residential building areas (PL, DK)
- University buildings (SI)
- Apartments in a hotel (IT)
- 1 health-care centre (NL)
MOBISTYLE approach

Integrating social science aspects into occupant behavior research

STEP 1: IDENTIFICATION
WHO ARE WE SOLVING FOR?
- Collecting thick data

STEP 2: RESEARCH
WHAT DO PEOPLE WANT?
- Listen to the users
- Provide an added value
  (new motivation factor)

PEOPLE-CENTRED APPROACH
(surveys, questionnaires, interviews, focus groups, participant observation, experiments, etc.)

STEP 3: INTERPRETATION
WHAT AND HOW TO SERVE THEIR NEEDS?
- Requirements for ICT solutions
- Tailored solutions to different user groups
- Varied communication and feedback strategies

STEP 4: TESTING
WHY DOES IT MATTER TO THE PEOPLE?
- Put them in control
- Educate the users
- Engaged learning

IMPROVEMENTS

DESIGN and DEVELOPMENT of ICT solutions
(Ensure data privacy)

*Podjed, D., Anthropological approach in the MOBISTYLE project

MOBISTYLE
First findings

based on MOBISTYLE focus groups organized for 5 demonstration cases

1. **Health and well-being** more important than energy saving and CO$_2$ emissions
2. No ‘one-size-fits-all’ solution
3. **Meaningful & relevant information** on local (person) as European (society) level
4. Offer **non-intrusive, calm technology**
5. **Coopetition** = cooperation + positive competition
6. Information coming from a **trusted source**
7. Ensure **user** and **data privacy**
First findings

based on MOBISTYLE focus groups organized for 5 demonstration cases

1. Health and well-being more important than energy saving and CO₂ emissions
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MOBISTYLE ICT solutions

Methodologies (Algorithms, models)

Energy, IEQ sensors

Wearables

White goods

Digital authentication

Gamification

Feedback to the user

Information bundles

* Adopted from MOBISTYLE partner HOLONIX.
What is healthy?

Let’s forget about the comfort requirements and look into what is healthy:

- World Health Organization limits instead EN 15251 comfort recommendations

Fluctuating temperatures and the Thermo-neutral zone (*):

- Research from Maastricht University (MU) showing that dynamic indoor temperatures are better for our health than the 'comfort zone' of about 21 °C (based on PMV)
- Our bodies need to work harder to maintain our core temperature of 37 °C when indoor temperature is increased or decreased

**Increased metabolic rate** (similar to exercising)

Experimental studies at MU showed that exposure to dynamic thermal environment increases:

- Energy metabolism (*)
- Resilience to thermal discomfort due to acclimation (*, ***)
- Resilience to cardiovascular disease and insulin sensitivity (**)

REFERENCE:

Energy – IEQ – Health

- **TEMPERATURE TRAINING in MOBISTYLE**

  Effect of dynamic varying temperatures (personalized HVAC system) on building’s energy saving, IEQ and health.

  Temperature deviations as part of overall healthy lifestyle and healthy aging strategy.

  Gradually cooler environment in winter and warmer in summer can lead to energy saving, improved comfort and higher acceptance.

Schellen et al., Indoor Air 2010
MOBISTYLE quantitative objective: 16% of energy reduction prompted by combined monitoring and other consumption feedback strategies on energy, IEQ and health. The developed MOBISTYLE tailor-made ICT solutions and services are promoted and communicated with users through the *awareness campaigns*.
Change occurs gradually

**MOBISTYLE awareness campaigns**

- Feedback to the user
  - MOBISTYLE app alerts
  - GAMIFICATION
  - FACE TO FACE PRESENTATIONS
  - ADVERTISEMENTS, NEWSLETTERS

- MOBISTYLE Open Users Platform (information bundles)

- Storyboards
Energy efficiency at the heart of EU transition towards sustainable future

Interdisciplinary work between engineers and social scientists can help understanding users

For users: **health is today’s wealth!**

Health can be intentionally incorporated in decision-making process (added economic value)

Primary target = healthy building ➞ Consequently = energy-efficient building

Promote solutions where goals on energy efficiency, good IEQ and health overlap
Thank you for your attention.

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COLOPHON
This project has received funding from the European Union’s H2020 framework programme for research and innovation under grant agreement no 723032. The information in this presentation does not necessarily represent the view of the European Commission.

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