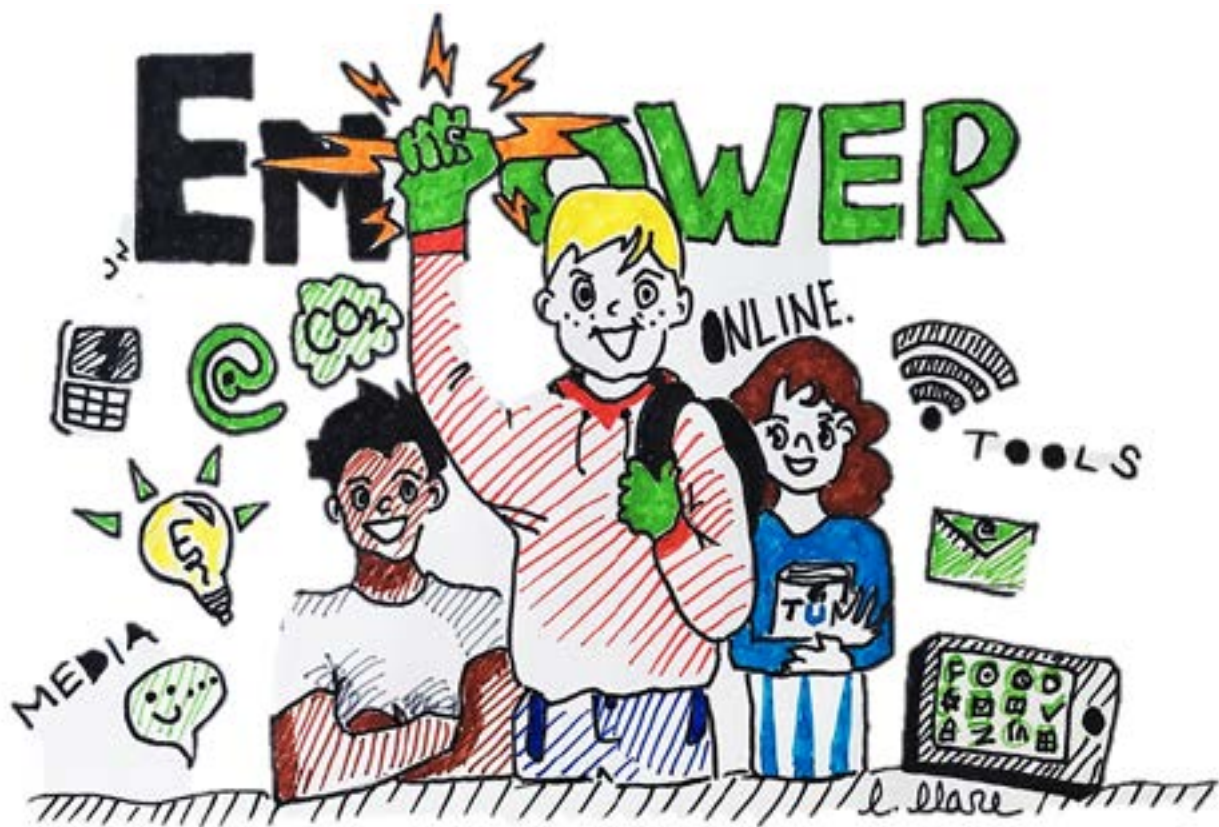


Empowering people with data.





[Data Champion](#) from the [Faculty of Industrial Design and Engineering](#), [Natalia Romero Herrera](#), explores innovative ways of giving data back to the user for social good.

Chilean computer scientist, [Natalia Romero Herrera](#), has worked in the field of human-computer interaction for almost 20 years. Her research within the [Design Conceptualisation and Communication](#) section at TU Delft focuses on the development and application of user-centred design methods to understand people's daily life practices and, in particular, the impact of environmental and health issues.

As an active member of the [idStudioLab](#), Romero Herrera uses [living labs](#) to contextualise complex behavioural data. In a living lab, innovative technological applications and tools are designed, and tested by participants to determine how people engage with specific products and services. Romero Herrera's technological designs are 'experience-centred', meaning that they aim to improve user experience as a whole. Therefore, a key element of her research is to learn about the needs and values of users; to engage, empathise and empower them through data.

A 'give and take' perspective on data

"Technology has always used data to direct people towards a desired goal," explains Romero Herrera. "For example, environmental technologies use data to encourage people to reduce their energy consumption at home. Likewise, healthcare technologies use data to encourage people to walk 10,000 steps a day because it's good for their health."

Whilst data plays a central role to drive change in societal behaviour, Romero Herrera has different ideas for its use. "Rather than simply taking data from people, we can give data back to people to influence their actions." She enlightens us on her mission to empower citizens and communities by giving them data. "My research aims to grant people access to the information they need to make autonomous decisions and change their own behaviour."

To this effect, we discussed Romero Herrera's current international projects that give data back to people for personal and wider social benefit.

Getting students involved with 'ENERGE'

The EU has set itself the goal of [reducing greenhouse gas \(GHG\) emissions](#) to zero by 2050. [ENERGE](#) (ENergizing Education to Reduce Greenhouse Gas Emissions) is a project funded by [InterregNWE](#) that helps to achieve this goal by facilitating the implementation of low carbon, energy and climate protection strategies to reduce GHG emissions in North-Western Europe.

The project focuses on secondary schools which are typically housed in pre-war buildings and are, therefore, energy inefficient. "If such schools are to meet the zero emissions target, a significant financial investment will be required to renovate their infrastructure." Romero Herrera continues, "As these renovations will take a long time to plan, there is a demand for immediate low-cost solutions that enable long-term resource efficiency and reduced GHG emissions."

ENERGE aims to achieve a 15% reduction in total energy consumption within 12 demonstration site schools in the UK, Ireland, France, Germany, Luxembourg and the Netherlands over a four-year period. Here's how...

Quantity and quality with mixed methods

"We're collaborating with research institutes and industry partners to design mixed method tools to capture quantitative and qualitative data from schools. This will involve targeted physical interventions, such as a web-based platform, energy meters and building sensors that measure temperature, humidity, carbon dioxide, sound and light." Romero Herrera has used sensors to collect indoor climate data from buildings in past research projects.

Objective (quantitative) data collected from sensors will be combined with subjective (qualitative) data collected from behavioural studies involving students. Using similar tools to those developed for her previous [SusLabNWE](#) project, Romero Herrera can learn more about the comfort of the classroom by asking students how they are feeling. For instance, students can report their thermal comfort using a dial. A digital diary presents the data from the dial in a daily timeline and invites users to indicate what they did to manage their comfort... Did they have to open a window? Or, turn on the heater?

Education to empower

Ultimately, the data collected from ENERGE is given back to the students, along with various data enabled tools, workshops and a hackathon. Students are educated on the data lifecycle as they gain first-hand experience of data capture, processing, analysis and visualisation.

Romero Herrera adds that students also learn the importance of collaboration. "Taking a holistic and multidisciplinary approach involves many stakeholders within the school ecosystem. Students, teachers and



Caption: Mixed method tools used in Romero Herrera's research to collect integrated indoor climate data. (SusLabNWE and Building Occupant Certificate System (BOCS) Climate-KIC).

managers collectively engage with data, learn about the impacts of their actions on energy consumption and can experiment to develop new strategies to solve problems together.”

She also highlights an important future impact of ENERGE. “The project raises awareness about environmental sustainability amongst our future generation. It gives students agency to reduce their energy consumption and help to mitigate GHG emissions. These teenagers are our planet’s future decision-makers and it gives them a voice to express their ideas and opinions.”

The long-term impacts of ENERGE will be consolidated by the addition of revised educational material to supplement existing school curricula for secondary school students. Moreover, the project will monitor the effects of its initiatives beyond the school environment. Data captured in staff and student homes will emphasise the importance of sustainable energy efficiency within the domestic environment.

A healthy relationship with data

[Food Sampler](#) is another of Romero Herrera's current projects. Funded by the [ZonMw Create Health](#) programme, this project uses mixed methods to monitor food intake in overweight or obese adult patients.

Romero Herrera describes the problems of existing methods for monitoring food intakes. “Paper-based questionnaires are laborious, time-consuming and are often not applicable to real life. Patients are, therefore, reluctant to complete questionnaires.” She advises, “If we are to be successful in changing food consumption habits of overweight individuals, we must develop better reporting techniques that engage participation and extend data collection with contextual aspects of dietary practice.”

Persuasive engagement with patients

Food Sampler integrates objective data from tools and subjective data from patient self-reports to evaluate complex dietary behaviour.



Upon interviewing patients, Romero Herrera found that their main objection to completing questionnaires was not due to labour or time, but their fear of judgement. Design has a main role in redefining the qualities of current reporting practices to reduce these negative experiences.

She explains the importance of designing non-intrusive in-situ mixed methods to persuade patients to engage with reporting tools. “Future methods must identify not what individuals are overeating but why they are overeating in order to understand the ecology of food intake.”

In the project’s preliminary stages, Romero Herrera is trialling several prototypes in living labs. “Inspired by the generation of e-health prevention apps, I’m developing ideas for tools that can be used in people’s homes. I want to design a tool with a user-friendly interface that encourages patients to confide. Like a secret diary, patients can report on their mood, emotion and other contextual factors that influence their food intake in a way that is non-judgemental and non-confrontational.”

As with all of Romero Herrera’s research projects, the resulting data will be given back to patients in a way that they can understand and relate. She hopes that Food Sampler will give patients the relevant knowledge to reflect and take action to improve their personal health and wellbeing.

Publishing personal data

Romero Herrera discusses her ambitions to openly publish her datasets. “My datasets are rich. The data is not only relevant to designers but many other professional fields. I’m interested to see how making my data accessible and referable can benefit other scientific research communities.”

She talks about the challenges of sharing personal data. “Of course, the data I have collected during my research is confidential and extremely sensitive. Therefore, if it is made public, it must be anonymised.” After guidance and support from faculty Data Steward, [Jeff Love](#), Romero Herrera has investigated ways to anonymise her data by clustering patients into categories so that individuals cannot be identified. She is now confident to deposit a coded version of her Food Sampler dataset on the [4TU.ResearchData repository](#).

Back to Chile!

As an editor-in-chief of the open access journal, [EAI Endorsed Transactions on Pervasive Health and Technology](#), Romero Herrera, shares her interest of empowering people through data with the wider scientific community. Next year she will chair the first edition of the EAI International Conference on Digitalising Healthcare, '[DigiCare 2020](#)', in Santiago (Chile), inviting researchers, designers, developers and policy makers to further explore the role of technological innovation in solving societal health challenges.

Thank you Natalia for showing us a new side to citizen science... "Rather than simply taking data from people, we can give data back to people to influence their actions."

Citation

This showcase is a selection from the following publication:

Clare, Connie. (2019). The Real World of Research Data [Book]. Zenodo. <http://doi.org/10.5281/zenodo.3584373>.