MOBISTYLE

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

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1. Introduction

A prevailing perception is that buildings consume energy. For example, a publication begins with a sentence: “Buildings in EU use nearly 40% of final energy…” [1]. With the MOBISTYLE project we attempt to change the paradigm and show that in fact **people use energy** for their comfort at home, work, etc. We should therefore move our focus from buildings and technologies to people and try to influence their behaviour and habits, which contribute to energy consumption. In addition, we wish to highlight health and wellbeing of people, which is an important motivation factor for behavioural change and can also influence use of energy.

In the MOBISTYLE project we check how people interact with tools and devices at home and at work, how do they consume energy throughout the day and how we can change and improve their practices and habits by various technologies. **Ethnography** is used as a type of anthropological inquiry that investigates lifestyles with qualitative techniques (participant observation, focus groups, etc). Afterwards, (Task 2.3.) we will investigate changing habits by semi-structured interviews (steered conversations which enable opening of new topics), carried out in the same groups of users, and by focus groups.

These approaches have proven to be especially effective to track group dynamics and understand social patterns beyond individual behaviour. The anthropological approach enables us to gain an in-depth understanding of human behaviour, which is able to penetrate beyond the quantified behaviour of ‘big data’, collected via technological solutions. Through experienced learning, carried out by qualitative studies, MOBISTYLE team is able to understand not only how and when do people consume energy, but why do they actually do it and what are the main motivation factors for them to make a shift in their daily habitual patterns (e.g. financial savings, health, environmental awareness).

Different user groups were first identified by a short **online survey**. We collected information about the users and identified the most appropriate individuals for further research. We identified 5-7 individuals (age, gender, etc.) per participating country (the Netherlands, Slovenia, UK, Poland, Italy, Denmark), i.e. 30 people in total, who were willing to get engaged in observations of their daily habits (Task 2.2.) and usability testing (Task 2.3.) for development of new solutions.

In WP 2 we carried out mapping of:

- different types of data that can be captured from in-home equipment and sensors like smart meters and heat metering tools, smart plugs, smart appliances and energy-aware products, intelligent controls and building automation etc.
- different types of energy users and their specific communication and identification needs.

For the specific communication and identification needs, several socio-cultural and technological factors were taken into account that influence daily habits, including provenience, income, gender, age, education, home equipment, energy infrastructure, etc. Next, the energy consumption habits are being identified in these groups by ethnographic approach (participant observation, interviews, focus groups, etc.) and prepare a list of recommendations for development of technological solutions to influence short-term behaviour and to shape long-term habits for sustainable energy use.

In the later stages of the MOBISTYLE project, we will introduce the developed solutions to potential users, involved in the project, and carry out usability testing with them. In this phase we intend to focus the most on interaction with devices and improvement of user interfaces.

The aim of this report is to identify users and study their health and energy use related habits and behaviours in five MOBISTYLE project demo cases and in two additional examples in UK. The findings will be used in the project for development of IT solutions in and will be tailored to different scenarios, specifics of buildings, and identified energy use possibilities. As explained above, people are in the core of the MOBISTYLE project. Therefore, we wish to prepare recommendations for development of new IT solutions in collaboration with them and take into account their needs, requirements, specifics, socio-cultural and economic backgrounds, etc.

This deliverable (2.2.) should be read together with mapping of available 'hard data' (*D2.1: Inventory of supplied data*) from sensors recording parameters of energy, IEQ and health. The information in this report will be later upgraded in *D2.3: Recommendations for improvements and further development of solutions* which will include findings from focus groups and interviews from the demo cases users.

1.1 Methodology

In the MOBISTYLE project we focus on human interactions with buildings, technologies, tools, and devices at home and work. We are interested how do people consume energy throughout the day and how we can change and improve their health related practices and habits by different IT-based solutions. In this project we decided to emphasise the human- or people-centred design which is defined by ISO 9241-210:2010(E) [2] as "a creative approach to interactive systems development that aims to make systems usable and useful by focusing on users, by designing around their needs and requirements at all stages, and by applying human factors/ergonomics, usability knowledge, and techniques. This approach enhances effectiveness and efficiency; improves human well-being, user satisfaction, accessibility and sustainability; and counteracts possible adverse effects of use on human health, safety and performance."

The people-centred design is often (but not strictly) based on qualitative inquiry, which can include interviews, focus groups, participant observation, and other anthropological and sociological research techniques. The most important is the shift in perception from passive users to people, who are partners and active co-creators of new solutions and are directly involved in product development from its inception. The people-centred approach focuses on actual needs of humans („users") and attempts to include their habits, practices, ideas, desires in new products and services. The result of such a development approach is people-friendly and intuitive solutions which are relevant also from a broader perspective of communities and societies.

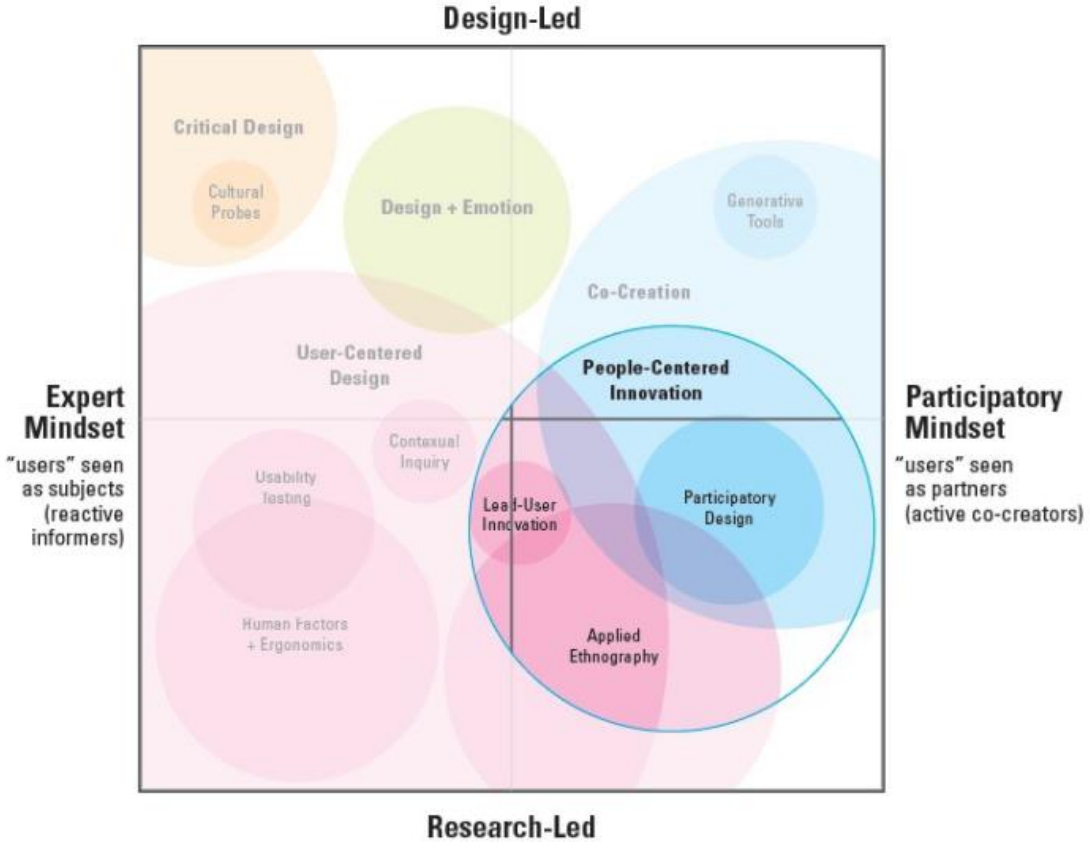

Figure 1: "People-Centered Innovation" on Map of Design Research (Sanders, 2008) [3]

1.2 Workflow and context of this task

WP2 Objectives: Mapping of data supply and communication needs for different types of end-users
GOAL: from inventory of the sensors / Equipment and information about user groups and their habits to the specific data needed for the demonstration cases and catalogue of user profiles

Task 2.2 Identification and categorisation of users

GOAL: inventory of users and their socio-cultural specifics

Identification of 5-7 users per country, different age group, gender, profession, technologies used at home and work, etc. = 30 users total for long-term in-depth study and engagement in product development > people-centred approach

In the figure below there is a graphical representation of work flow of identifying users and their need in the frame of this task within WP2.

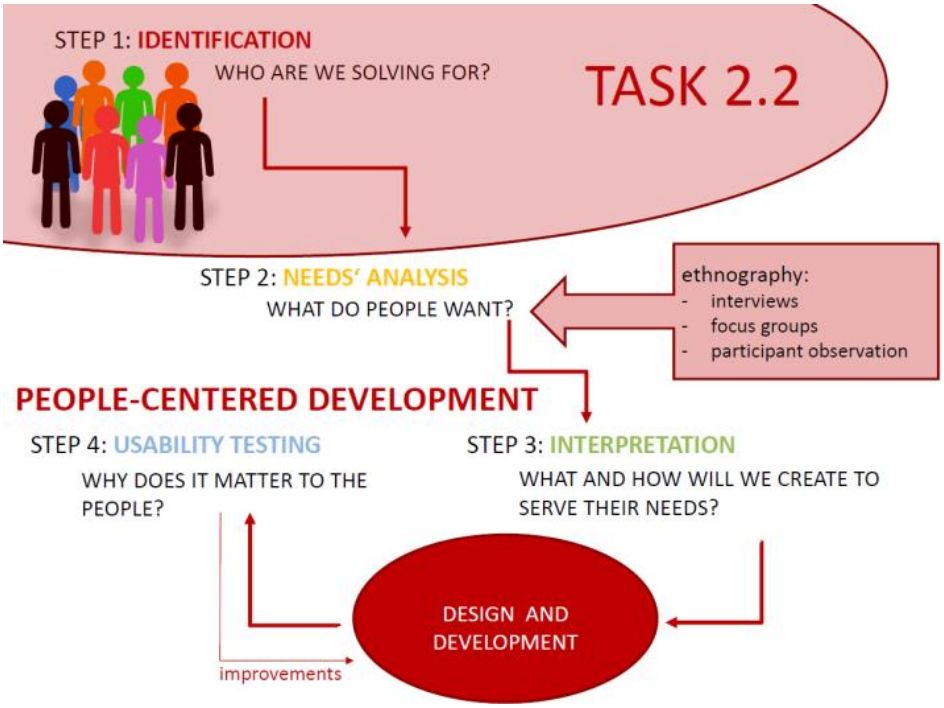

Figure 2: workflow of task 2.2.

There has been a widespread of building automation systems, however, there is a lack of solutions that would inevitably motivate the building users to start behaving in an energy efficient way. Experience shows that promoting the building's energy efficiency as such is not an attractive driving factor for changing everyday habits and lifestyle of the building users. Combining information on energy use with other relevant information such as the indoor environmental quality, personal health and eventually combined with other attractive life style information can be used to catch the interest of consumers and even more importantly change their behaviour and maintain their new habits and interest in the long term.

2. Preliminary focus groups and workshops

In order to verify the methodology, pilot ethnographic studies were made at the University of Ljubljana building (focus group) and additional two workshops at UC London and Durham University.

2.1. Preliminary focus group @ UL

18/1-17 @ UL Faculty of Arts, University of Ljubljana, Slovenia

Students, teacher, technical staff

Preliminary findings:

- energy efficient behaviour is habituated and often transferred from generation to generation („mentorship“ principle – parents, teachers, older colleagues, etc.)
- negative motivation: not simply making activities pleasant (gamification principle) but also making an activity unpleasant (e.g. using an elevator)


Figure 3: Pictures from the focus group at the Faculty of Arts, UL that took place on 18/1-17

2.2. Workshop @ UCL

The goal of the workshop was to identifying participants' health and energy use related habits. The technique used was of a brainstorming post-it session. Due to time constraints, the participants were divided in 2 groups (for facilitation purposes) and only the health habits were sufficiently investigated.

8/2-17 @ University College London

20-30 years, anthropology department students and teachers, different socio-cultural backgrounds (coming from various countries)

Preliminary findings:

- „appified lifestyle" (students use smartphone apps for tracking habits),
- smartphones used as assistants for supporting existing habits (e.g. meditation),
- smart watches and wristbands not very popular.

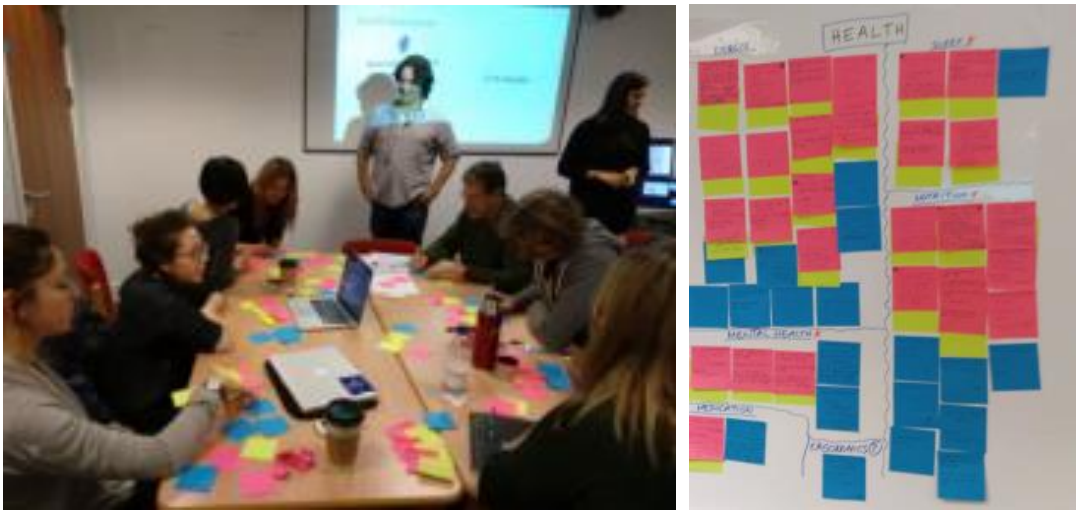

Figure 4: Pictures from the workshops at University College London that took place on 8/2-17*.*

2.3. Workshop at Durham University's International Women's Group (IWG),

The goal of the workshop was to identifying participants' health and energy use related habits. We carried out a workshop in a group of women with various socio-cultural backgrounds, i.e. coming from China, U.S., Sri Lanka, Australia, Czech Republic, Jordan, U.K, etc. The workshop lasted approximately 1.5 hours and was carried out in a form of a moderated debate, supported by a brainstorming post-it session.

Figure 5: Pictures from the workshops at Durham University's International Women's Group that took place on 14/2-17

Preliminary findings:

- IT solutions for supporting health and energy related habits are used much less than in the first workshop (UCL)
- health is an important factor for changing practices and behaviour (more than energy)
- existing habits, related both to health and energy use, are culture-specific ("brought" from original places where participants lived before moving to the UK)
- health and energy related habits are often connected to family lifestyle and not only to individuals (e.g. cooking, daily walks in nature, cycling)
- needs and expectations of participants are also often connected to improving their time management

3. Online questionnaire

We used an online questionnaire to **collect additional information about people who are in the focus of our study** and who will contribute to development and evaluation of solutions, designed in the MOBISTYLE project. We did not involve broader sample of respondents in the study, since we were for the most interested about lifestyles of people who will contribute to development of solutions in the project.

We prepared a short online survey and distributed it among 30 identified participants in 5 case studies of the project. Questions were prepared in collaboration of IRI UL, MU, and HS, and were focused on two categories (Part 1 and 2). In Part 1 of the questionnaire we collected data about age, gender, provenience, etc. In this part we took into account that personal data is also sensitive from ethical point of view. We designed this part of the questionnaire according to MOBISTYLE ethical requirements and privacy protection plan and excluded all sensitive or private data, e.g. name and date of birth. In Part 2 we carried out an overview of participants 'daily habits, energy consumption, use of home and work appliances, organisation of space, etc.

Results of the survey will be used to prepare:

1. inventory of user needs and expectation (D2.2),
2. protocols for Task 2.3: Observation of users' energy consumption habits.

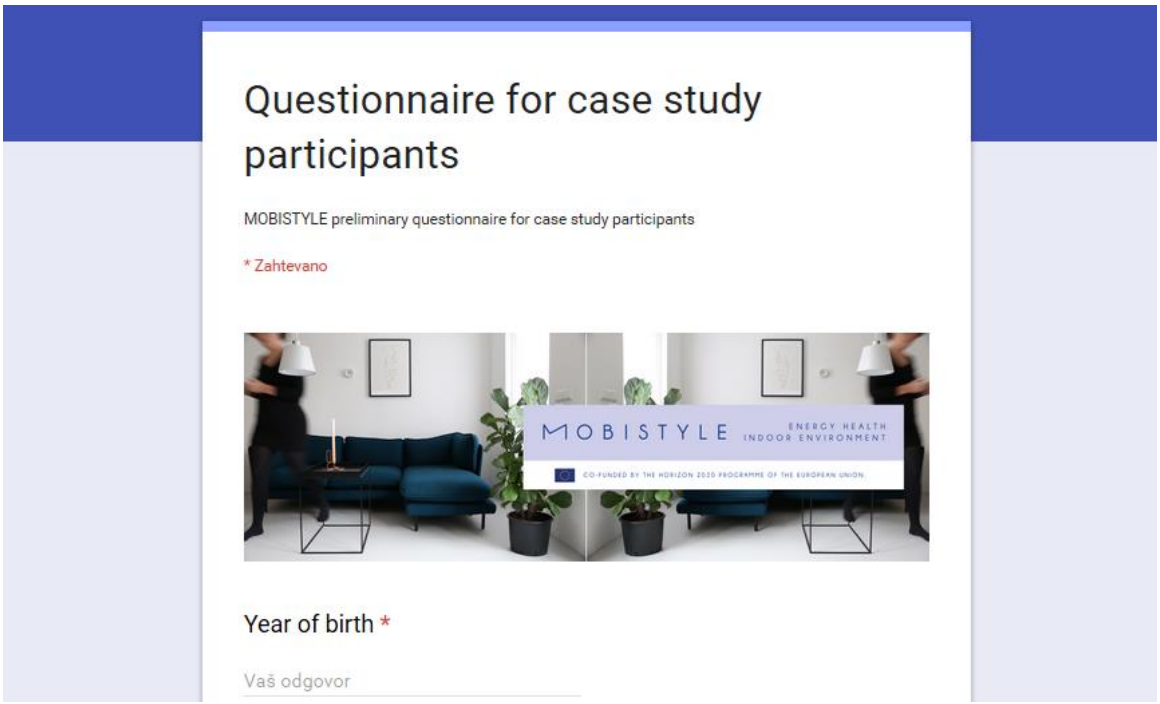

Figure 6: First part of the online questionnaire

3.1. Informed consent

In the ethnographic study, the informed consent as described in Report on Ethics was used. It was included in emails (text and attachment) send as **blind** copies to the identified participants. Further informed consents will be devised each time when MOBISTYLE will interact with the end-users and will aim to gather specific end-user information.

The content was framed and sent in this way:

General Information

The information on this page is intended to help you understand exactly what we are asking of you so that you can decide whether or not you would like to participate in this study. Please read this consent form carefully before you decide to proceed with the survey. If you decide to not participate, it will not be held against you in any way. You may exit out of the survey at any time.

The purpose of this questionnaire is to gather preliminary information for categorization of user of demo buildings in the frame of MOBISTYLE project. As a participant, you will be later involved in development activities by focus groups and interviewees with the purpose of helping define needed solution and evaluating them during the development process. Solutions are targeted as ensuring healthy and comfortable indoor environment for satisfied buildings user while minimizing energy use.

Privacy and confidentiality

Your participation in this survey is completely voluntary, your anonymity is assured and your responses will only be used for research purposes. Your answers will be kept confidential and your identity protected (not revealing any of your personal information to public) unless you will explicitly state that you do not wish to stay anonymous. All data will be transmitted by a secure, encrypted internet connection and stored in a password protected file. The Institute for Innovation and Development of University of Ljubljana acknowledges that this study satisfies the criteria of national and EU regulation concerning Protection of personal data.

Potential harms / benefits

There are no known harms associated with your participation in this research.

If you agree to the terms listed above, please proceed to the survey by clicking this link: https://tinyurl.com/z2szp7l Thank you in advance for your time and cooperation. Please be honest with your answers. Your responses are extremely valuable to our research! If you have any questions, please do not hesitate to ask.

3.2. Results of the online questionnaire inputs

Questionnaire for case study participants n=31

Gender distribution:

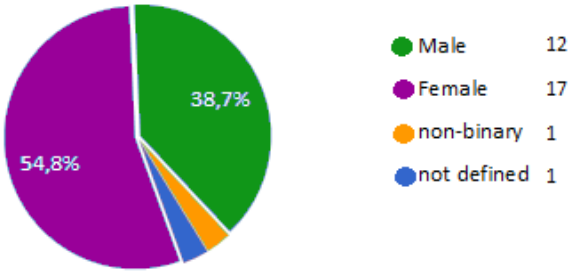

Figure 7: Shares and number of participants genders (n=31)

Country distribution:

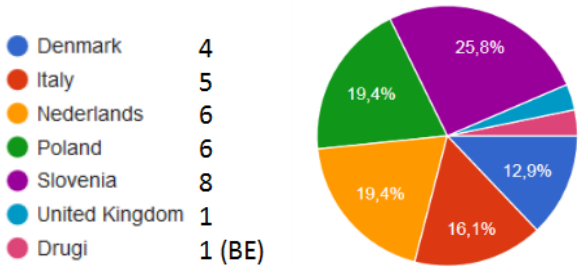

Figure 8: Shares and number of participants by country (n=31)

The person from Belgium can be associated with NL demo case.

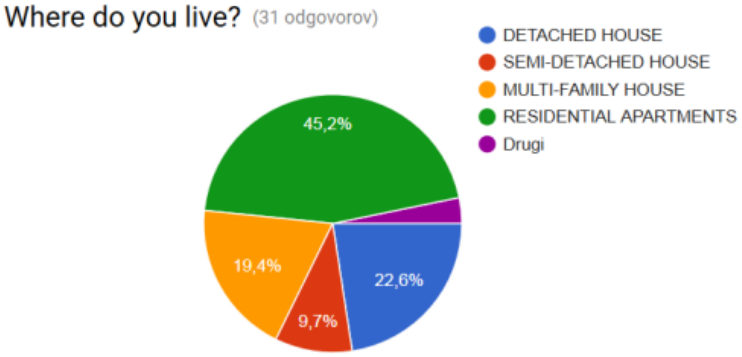

Figure 9: Shares of residency types (n=31)

Almost half (14/31) participants live in residential apartments and another 6 in multi-family buildings. Only 1 person responded to be living alone, 7 responded to be living with another person (5 NL and 2 DK case) and 12 reported to be living in a household with 4 or 5 people (7 SI[1], 2 DK and PL and 1 NL).

[1] Mostly students.

3.2.1. Energy management

At least 12/31 respondents manage energy consumption at home. It was explicitly stated that energy management at home is done by male household member in 14 and by female in 7 cases out of 31. One person stated that nobody manages energy consumption at home, and one respondent that everybody is involved in energy management.

12/31 respondents do not know who manages the (daily and financial) energy consumption at work or in their institution.

9/12 of people who manage energy at home (responded: me) **feel neutral at home.** Interestingly, only **2 out of 12 people feel neutral at work.**

Table 1: Participants who manage energy at home and how they feel in terms of thermal comfort (n=12)

Who manages the (daily and financial) energy consumption at home?	How do you usually feel at work or in your institution:	How do you usually feel at home:
me		
me	Slightly cool	Slightly cool
me	Slightly cool	Neutral
me	Slightly warm	Neutral
me	Slightly cool	Neutral
me	Slightly warm	Neutral
me	Slightly warm	Neutral
me	Warm	Warm
me	Slightly cool	Neutral
me	Warm	Neutral
me	Neutral	Neutral
me	Neutral	Neutral

A majority (9/12) of people who manage energy at home feel neutral there; however, they do not feel so at work (2/12).

3.2.2. Well-being and fitness

Figure 10: Shares of physical activity frequency (n=31)

From this answer we found out that almost all the responders are physically active at least weekly (29/31), 13/31 even daily.

1.3.3. Perceived thermal comfort

Thermal comfort was evaluated by standard scale (Fanger) [4]: -3 cold, -2 cool, -1 slightly cool, 0 neutral, +1 slightly warm, +2 warm, +3 hot.

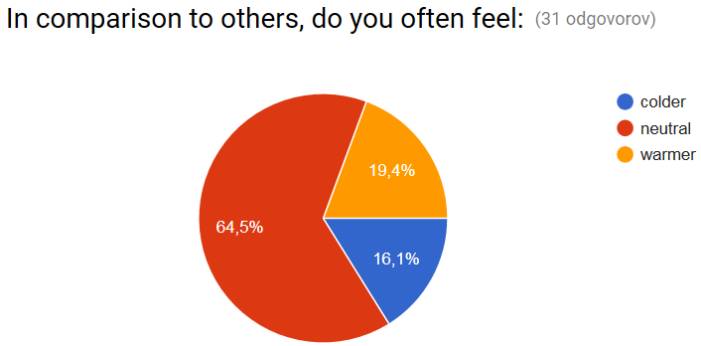

Figure 11: Shares of general perceived thermal comfort compared to others (n=31)

A majority (20/31) often feel neutral. Share of people who feel colder (5) and warmer (6) are balanced.

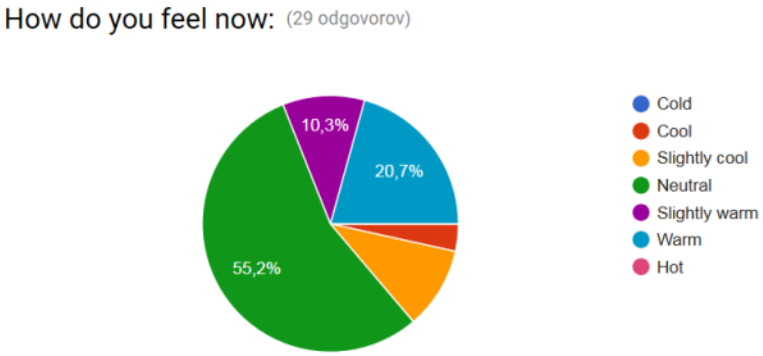

Figure 12: Shares of perceived thermal comfort in the time of filling the questionnaire (n=29)

A slight majority (16/29) feel neutral. Altogether 6 people feel slightly cool (3) or warm (3). Surprising **6 people feel warm** and only 1 cool and none of them cold or hot.

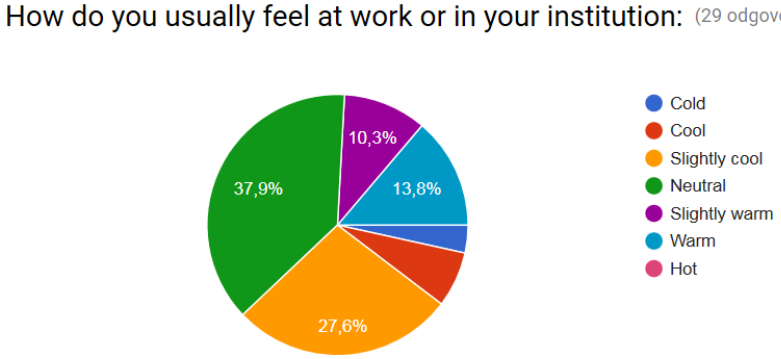

Figure 13: Shares of perceived thermal comfort at work (n=29)

A minority (11/29) feel neutral at work, 22 taking into account also slightly warm and cold. 2 respondent feel cool, 1 cold, and 4 warm. **Colder (-)[2] feel 4 participants from NL and PL case** (each) and only 1 from each other case (SI, DK, IT). **Warmer (+)[3] feel 5 people from SI** case and 1 from Pl and NL case.

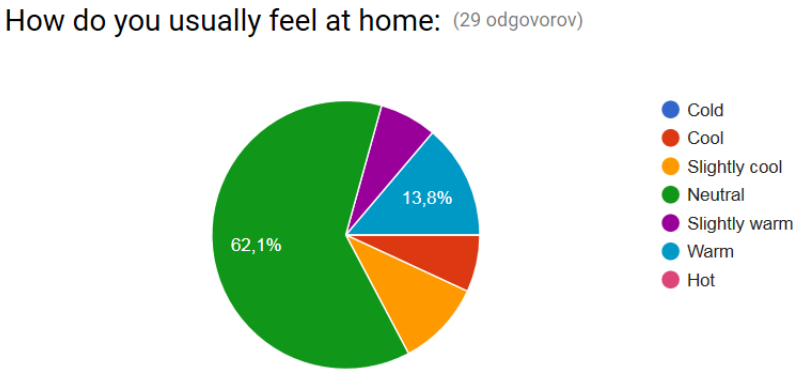

Figure 14: Shares of perceived thermal comfort at home(n=29)

A majority (18/29) feel neutral at home. 23/29 feel neutral if taking in to account also slightly warm and cold. 2 responded, that they feel cold at home (PL) and additional 3 slightly cool (2xNL, 1x PL). Similar to 4 feeling warm and 2 slightly warm. **4/6 people feeling warmer (+) are from SI**.

[2] -3 Cold, -2 Cool, -1 Slightly cool
[3] +1 Slightly warm, +2 Warm

1.3.4. Wearables

A wristband for supporting health related habits (sport, recreation, walking, hearth-rate, etc.) is used only by 4 participants (TomTom Go 2 cardio, Polar with heart-rate monitor, I-phone and Xiaomi Mi Band 2 with heart-rate monitor): 3 from NL case and 1 form PL.

A smartwatch is used by 4 respondents (TomTom go 2 cardio with heart-rate monitor, Withings Activite, U8 with heart-rate monitor and MISFIT): NL, SI and IT case.

1.3.5. Smartphone apps

Apps are more common and were reported as follows: 15 reported to be using app and mobile phone

Table 2: Used apps and mobile phones

Apple, iPhone 6, Health, Runkeeper
TomTom sports
s health samsung
I-phone 7
Endomondo
Nextbit Robin; Health Mate, Google Fit, 1, 2, 3 Ljubljana
Samsung
Endomondo, My Fotnesspal
Huawei
Samsung S4
Diffrent
many different which can register my walking (route, amount of steps, speed)
Huawei
Huawei P9 Lite
iPhone

2. Preliminary personas creation

4.1. Introduction to personas

Personas are fictional characters which are created to represent the different user types that might use a certain product or service. The term is often used in development of IT solutions as part of the people-centred design, when several personas are usually made, and one is usually selected and remains in the focus of design and development processes (Lidwell, Holden & Butler 2010) [5]. The persona represents one of the key tools in interaction design introduced by Alan Cooper (1999) [6]. Each persona is a fictitious aggregate and a representation of target users (Miaskiewicz and Kozar 2011) [7]: "a precise description of a hypothetical user and his or her goals, and it represents the user throughout the whole design process" (Blomquist and Arvola 2002) [8].

The basis for creating personas are interviews and observations in the pre-design phase and every persona is carefully described as well as given a name and a face (for a detailed description of a design project, using personas see Blomquist and Arvola 2002 [8]). Merholz et al. (2008) [9] explain that the most efficient personas "tell their story in their own words, often using quotes from actual research participants". Cooper et al. (2007) [10] explain that "although personas are depicted as specific individuals, because they function as archetypes, they represent a class or type of user of a specific interactive product.

A persona encapsulates a distinct set of behaviour patterns regarding the use of a particular product (or analogous activities if a product does not yet exist), which are identified through the analysis of interview data, and supported by supplemental quantitative data as appropriate." For a detailed analysis of personas and their potential benefits to the design process, see Miaskiewicz and Kozar (2011) [7] and Cooper et al. (2007) [10]. Usually, the personas are represented on one or a couple of pages, and numerous examples may be found by an online inquiry ("design personas").

In the Mobistyle project we decided to implement the approach to inform the developers and designers about their own perception of users and their specifics. We decided to use a general template for preliminary personas identification for all 5 case studies of the project. The technical information about the demo sites was gathered in the frame of WP3 and WP6 documents, filled in by the case study holders and partners.

With this information in mind, the participants of the workshop were informed about the specifics of all cases. A preliminary identification of the user groups was carried out on the basis of specifics of the cases (e.g. students in the case of university and nurses in the case of healthcare centre). These predetermined groups were used as an initial starting point for creation of personas. In the initial phase of the work shop the health aspects as a motivational factor for behaviour change were presented by MU. Afterwards, a responsible person ("demo case holders") who was from the site or was familiar with it, presented each case. The group which created personas gathered around the demo case holders. The participants got a task to create 3-4 typical users as they imagine them – from their personality and biography to physical characteristics. The process was moderated in order to receive comparable results from all groups.

4.2. Personas creation

Personas were created on WS1 that took place on 14th and 15th of February 2017 in Amsterdam. Transcribed personas, created at the workshop, are available here. Scanned original files are available here.

The following personas were created:

DK:

- old retired couple
- single mother with children
- young male professional
- student

NL:

- nurse
- cleaner
- physician
- building manager
- patient

SI:

- university student
- technical staff member

PL:

- 20-30 years old
- 30-40 years old (no children)
- 30-40 years old (with children)
- 40 + years old

IT:

- long-term guest
- cleaning staff
- manager

Figure 15: Personas were created at the MOBISTYLE workshop in Amsterdam

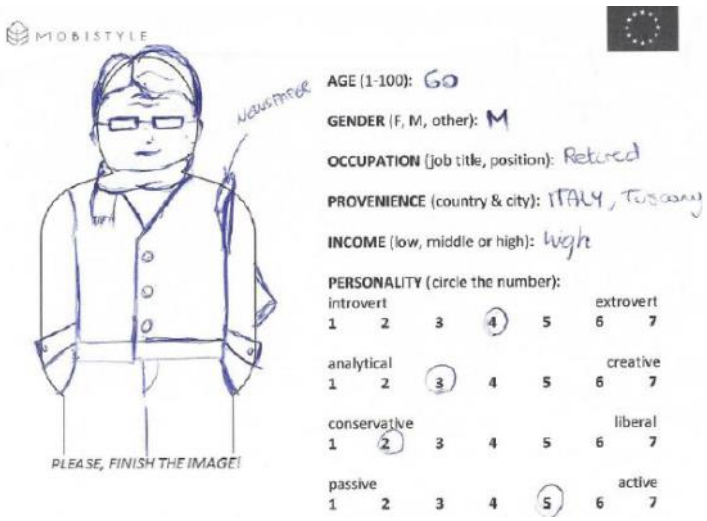

Figure 16: An example of "persona", created by a workshop participant in Amsterdam.

4.3. Findings of the experiment

In this analysis we attempt to generalise findings from the workshop in Amsterdam and provide recommendations for further investigation and development. First, we present the findings by a specific case; afterwards, we present some general findings about the users of all 5 cases; finally, we make suggestions for further detailed study of actual users by ethnographic approach.

4.3.1. Italy

In the Italian case, i.e. Hotel Residence L'Orologio located in a central area of Turin, the participants in the workshop created 3 personas. The first user is a retired, 60 year-old long-term male guest from Tuscany with high income, who had a successful career. He wants to spend his free time with his wife (his daughter is already grown up) visiting cultural sights in cities. He enjoys running (also with a support of running-related apps on phone) and has firm habits, connected to saving energy (switching off lights, setting the thermostat, etc.) He is depicted as a conservative-looking man, a bit wrinkled and worried; he wants to appear younger as he actually is.

The second user of the building is a 55 year-old female cleaner from Turin, employed at the hotel. She has a low income, and she manages to support her family. She does not do any extra activities for her health and wellbeing, and does not use any technologies for supporting such habits. However, she puts a lot of attention to energy consumption – switches off lights, closes windows, closes the tap, uses a thermostat to regulate room temperature. There is an interesting detail on the illustration – a large key in person's hand – which could on one side represent also access to different rooms, and on the other also access to information in the facility.

The third user is a 40 year-old female manager from Turin, working at the hotel. Apparently, she works there to fulfil her ambitions and also to increase the income, which is in fact already high. She tries to do sport regularly – also to reduce stress – but does not always succeed to do so. She is very open to various technologies, both for health and energy management, but she is not an early adopter. The picture shows that technologies are an important part of her lifestyle – she is depicted with a smart watch and a smartphone in her pocket.

Interestingly, all three users of the Italian case use some kind of "wearables", which provide them access to information. The man reads a newspaper (a non-IT solution) to get informed, the cleaner has a key to get in direct touch with information about the rooms and has access to »hidden life« of people; and the IT manager keeps technology gadgets at hand, which keep her informed about other people and her own daily achievements. A challenge in the Italian case seems to be the transfer of information between different users and motivation of the long-term guests to become active »energy managers« of the building.

4.3.2. Denmark

The Danish case is a residential building complex Kildeparken. The first user of the complex, presented at the workshop, is a 32 year-old female consultant from Aalborg with middle income. She is strongly motivated by her social status and wants to be “a perfect mother”. She is a “couch potato” and does only some fitness at home – also by support of a smartphone app. However, she is more active when it comes to energy management; she keeps switching off lights, keeps the doors closed, and sets the thermostat to constant indoor temperature. In the picture she looks like a practical and organised person, who likes flowers, as it was specified in the description.

The second user is 26 year-old Jensen (the author of this profile added a name), who is a sales manager from Milan, Italy (an unusual name for an Italian) with a mid-ranged income. He is quite extroverted and creative person with an interesting motivation: to retire by the age 35. However, his spending habits do not lead in this direction, since he uses his earnings for booze (he is a big fan of weekend parties) and fast cars. Apparently, he does not intend to settle down yet and he does look for a stable relationship. He is also an egocentric person, focused on his good look, so he starts a day with workout and often concludes it with a long run. He uses Fitbit to support his activities and keeps his steps at 15 thousand as a minimum target. He also uses smart meters to find out more about his expenditures, but has no clue how well is he doing in comparison to others. Wasting the energy actually frustrates him, but he does not do much to change this – he is waiting for a “smart device” to manage his individual environment.

Third user is Tobias, 29 years old male extrovert and active student who wants to see the world. He has sport activities 5 times per week and uses watch (heartrate, steps counter) and sports app. He is saving energy with thermostat due to financial limitations and would like to have more control over electricity usage. The fourth user is Louise, a 19 year-old female student from Aalborg without any personal income. She is a fairly extroverted, creative, liberal, and active person, who wants to get the highest grade in school. She is in good health and likes to attend dancing class and soccer. She does not do much in the field of energy management, except switching off the lights. She uses several IT solutions to support her health and wellbeing, including the pedometre, calorie counter, and the Endomondo smartphone app.

Fifth user is 65 years old Karl who is retired. He is more introvert and conservative and wants to enjoy life. He uses phone app, checks the meter (due to high energy bills) and hates it when it is too hot in summer. The sixth user is a 65 year-old retired Karl from Aalborg. His income is now mid-ranged, and is motivated by social status. He likes to walk and uses a smartphone app to support his activities. At home, he regularly checks the smart meter and is quite aware of the energy consumption, especially when a high energy bill arrives each month. The seventh user is 45 years old Tove. She is unemployed passive, introvert and conservative mother. She wants to lose weight and uses step counter. She cares only about low costs and her family.

4.3.3. Netherlands

The Dutch case is a soon to be build health centre Mosae Vita intended for recovery care of patients staying for longer periods of time. The first user of this case is a 35 year-old Sarah who does cleaning in order to support her family and have a stable life. She eats healthy but doesn't work out because she moves a lot at work and counts her steps with a smartphone app. She thinks the design of the facility where she works lacks a personality and is too modern. In the terms of energy management, she turns off appliances or lights when not in use but doesn't take a particular care about heating. She takes a look at the thermostat and smart meter.

The second user is a 30 year-old Tom. He is a nurse who works also during night shifts. He is a mild extrovert, quite active and wants to help people but is not very ambitious. He goes to fitness on a weekly basis, has an app to support his activities, but doesn't use it. At home he uses thermostat, however, at work in the health centre he is not satisfied with heating – in his opinion it is too warm there.

The third user is 62 year-old recovering patient Evelyn who had her hip replaced. She is now semi-retired, extroverted and quite conservative primary school teacher. She is quite involved in her community. Limited mobility frustrates her, as she was used to walk every ware, and fears that she might become a burden to the society. She doesn't pay much attention to the use of electricity at home, and in the Mosae Vita; interestingly, the incompetent young people who can't get the temperature right bother her. At home she feels it is either too hot or too cold. Grandchildren gave her a Fitbit device, but for her it is an "utter nonsense". She is using instead a blood pressure machine to check her health. The fourth user of the case is a 45 year-old physician Isabell. She is an analytical and active person, and she wants to help people while earning enough to play golf regularly. With e-bike and Nest thermostat she is a fan of new technologies, but still often forgets to use the installed smartphone app which should influence her behaviour.

4.3.4. Slovenia

The Slovenian case are four faculty buildings of University of Ljubljana, which are all situated in the city of Ljubljana. These are public facilities, where users generally do not take much care about energy consumption and consequent costs. The first user is a 23 year-old female student who moved to Ljubljana for her studies. Her graphical presentation is fairly simple and still relevant, as it shows an alternative person, who wants to stand out of the crowd. She has typical student worries, such as exams, is ambitious and visits parents during the weekend. She commutes to university by bus, runs once per week, eats lunch in the school cantina, and eats her dinner at home. She does not care about energy management neither at faculty nor at home. She uses technologies to make her life easier, e.g. running apps, tablets for her classes, a smartphone, and the social networking apps.

The second user is 35 year-old male technical staff member who seeks technological perfection in buildings operation. He trains for a marathon, and tries to do his best in daily energy management; at work he checks only the light control and at home the thermostat. The architectural design of buildings often frustrates him.

4.3.5. Poland

The Polish case is a smart city Wroclaw where large numbers of smart meters is already implemented. The first user is a 40+ year-old introvert, analytical, conservative and passive male blue collar worker with grown-up children. He is driven by fear and strives for social status. He does physical exercise (plays soccer and cycles on a weekly basis). His only energy related habits at work or home are connected with heating regulation and lights switching. He uses the social networking apps. The second user is a 30-40 year-old male, without children, with fear of being alone, rather conservative and passive; he still strives for power and carrier, goes to fitness and takes food supplements, but in fact does not care much about health in general. He doesn't even know what the numbers "1-5" mean on the thermostatic valve.

The third user is 20-30 year-old male junior specialist, very extroverted, liberal, creative and active. Motivated with money which, or lack of it, is also a source of frustrations. He uses mobile technologies, as it can be also seen in the image, and utilises various apps. Energy is not a relevant theme for him and it is definitely not in the focus of his daily habits, which results in poor decisions, e.g. in poor and inappropriate ventilation.

The fourth user has children, he is 30-40 years old. He is the only "persona" visualized with a cigarette. In addition to a solid car and a house that he already has, he wishes a good life for his children. Health is also an important aspect of his lifestyle. He exercises daily while using a GPS-based pedometer and a pulse meter, but has a "bad diet" with small intake of vegetables and fish. He is quite aware of energy saving possibilities and uses the thermostatic heads, low-energy devices, switches off lights regularly, and cooks large portions of food for all family, which last for some days.

4.4. General findings

Almost all health-related habits, described in "personas", are connected to sport activities, e.g. running, walking, etc. Only two of our fictional images ("Evelyn" and "Maryjane" from the Netherlands) out of 21 are described as individuals who put on top of their priority list the healthy and home-made food. In addition, we had an example of a 30-40 year-old man from Wroclaw, who has a "bad diet", as it was described in his presentation, and eats only small amount of vegetables and fish, and another Polish person who regularly consumes food supplements.

Mental health is also put in the back of interests and priorities, and does not seem to be a very relevant theme for the Mobistyle project, although people in fact practice many activities (yoga, meditation, etc.) to balance their lives and live less stressfully, and even use several apps and gadgets to help them create and support such habits.

The workshops in Slovenia and the UK have also proven that people perceive several other practices – in addition to sport – as being healthy, for example eating healthier, letting fresh air in rooms, and having an afternoon stroll with their family members. Interestingly, the fictional characters ("personas") also seem to be quite socially isolated – they do most of the health- and energy-related activities on their own, and are not closely connected to their families, friends, work team, neighbourhood, or other social networks.

Not all "personas", created at the workshop, are open to IT solutions. Some of them, especially elderly people, do not use apps and rely on more conventional media, e.g. newspapers for staying in touch with the latest events and use blood-pressure metres and scales to "quantify" their health-related parameters. Smartphones and wristbands seem to be the most relevant technologies for supporting health (especially by the younger generations), while the thermostat (in addition to the smart meter, used for supervision of electrical energy use) remains the main technology for managing energy at home. According to "personas", women are more likely to use calorie counters – losing weight seems to be an important motivation factor for influencing their habits and practices.

An important problem, which was noticed in analysis of the "personas", is our project focus on individuals, which could be seen in all 5 presented cases. An individual is usually perceived as a single human being, who is distinguished from a group and has his or her own needs or goals. The biographies, characteristics and traits of the "personas", constructed at the workshop, were rarely defined in relation with others, e.g. how do other people interact with them and perceive them; the "personas" were also depicted as single, "atomistic" social units. (For example, we are unable to see any other persons on the illustrations.) In fact, however, people constitute their social identity – and also habits and practices – in connection and relation to others.

Some social scientists (e.g. Gilles Deleuze and Marilyn Strathern) [11] therefore claim a term "dividual" would be in fact more appropriate to describe both premodern and postmodern societies instead of the prevailing "individual". Such a shift of perspective from a single "individual" to interconnected "dividual" could be relevant for the Mobistyle project since it can explain that a human subject is in fact endlessly divisible and reducible to data representations via the modern technologies of control, like IT-based systems for energy management and wellbeing (Williams, 2005) [12].

4.5. Preliminary suggestions for further research and development

A **balance between collaboration and competition** seems to be an important challenge for the Mobistyle project, which should make a move from being passive users to being engaged inhabitants of buildings. How can we achieve that? A comparison between users seems to be particularly important, as it provides the first step from an isolated, singular, atomistic individual to a networked and collaborating community of dividuals. As it is explained by Christakis and Fowler (2011) [13], connections – our friends, their friends, and even their friends' friends – have an astonishing power to influence everything from what people eat to how they sleep. And people, in turn, influence others. Human actions can change the behaviours, the beliefs, and even the basic health of people we've never met.

Christakis and Fowler claim that there are in general two prevailing opinions: on one side there are people who think individuals are in control of their destinies, and on the other those who believe that "social forces" (ranging from a lack of public education to the presence of a corrupt government) are responsible for what happens to people. However, there is an important factor missing, according to which our connections to other people matter most in forming and changing our daily habits and practices, including the ones connected to energy management, health, and wellbeing. In short, long-lasting **habits and practices are not made by individuals; they are instead created in communities and networks of cooperation.**

Table 3: identified user type by the different methods

WP3 data collection[4]	Case study participants[5]	Personas from WS
SI case		
students technical staff teaching staff administration	Student 4x Head of group, engineer researcher head of department	A student of the university A member of the technical staff
NL case		
physicians, nurses, managers, cleaners, patients	Physician, phd Coördinator coach sport and research Family coach pedagoog Care coordinator Researcher Onderzoeker PhD candidate	The physician The nurse The building manager The cleaner A patient
IT case		
guests staff members managers	Guest Cleaning lady Reception 2x Manager	Long term guest Cleaning staff Manager

[4] WP3 data obtained from "Case studies definition" 2° WP3 Webmeeting that took place on 1st of February, 2017

[5] Own definition in the questionnaire.

PL case		
residents	Specialist Project Manager student + trainee Student Engeenering specialist R&D Expert	20-30 years old 30-40 years old no children 30-40 years old with children 40 + years old
DK case		
residents	pensioner Taxi chauffør Unemployed Student /Company owner	Old retired couple Single mother with children Student Young male professional

5. Methodology validation

A recommended approach of validating the methodology is by surveying participants during and after the project completion to get their feedback. We intend to analyse and apply experiences of other R&D teams, which have used the people centred-approach. A similar approach in product development as envisaged in MOBISTYLE was implemented in 1990s by Boeing in development of an aircraft 787 Dreamliner and Microsoft in development and usability testing of their Windows XP operating system. One of the leading groups of applied anthropologists is currently gathered in Intel's User Experience Research laboratory. The team is especially focused in ubiquitous computing and pervasive technologies, i.e. in the future of technologies that recede into the background of our lives. Now several other international corporations hire anthropologists or use ethnographic approaches in development of people-friendly products and services, including Google, General Motors, Motorola, Nynex, General Mills, Nissan, Adidas, Beiersdorf, Carlsberg, Novo Nordisk, and Samsung.

In addition, we will use findings of another EU-based project, titled "People-Centred Development Approaches in Practical and Learning Environments" [14], which is focused on good practices and applications of people-centred approaches in theory and practice (EU programme: Erasmus +, lead institution: IRI UL, acronym: PEOPLE). In the PEOPLE project's Conceptual Framework, for example, a useful example of a research, carried out at the Digital Ethnography Research Centre (DERC), is presented. The researchers are investigating "what a hospital building and its designed forms feel like from the standpoint of those who use it most" at the Bendigo Hospital in Victoria, Australia (DERC) [15]. A key feature of the research is "the use of ethnography to focus on how people experience, understand and make sense of their surroundings" (ibid.). We intend to get in touch with Prof Sarah Pink from the DERC to evaluate the MOBISTYLE approach and findings and to share their good and bad practices from their case study.

Another relevant recent case is the "LA Express Park study", carried out by Xerox PARC which endeavoured to understand users' behaviors, knowledge, and perceptions around parking in order to help LA Express Park improve how technology could help increase the availability of limited parking spaces through dynamic pricing, reducing traffic congestion and air pollution, and encouraging the use of alternative modes of transportation.

(PARC) “The Baby Care” is also an interesting recent project. “The aim of the project was to identify and develop new technologies and product concepts for baby care, based on rich understanding of the lives of parents with babies” (Postma et al. 2012) [16]. The initial project team included members with backgrounds in electrical engineering, computer science, psychology, and industrial design (ibid.). They used tools such as probes (“packages of tools and playful exercises that invite participants to reflect on their routines and daily experiences”), followed by generative sessions with research participants. In the health-related field we will analyse two case studies illustrating the use of rapid ethnography at a U.S. academic medical centre. The first case is an evaluation of a ‘failed’ health IT project in which researchers used ethnography “to understand the fate of a promising diagnostic device that was integrated into routine clinical practice in one setting and then resisted and ultimately abandoned elsewhere” (S. Ackerman et al. 2015) [17]. The second case study involved the use of rapid ethnography “to evaluate and inform a multi-sited implementation of an electronic tool that enables clinicians to exchange diagnostic and treatment advice about individual patients” (ibid.) The authors conclude with “a discussion of how ethnographers can contribute to the improvement of health IT by providing a deeper understanding of the contexts and communities in which new tools are introduced” (ibid.)

Finally, the “eFlex project” is a user oriented innovation project commissioned by the largest utility company in Denmark: DONG Energy. “The company hired a consultancy firm to generate in-depth qualitative knowledge on the use of smart grid technology in everyday life through anthropological fieldwork in households in the Copenhagen area” (Nyborg 2015) [18]. We will get in touch with the DONG Energy and evaluate their experience at the fifth international symposium ‘Why the World Needs Anthropologists 2017’, which will be held in Durham, UK (Dr Dan Podjed from the MOBISTYLE team is the head of organizing committee and founder of the event). The keynote speaker at the event in Durham, thematically subtitled “Powering the Planet”, will be Brent Cheshire, the Country Chairman of DONG Energy in the UK and Managing Director of DONG Energy Wind Power and has responsibility for country management in the expanding overseas footprint. The event will be an important platform for evaluation of MOBISTYLE methodology from the viewpoints of industry and academy.

6. Conclusion and recommendations

The questionnaires, focus groups, workshops and other people-centred approaches, carried out in the frame of MOBISTYLE project, have provided us some relevant and also unexpected findings, which can be used for further investigations and designing the technologies and solutions in other WPs. We have, for example, realised that our project focus has been leaning towards energy use, while people that participated the study, i.e. potential users of technologies, are more focused in health and wellbeing in their daily lives. In addition, we started our research with presumptions about health and energy related habits, which have proven to be partly mistaken. **Health and wellbeing is, as it has been proven, a much broader category than just physical activity.** People put a lot of attention on their mental health (relaxation, yoga, sleeping, etc.) and emphasise food and cooking as an important element of a healthy lifestyle. In addition, we have started the project with a focus on individual lifestyle; however, the focus groups and workshops have already shown that habits and long-lasting practices are in fact formed in broader communities, neighbourhoods and circles of friends through peer pressure, and in families and educational institutions, e.g. schools, by "top-down" supervision and control.

Health and energy related habits are often formed at an early age and are influenced, supported and strengthened by socio-cultural environment. When developing new technologies, we should therefore **emphasise the *collective and collaborative* factors and make a move from influencing, changing and improving *individual* behaviour**. The IT-based solutions should be also adaptable to local specifics of case studies and take into account diversity within the cases, i.e. how one user group differs from another and how we can adapt the solution for specific needs of these groups.

The experiment with "personas", carried out among MOBISTYLE project team members, has also proven to be relevant for our further studies and development, as it showed how the researchers and developers in the MOBISTYLE team construct the "ideal type" (cf. Schutz 1972) [19] images of "average" users in the case studies. In the next stage of the research, we plan to shed a new light on the individuals who spend their time in buildings. We wish to **put in front the actual people**, who were identified and recruited in our case studies for collaboration in the project (5-7 per case study). They were already involved in our pilot survey to obtain some basic information about their homes and workplaces, about their health- and energy-related habits, and about various technologies, used in their daily lives. We wish to highlight these people and compare them with the mental images, created at our workshop. We wish to put in front their actual needs, requirements, problems, and ideas, which will help us designing and improving the IT solutions, designed in the MOBISTYLE project. Their active participation will be instrumental for verifying and perfecting the mental images ("personas") and their lifestyles ("timeline"), which will be used in future phases of the development process.

Two main recommendations for further research and development:

1. In the project we should focus on preparing solutions which will enable **collaboration and communication** – in addition to gamification and competition.
2. In the project, health-related habits are now mainly perceived as individual's physical activities. We should take into account **other elements of daily lives** which could be even more related to energy consumption, e.g. preparing food, sleeping, relaxation.

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