

# Introduction to the H2020 MOBISTYLE project



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Motivating end-users behavioural change by combined ICT based tools and modular information services on energy use, indoor environment, health and lifestyle.

**Keywords:** Energy use, indoor environment, health, behaviour change, awareness campaign, people-centred approach.

The European Union (EU) introduced several measures to ensure better engagement of the citizens that are the key for a successful realization of the ambitious EU energy targets [1]. Among other initiatives, the European Commission (EC) funded several projects under Horizon 2020 programme aiming to achieve a behavioural change towards energy efficiency through ICT-based solutions.

In this context, 42-months European H2020 MOBISTYLE project was funded combining 10 organizations with different expertise. This paper presents project people-centric approach, highlights the main project objectives, describes the demonstration cases and presents the ICT solutions developed after 2 years working on the project.

## The MOBISTYLE challenge and objectives

Despite the technological improvements of buildings and stricter policy measures, the latest assessments of the European energy strategy for 2030 targets show that these targets are not being met with a sufficient pace [1]. The studies show that the energy consumption has been increased in the recent years where the citizens are the ones consuming energy [2]. Energy efficiency has at the heart of the EU's transition to a resource-efficient economy and the EU 2020 strategy for sustainable growth. However, it seems it is not at the heart of its citizens.

This is one of the main drivers of MOBISTYLE since the MOBISTYLE attempts to alter a prevailing assumption that buildings use energy to an understanding that in fact, people use energy, for their everyday lifestyle and comfort. Therefore, to successfully accelerate the transition to a low-carbon society and economy, more emphasis should be on engaging people, motivating people and increasing their awareness, leading to an energy efficient building use on long term. Through a holistic approach, the multidisciplinary MOBISTYLE consortium aims to motivate behavioural change by raising user's awareness through the provision of attractive, personalized infor-



**Figure 1.** The H2020 MOBISTYLE project recognizes that people use energy, hence, most often this remains unnoticed. The MOBISTYLE aims to make the invisible relation between the building-user-energy visible to building users.

mation, both on user's energy use, indoor environment and health, all enabled by an integrated information and communication technology (ICT) service.

The overall aim of MOBISTYLE is to motivate behavioural change by raising citizens awareness by providing attractive personalized combined knowledge services on building's energy use, indoor environment, health and lifestyle, by ICT-based solutions. This awareness will support and motivate citizens to well informed pro-active behaviour towards energy use, energy efficiency and health, thus empowering users and providing confidence of making the right choices. The combination of awareness on both energy, health and lifestyle will offer citizens more and better incentives than only information on energy use.

In order to achieve this overall aim, MOBISTYLE is built on the following five qualitative objectives:

1. To present understandable information and indicators, related to energy use and energy efficiency, in an easy to handle and attractive way for users.
2. To provide understandable personalized information for users by combining energy monitoring with monitoring of indoor environmental quality, behaviour parameters and daily habits.
3. To motivate a prolonged change of users' habits and daily practices on energy use by combined modular personalized information on individual energy use, health and lifestyle.
4. To foster new business models and applications for future engagements of developers.

An important feature of the MOBISTYLE concept is the use of real environments to develop, deploy and validate the tools and solutions, developed in the project. The MOBISTYLE study and demonstration cases cover different building types (residential, non-residential), different scales (building, district), climatic zones and, most important, different types of building users:

- **Social housing apartments at Kildenparken, Aalborg, Denmark**  
18 residential apartments in 10 different two-story apartment blocks. Climatic zone: Northern.
- **University buildings at the University of Ljubljana, Slovenia**  
8 office rooms in 4 faculty buildings. Climatic zone: Continental Central.
- **Apartments at the Hotel Residence L'Orologio, Turin, Italy**  
4 hotel guest rooms/apartments and reception. Climatic zone: Mediterranean.
- **Office building Qeske, Kerkrade, The Netherlands**  
Open plan office in a five-story office building. Climatic zone: Western Central.
- **Residential houses as part of the Smart City Wroclaw, Poland**  
1000 residential units (detached & multi-family houses, apartment blocks). Climatic zone: Eastern.



**Figure 2.** MOBISTYLE approach is demonstrated in 5 European countries covering different building types, scales, climatic zones and different types of building users.

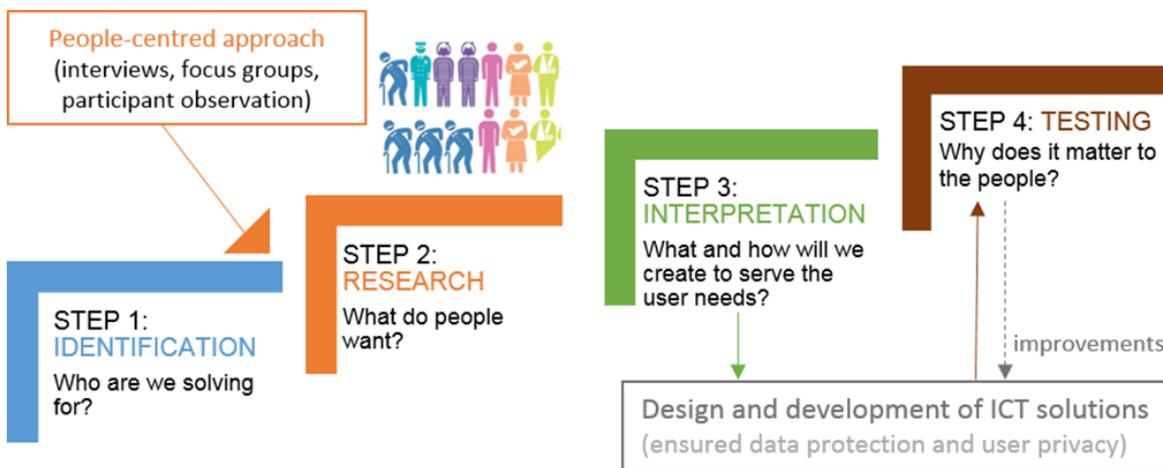
## People-centred approach in design and development of ICT tools

In MOBISTYLE, users are put at the centre of the ICT tools development process as a necessary and knowledgeable stakeholder. **Figure 3** presents the developed MOBISTYLE people-centric approach; a four-step anthropological approach helping to develop user-friendly ICT tools.

Most often, the ICT design of solutions starts with Step 3 where designers and engineers forget for whom they are developing the solutions. In people-centric

approach, a fundamental step is Step 1 Identification. In MOBISTYLE it was observed for each of the five demonstration cases who are actual building users and by looking into their daily behaviour and habits, their needs were identified.

The anthropological approach enables to access ‘thick data’, as an in-depth understanding of human behaviour, able to penetrate beyond the quantified behaviour of ‘big data’ collected via technological solutions. This understanding defines requirements for developing the ICT tools in order to provide user-friendly and attractive services.



**Figure 3.** MOBISTYLE approach integrating social science aspects into occupant behaviour research.

Focus groups, supplemented by participant observation, have proven to be a useful research technique for studying users’ habits, motivations, needs and expectations in the MOBISTYLE project since they allowed researchers to study people in a less structured conversation pattern than typically occurs in an ethnographic interview. The discussions were guided around MOBISTYLE related topics with open ended-questions where people were encouraged to talk to one another. They often commented each other’s point of view or exchanged anecdotes. Some examples below:

- “When we receive the bill at the end of the year, everyone gets really upset.”
- “You should do the things you like. I think that is the most important thing for being healthy”
- “My father used to say: if there is sun shining outside, turn off the lights!”
- “I changed my habits because of the electricity bills.”
- “I would turn off the lights if the savings would be 5€ per month.”
- “I no longer use the technology [a smart watch], since it makes me nervous.”
- “My parents never told me to turn off the lights, because they lived in a block of flats.”



**Figure 4.** Focus groups are organized face-to-face in the natural environment of the people. People habits are investigated to discover their current practices, use of existing technologies, as well to investigate key factors that would trigger them to change their behaviour.

### Behavioural action plan per demonstration case

In MOBISTYLE, the goal is to use existing technologies and make them more user-friendly and understandable in its operation. The goal is not so much the access into data but to get insight into data. Accordingly, based on the information made available from the focus groups (thick data), together with data coming from sensors, wearables and questionnaire responses (big data), scenarios of behavioural change intervention were developed for each demonstration case (Figure 5). Each developed MOBISTYLE Behavioural Action Plan includes a full description of:

- Optimization objective(s) of the Behavioural Change Campaign;
- Definition of Action(s) that can be taken (and influences) from the users;
- Definition of the variables that can be monitored, related to:
  - Actual energy usage (using indoor environment monitoring systems and smart meter data);
  - User’s motivational drivers, attitudes, subjective norms and perceived behavioural control (using the questionnaire as a foundation of the app system architecture).

This implemented into the MOBISTYLE ICT solutions via which the information is disclosed to end users.

### MOBISTYLE ICT architecture integrating user needs, recommendations and behavioural action plans

The main idea of personalized MOBISTYLE modular information services is to offer so called information/data acquisition bundles where end-users decide which services they want, how long and during what time, and which data they are willing to provide for these services. As seen in Figure 6, a modular structure is developed providing tailor-made information giving a possibility to add new modules later, e.g. desire to monitor additional IEQ parameters. Based on the project experiences blue prints will be made how to develop similar campaigns in other projects.

The design of the MOBISTYLE sensors network architecture for each of the five demonstration buildings is based on building occupants needs and (existing) requirements of the building. For each demonstration case, relevant data about building and occupant performance (e.g. energy, indoor environment quality, health) is collected via sensors and then personalized information is presented to the users via different ICT based solutions: the MOBISTYLE Dashboard and the MOBISTYLE Game. The integrated methodology in the ICT tools incorporates behaviour nudging aspects for assessing what has the deepest impact on their behaviour.

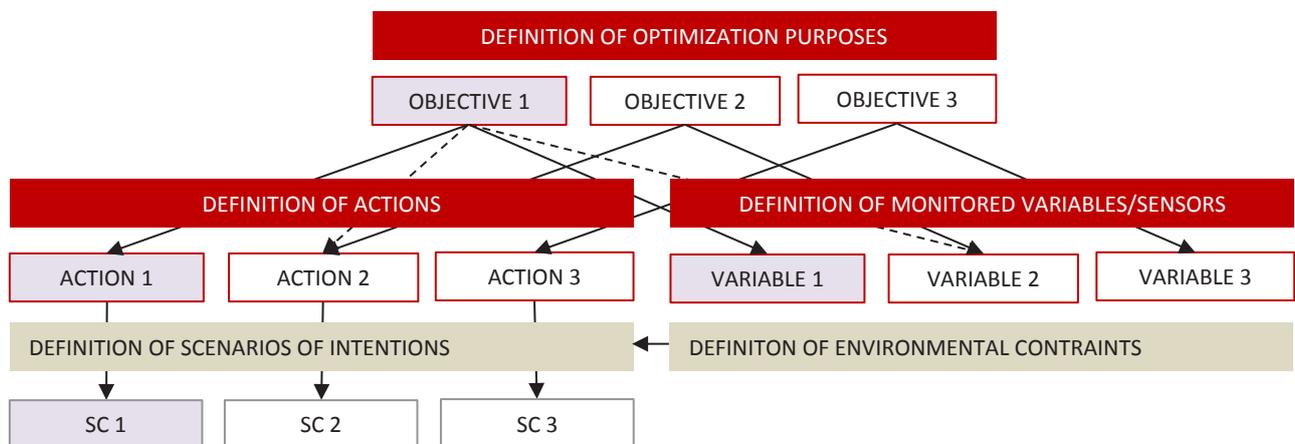
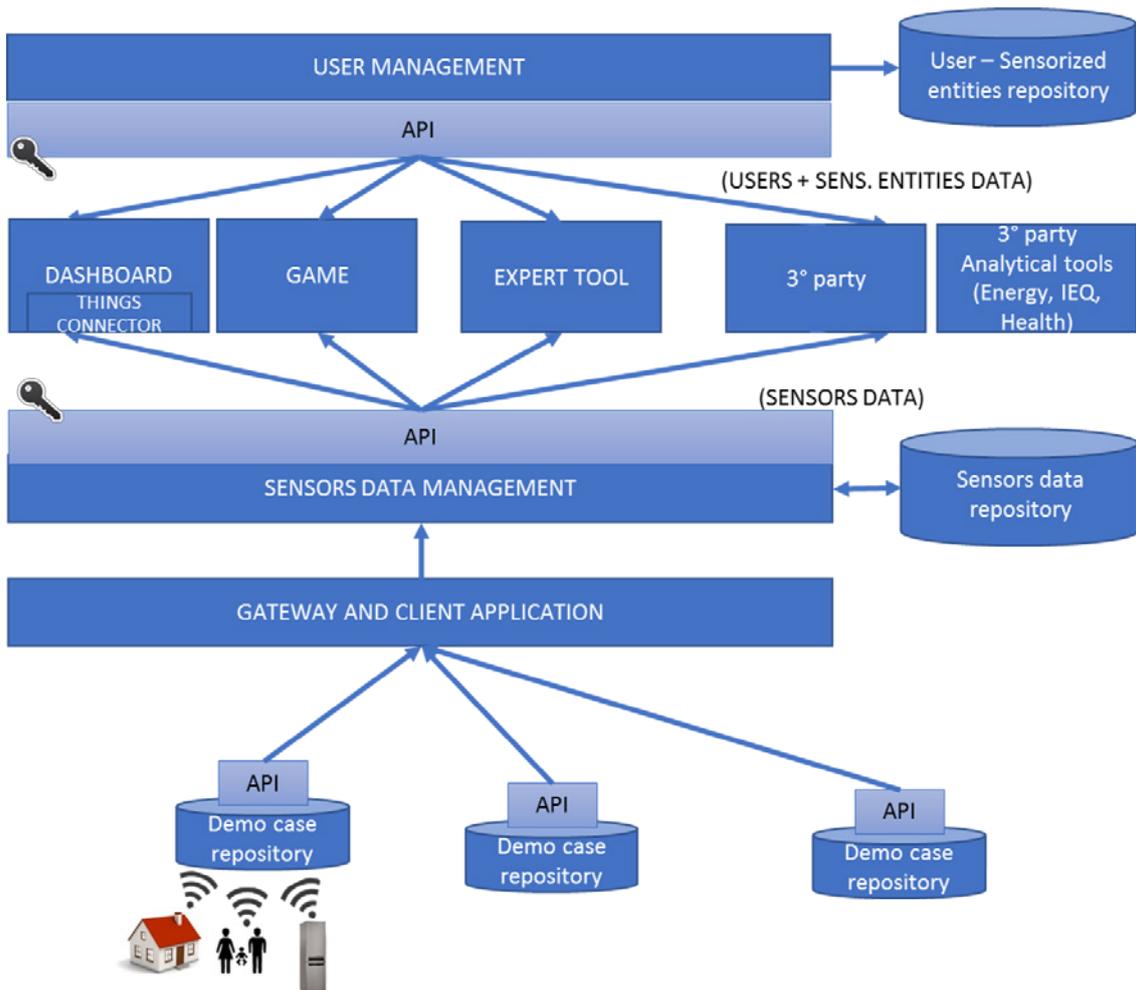


Figure 5. Structure of the Behavioural Change Intervention Action Plan, including optimization objectives, definition of actions and the data gathering from sensor, for the implementation of the scenarios of interventions and the feedback system architecture into the MOBISTYLE ICT solutions.

**Table 1.** MOBISTYLE ICT solutions.

	MOBISTYLE Dashboard	MOBISTYLE Game
<b>What is it?</b>	<ul style="list-style-type: none"> <li>• Application for non-experts.</li> <li>• Data on energy use and IEQ based on measured parameters.</li> <li>• Visualisation can be customised for different roles (e.g. building occupant or building manager).</li> <li>• Objective is improving indoor environmental conditions and energy consumption through alerts/push messages recommendations.</li> </ul>	<ul style="list-style-type: none"> <li>• A mobile application, that based on defined objectives for preferable user practices.</li> <li>• Nudges user to change practices in a fun way.</li> <li>• It can track the effect of changed practices on energy use and indoor environment over time and compare with peers.</li> <li>• It provides scores to users for recommended practices and desirable changes.</li> </ul>
<b>For which purpose?</b>	Monitoring & Raising awareness	Behavioural change & Raise awareness
<b>For whom?</b>	Building manager & Occupants (non-residential)	Residential users
<b>Where it is validated?</b>	Slovenian case & Italian case	Polish case & Danish case



**Figure 6.** The MOBISTYLE ICT architecture.

## Involving commercial companies interested in MOBISTYLE approach

In order to ensure adequate exploitation of project results, activities are aimed at defining appropriate measures and methodologies for managing exploitation activities, including management of business models for different target groups, third parties and different countries.

The MOBISTYLE business strategy is based on a preliminary selection and definition of suitable business model(s) based on discussions with different organizations and companies taking part in in MOBISTYLE Consumers Advisory Board (MCAB). Different organizations and commercial companies around Europe have expressed their interest in the MOBISTYLE approach by signing a Letter of Support.

### Do you want to be in style? Then join the MOBISTYLE Consumers Advisory Board and get more insights in this H2020 project.

The MOBISTYLE Consumers Advisory Board is open for all relevant stakeholders and interested organizations. If you are interested, contact the MOBISTYLE Ambassador: Andrei Vladimir Lițiu: [litiu@kth.se](mailto:litiu@kth.se). More information is available online at: <https://www.mobistyle-project.eu/>.

“MOBISTYLE is the way of life...



Let me tell you why!”

Getting tailored information on how my daily actions affect: building’s energy usage, generated indoor environment & my personal health make me want to do and be better.

Being part of this MOBISTYLE demonstration campaign during one year helped me achieve:

Reduced energy bills	16 %
Improved indoor climate	21 %
Improved health	5 %

## Conclusions

MOBISTYLE shows that improving building technologies and systems is not enough. In order to achieve ambitious goals of EU regarding energy savings a different approach is needed where users of the buildings are equally important part of the building ecosystem as building technologies. Therefore, the emphasis should be on educating users on how to behave in their buildings and increasing their awareness by combined information on their energy usage, generated IEQ and lifestyle. A long-term understanding can be stimulated where energy conscious healthy behaviour is a way of life and not only a one-time service (energy saving at the end of the month). ■

## Partners



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