

Society is part of the equation

Verena Schulze Greiving and Kornelia Konrad describe a toolbox that they developed to support researchers in exploring the societal implications and prerequisites of their work.

The pathway of a new technology, from development to commercialization and actual usage, is not simple and involves many different aspects. Societal dimensions are often neglected, assuming that these will somehow be taken care of later on.

This is what I (Verena Schulze Greiving) experienced during my PhD project in which I developed a microfluidic bilayer platform for drug screening of proteins. While I was focusing on the improvement of the fabrication, the development of new measurement schemes and the demonstration of the platform's performance by proof-of-principle experiments, I spent little time thinking about what is needed for the platform to be actually used for drug screening or considering alternative applications.

However, my PhD was part of the Dutch research and innovation program NanoNextNL (NNNL). The chairman of the executive board of NNNL stated at the beginning of the program in 2011 that every researcher in the field of nanotechnology has to consider the consequences of his or her research. This statement was integrated into NNNL as an obligation for PhD students to consider risks and societal dimensions during their research. In the frame of this obligation I attended a workshop introducing students to risk analysis and technology assessment, and in the last year of my PhD research¹ I decided to organize a workshop to explore new and alternative applications for the microfluidic bilayer platform I was developing and to consider the challenges to incorporate such technologies in society — beyond the purely scientific ones. Beside scientists, I invited people working in relevant technology companies, as well as experts in intellectual property, technology transfer, technology assessment and regulations. The workshop made me aware of the technical, regulatory and societal requirements for my technology to be commercialized and implemented, provided me with new contacts outside my own field of expertise, and allowed me to take a step back from the lab-related issues and see the bigger picture. Furthermore, I used what I learned to add a full chapter to my PhD thesis² and write a section for a book on emerging technology³. I also developed more

solid and alternative application perspectives for the project, and the workshop served as an inspiration to other PhD students within NNNL who had to address this requirement.

During my excursion into the world of technology assessment I realized that methodologies from the field of science, technology and innovation (STI) studies are quite suitable to be applied to technical research projects; however, examples translating these complex and somewhat abstract concepts to practical cases are rare. For researchers, the limited background knowledge of STI studies and lack of time are perhaps the biggest challenges. In my case, the success of the workshop was to a large part due to the support I received from an expert in the field of technology assessment, Douglas K. R. Robinson, who introduced me to methods and concepts within this discipline, assisted me with the organization and analysis of the workshop (which immensely reduced the time that I had to invest), and invited his contacts to broaden the scope of the discussion during the workshop.

In order to support academics who are interested in adding an extra dimension to their research, I proceeded with a postdoc project in the research group of Kornelia Konrad in the Department of Science, Technology and Policy Studies. Together, we developed an online 'toolbox', which makes methodologies originating from technology assessment and related fields more accessible and user friendly to technical students and researchers (www.cta-toolbox.nl). This toolbox is explicitly meant as a platform to provide an entry point to a number of approaches that researchers may choose from, according to what seems appropriate for their topic, given the time and financial resources available.

Supported by our colleague Haico te Kulve, we helped various PhD students and senior researchers to consider societal aspects in their work and included these activities as examples in the toolbox to inspire other researchers. Some of these activities concern mapping changes and challenges in the socio-technical environment created by a new product or technology. Other activities are about creating awareness of the economic,

societal and political developments required for a technology to be realized, as in the case of solar hydrogen technologies. Finally, some activities are about searching for potential collaborators early in the process of setting up a new research line.

Undoubtedly some researchers are sceptical about the value of considering societal challenges early in the research process. But others see why these aspects are important, especially for research that aims to solve a societal challenge. We have received many positive responses from researchers. "If I had done this activity earlier," said one PhD student after carrying out an activity towards the end of their research, "it would have really helped me in my project." And a professor who we supported in organizing a workshop said, "It was very useful to think in advance about possible actors and applications and to have a sparring partner to develop the questions together." Two professors stressed that the expertise of the participants in the workshop was different than in their normal meetings and hence provided some useful insight — especially the social scientist's, which made them think about aspects that hadn't previously been considered. We therefore hope that the toolbox not only stimulates researchers to consider societal challenges early in the technology development process, but also contributes to more collaborative efforts between technical and social scientists, in order to add societal dimensions to the equation and enhance research and innovation processes. □

VERENA SCHULZE GREIVING and KORNELIA KONRAD are in the Department of Science, Technology and Policy Studies, University of Twente, MESA+ Institute for Nanotechnology, PO Box 217, 7500AE Enschede, The Netherlands.
e-mail: v.c.schulzegreiving@utwente.nl;
k.e.konrad@utwente.nl

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