Constructive Philosophy of Technology and Responsible Innovation

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Abstract

This essay argues for a new turn after the empirical turn in the philosophy of technology: the societal turn, which is the turn from reflective philosophy of technology (academic philosophy concerned with analysis and understanding) to constructive philosophy of technology (philosophy that is directly involved in solving practical problems in society). The essay aims to describe in detail what a constructive approach would look like and how it could be achieved. It claims that at least in the European Union, the conditions for a constructive philosophy of technology are favorable, due to the emergence in both policy and academics of the notion of Responsible Research and Innovation (RRI). It then goes on to describe how a constructive philosophy of technology can contribute to better technology development, better technology policy and better implementation and use of technology, through engineering-oriented, policy-oriented and use-oriented approaches to research.

Keywords: constructive philosophy of technology; empirical turn; societal turn; Responsible Research and Innovation

Introduction

In a recent essay, I argued for a new turn after the empirical turn: from reflective to constructive philosophy of technology (Brey, 2014).[1] In this essay, I will summarize my argument for this turn, and further develop and defend the approach of constructive philosophy of technology. I will also relate this approach to that of responsible research and innovation (RRI) that has in recent years become important in both academic research and policy. My argument will be that it is possible to develop the philosophy of technology in such a way that it goes beyond academic analysis to become part of actual practices and policies of changing and improving technology and its impact of society. This requires that the philosophy of technology is practiced in a way that is more oriented towards policy and engineering practice, and that involves collaborations and partnerships with other disciplines and with non-academic actors. The emerging consensus on the notion of responsible research and innovation in academics and policy offers an opportunity to give shape to a constructive approach to the philosophy of technology.

In the remainder of this introduction, I will explain the notion of constructive philosophy of technology and will defend its importance and feasibility. Having done that, I will then conclude with a preview of the remainder of my argument in this paper. Let us begin with an explication of the notion of *constructive philosophy of technology*. This notion is defined in contrast with *reflective philosophy of technology*. I define reflective philosophy of technology as the academic study of technology and its relation to society and the human condition. This approach involves conceptualization, analysis, explanation and evaluation of technologies and engineering practices and their societal implications, and yields academic publications in which the results of these investigations are presented. The aim of this approach is to gain a better understanding, in general terms, of technologies, their impacts, and normative implications.

Constructive philosophy of technology does not have as its main objective to study technologies and gain a general understanding of them and their societal implications, but rather to help create better technologies with more beneficial implications for society. It sees as its task the development of philosophical ideas and approaches that come to guide and transform the practices of those actors in society that are responsible for the development, regulation and use of technology. It is an approach that is focused on

[1] An English version of Brey (2014) is forthcoming in *Techné: Research in Philosophy and Technology*.

specific problems and issues relating to technology and develops constructive and workable solutions for better development, implementation, use or regulation of technology. These solutions are often developed in direct collaboration with societal actors, both academic and non-academic, involved in the study, development, use and regulation of technology. Constructive philosophy of technology is thus activist and interventionist in a way that reflective philosophy of technology is not, and is directed at the development and application of concepts, principles and methods that result in knowledge that can be directly used by actors involved in the development, use and regulation of technology.

For many of those working in reflective philosophy of technology, changing and improving technology and its place in society is an ulterior aim of their studies. The academic publications that they produce may indeed contribute to such change in an indirect manner. However, they do not improve technology in a direct way, as they usually do not speak directly to those who are involved in developing or regulating technology and others who shape its impacts, and they do not usually include specific, directly usable knowledge or prescriptions that these actors can use directly in their own professional activities. Constructive philosophy of technology has therefore a direct role in shaping technology and its impacts that reflective philosophy of technology does not.

I do not use the label "applied philosophy of technology" to refer to approaches with a direct focus on changing and improving technology, because the whole notion of "applied philosophy" is problematic, as is the notion of "applied science". Philosophers of technology have long resisted a characterization of engineering as applied science, arguing that the engineering sciences centrally involves the development of new knowledge rather than the mere application of laws and concepts that were developed in the sciences (Skolimowsk 1966). In a similar fashion, I would like to maintain that constructive philosophy of technology centrally involves the development of new concepts and approaches, even though it will probably also make regular use of concepts and ideas that have been developed in reflective philosophy of technology.[2]

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[2] It should also be clear that by arguing for a *constructive* philosophy of technology, I am not necessarily advocating an approach that is (socially) *constructivist*. I am arguing that the philosophy of technology should be more constructive, in the sense of being more focused on changing technology rather than just understanding it. This does not necessarily imply the (social) constructivist view that knowledge, technology and reality are the product of social meanings and processes, and that the physical world plays a small or nonexistent role in shaping and defining them.

In arguing for a constructive philosophy of technology, I do not want to make the case that reflective philosophy of technology should be replaced by it. The reflective approach has its value as a general way of studying technology and its relation to society that provides broad insights and evaluations that have multiple uses in society. Notably, the theories and analyses of reflective studies can be of great benefit in constructive approaches. I would want to maintain that it is in the continued development and combination of constructive and reflective approaches that the philosophy of technology can make progress; constructive approaches often require analysis and evaluations of technologies and their implications for societies, and for this, they can depend on reflective studies, and reflective studies can improve their analyses and evaluations through consideration of the case analyses and practical instruments developed in constructive approaches.

How does my distinction between reflective and constructive philosophy of technology relate to the distinction between classical and empirical philosophy of technology that is made by proponents of the empirical turn (Kroes and Meijers, 2000; cf. Brey, 2010a)? I claim that both classical and empirical philosophy of technology, as they have been defined, are mainly reflective in nature. *Classical philosophy of technology*, the dominant approach in the field until the 1980s, is clearly by and large a reflective approach. Studies within this paradigm tend to look broadly at technology and its implications for humankind, often not focusing on specific technologies or technological practices, but on technology in general. They tend to have a deterministic conception of the evolution of technology and the impacts it generates, and tends to be either pessimistic or optimistic about its implications. It is an approach that does not generally include attention to empirical detail or collaboration with other, more empirical disciplines. Well-known studies in this tradition, by authors like Ellul, Heidegger, Kapp, Marcuse and Jonas, present interesting analyses and evaluations of technology, but do not directly shape any new practices of technological actors.

The empirical turn in the 1980s and 1990s yielded philosophical approaches that were more empirically informed and more multidisciplinary, and that had as their object of analysis more specific technologies, practices and issues in society. These approaches tended to see technological change and technological impacts not as deterministic but as contingent on all kinds of social actors and influences of society. These post-empirical turn approaches were sometimes labelled as *empirical, or empirically informed, philosophy of technology*. Although these approaches have a greater focus on actual practices than classical approaches, are more multidisciplinary and pay more attention to the social actors that develop, use and regulate technology, they have so far for the most part

resulted in reflective philosophical research, with as end result academic publications, most of them with a philosopher as single author, with no direct intervention into technological practices.

Empirical philosophy of technology has, however, made possible the emergence of constructive philosophy of technology. It introduced an empirical, multidisciplinary orientation with a focus on practices and social actors, which constituted preconditions for a constructive philosophy of technology to succeed. In a constructive approach, further steps are taken to introduce practical aims for the research, to forge intense collaborations with both academic actors from other disciplines and non-academic actors to reach these goals, and to develop not just analyses and evaluations of technology, but also constructive tools for intervention. In this way, constructive philosophy of technology is an evolution of empirical philosophy of technology.

Constructive philosophy of technology is still in its infancy, but there have been dozens of studies in it already, especially in Europe, where the intellectual landscape and funding context for it have been favorable. My argument for pursuing this approach is threefold: it is desirable to have such an approach if possible due to its potential benefits for society as well as the future success of the field of philosophy of technology, there have already been past research initiatives that show that such an approach is possible, and the conditions for more such initiatives is favorable, especially in Europe. It continued development will involve trial and error, as any new approach would, but the potential benefits make it worth it to make these investments and see how far one can get in developing this new approach.

In the remainder of this essay, I will elaborate in more detail what a constructive philosophy of technology would look like and how it can be attained. In the next section, I will further describe the approach of constructive philosophy of technology, including a description of the unique intellectual contribution it can make to society. In the section that follows, I will argue that at least in the European Condition, the conditions for constructive philosophy of technology and the collaborative projects it entails are good, due to the emergence in policy and academic circles of the concept of Responsible Research and Innovation. The next three sections will specify three types of research that a constructive philosophy of technology can engage in: engineering-oriented, policy-oriented, and use-oriented, and it will describe ways in which these contributions can be made. These sections are then followed by a conclusion.

The Societal Turn

The turn from reflective to constructive philosophy of technology may be called the *societal turn*, as it aims for collaboration with, and influence on, a variety of social actors who are involved in technological practices. Making this societal turn includes several challenges for philosophers of technology, among them the challenge of negotiating and maintaining their disciplinary identity in the multidisciplinary activities that are involved, maintaining high standards for research, and navigating the extent to which their activities qualify as research, and engaging in activities other than research, such as implementation projects, trainings and public outreach.

For the philosophy of technology to have a positive influence on technology and its place in society, there are three classes of actors that it has to successfully address and influence. First, it has to address *technology developers*: the engineers, entrepreneurs, manufacturers, marketers and others who are responsible for technological innovation and the development of new technological products. To influence technology developers is to influence what technologies are developed and how they are designed. Second, it has to address *regulators*: governmental agencies, legislators, policy consultants and other policy makers who have a role in setting and enforcing policies for the development and use of technology. To influence regulators is to influence the policies that help determine how technologies are designed and used. Ideally, the philosophy of technology should not only address regulators themselves, but also those actors who exert influence over the regulatory process, such as interest groups, NGOs, the media, and the general public. Third, it has to address *technology users*: organizations and individuals that implement and use new technologies. This constituency is important to address because the impacts of technology are determined in large part by the way in which they are used.

Constructive philosophy of technology aims to succeed in directly affecting the beliefs and practices of these three classes of actors. It does so by engaging in research activities and interventions of three corresponding types: engineering-oriented, policy-oriented and use-oriented. *Engineering-oriented research* is research that addresses and aims to shape the practices, methods, beliefs and goals of technology developers. It addresses technology developers mainly through research collaboration, publications in media for technology developers, and talks and trainings for technology developers. *Policy-oriented research* is research that aims to shape technology policy and the practices of policy makers. It addresses policy makers and policy-relevant actors (including the general public) through collaboration, publications, talks and trainings. *Use-oriented research*, finally, aims to exert influence over the way in which technological products are implemented and used in organizations and by consumers. It addresses technology users

through projects, publications, trainings, and contributions to public discussions about the use of technology.

Before proceeding to specific ways in which the philosophy of technology may make the societal turn for each of the three classes of actors, let us first consider in general terms how the philosophy of technology may make a contribution to practical issues and problems in society. Why should we believe that the philosophy of technology is equipped to make such a practical contribution? I will argue that the philosophy of technology is in a position to contribute unique knowledge and skills that can help make major improvements to technology development, technology policy, and technology use and implementation.

The philosophy of technology can contribute to diminishing the lack of understanding of the relation between technology and society that currently prevails. This lack of understanding is partially the result of overspecialization. Engineers have a sound understanding of technology, but have usually received little training that gives them insight into social processes and human behaviour, let alone the relation between technology and such social aspects. Similarly, social scientists have been trained to study social and behavioural phenomena but usually have little understanding of technology. Policy makers often have a lack of understanding of technology and its relation to society as well.

This rift between the engineering sciences on the one hand and the social and behavioural sciences and policymaking on the other makes it difficult to successfully develop, regulate and utilize technology in a way that takes into account its societal impacts and steers them into a more desirable direction. It is well possible that this rift constitutes a major reason why large-scale technological innovation projects fail, why the social consequences of technology are misjudged, and why opportunities in solving social problems are missed because those in charge do not know what the technological possibilities actually are. Overcoming this rift requires interdisciplinary or transdisciplinary knowledge that transcends or synthesizes the vocabulary of the engineering sciences and the social sciences and effective models for successful multidisciplinary collaboration between natural and technical scientists and social scientists. What is dearly needed is knowledge between the engineering sciences and the social sciences that will enable us to discuss the relationship between technology and society, technology and culture, technology and norms and values, technology and human behaviour, and technology and social needs. This knowledge can help give direction to the development and application of technology in society. Although it is not the only field that generates such knowledge, philosophy of

technology has developed such knowledge over a broad spectrum and can in this way help reconcile the gap between social science and engineering.

The research methods available to the philosophy of technology that give it a unique position in the analysis of technology and society include philosophical analysis, synthesis, and normative research. Its methods of *synthesis* is the combination of conceptual framework, theories, paradigms and worldviews into larger systems by which hitherto disjointed phenomena can be understood relative to each other and as part of greater, meaningful wholes. Like no other discipline, philosophy investigates the relationship between fundamental and often abstract issues that cannot be easily investigated using empirical means, such as the relationship between language and reality and between science and religion. The method of synthesis enables investigations into technology that include a broad view and a broad agenda and identify the more abstract relations between technology and social phenomena. In this way, philosophy of technology can help our understanding of how technology relates to society, how the engineering sciences relate to the social sciences, and how these relations can be improved.

Philosophical *analysis*, a second method, is directed at attaining a better understanding of phenomena by conceptualizing them in a very clear and precise manner and by analysing their parts and the relations between them. Philosophical analysis is based on the idea that people's concepts, beliefs and reasons that they use to understand reality are frequently vague, incoherent or unsupported by reasons and can be improved through careful scrutiny and analysis. Applied to technology, philosophical analysis can help clarify the precise meaning of key concepts like "technology", "technological artefact", "sustainable development", "privacy" and "social impact", and can help understand and evaluate beliefs, theories, arguments and debates in the engineering sciences, social sciences, and in policy and public debate.

Third, *normative research* methods in philosophy consider how the world *should* be and how people *should* conduct themselves. Normative research is special in that it does not describe or explain reality, as most forms of research do, but prescribes how it should be. It does so on the basis of values and norms that define what is good and what we should strive for. Normative research takes place in ethics, which investigates how we should conduct ourselves and what are the conditions of a good life, but also in epistemology, which seeks to identify norms and standards for knowledge, in aesthetics, which investigates conditions for beauty and art, in political philosophy, which investigates how states and societies should be organized and how they should act, and in axiology or theory of value, which investigates which values should be most important to us.

Normative research methods can be useful in solving social problems that involve

technology by investigating values that are involved and ways in which these values are promoted. It can then assess and evaluate solutions, including technological solutions, relative to their expected consequences for the realisation of the values that it has found to be important.

The methods of philosophical synthesis, analysis and normative research enable the philosophy of technology to make a unique contribution not only to the study of technology and its relation to society, but also to improving the way in which technology is developed, used and regulated. However, for philosophy of technology to go beyond mere studies of technology and to be involved in this constructive role, there must be conditions present for it to do so successfully. These are not just conditions internal to the field itself, but also conditions in society. Specifically, there should be institutional structures in place that enable and support collaboration and interaction between philosophers of technology and the social actors that engage in technological practices. Such structures may include policies, organizational structures, and funding streams, amongst others. In the next section, I will argue that the efforts in the European Union to develop a framework for Responsible Research and Innovation currently offer the societal conditions for philosophers of technology to play this role. The European approach could possibly serve as a model for other parts of the world.

Responsible Research and Innovation

Responsible Research and Innovation (RRI) is an approach to research and innovation that has in recent years become an important component of European Union (EU) research and innovation policy (Owen, Macnaghten and Stilgoe, 2012; Van den Hoven et al., 2014; Owen, Bessant and Heintz, 2013). The term has become prominent in EU discourse since around 2010. It is the incarnation of a longstanding goal in EU policies to stimulate greater responsiveness of science and innovation towards society's needs. Research and innovation policy is seen in the EU as a means to promote its social and economic agenda. There has been a conviction in the EU that too much research is driven by intellectual curiosity only and not by the needs of society, and that too much innovation is driven by profit motives and does not respond to real needs in society. Since it is desirable that research and innovation help meet society's social and economic needs, and it is believed this cannot be left to universities and the market, the EU has put strategies in place at the policy level that help orient research and innovation processes towards societal needs as defined in its social and economic policies.

One of these steps by the EU is to make its research and innovation agenda part of its social and economic agenda. In the EU's economic agenda, the so-called Europe 2020 strategy for the period 2010-2020 that aims at "smart, sustainable and inclusive growth" (European Commission, 2010), research and innovation activities are defined as important means towards securing growth, and in ensuring that such growth is sustainable and takes into account social goals such as social integration and poverty eradication as well. The social agenda of the EU is incorporated into research and innovation policy amongst others by orienting a large part of the billions of EU research funding in its Horizon 2020 funding program towards societal challenges relating to health, ageing, well-being, security, sustainability, and social inclusion.
The RRI framework in EU research and innovation policy is in some ways the culmination of these initiatives. RRI is defined by the European Commission, the executive branch of the EU, as follows:

"RRI is an inclusive approach to research and innovation (R&I), to ensure that societal actors work together during the whole research and innovation process. It aims to better align both the process and outcomes of R&I with the values, needs and expectations of European society." (European Commission, 2012).

Philosopher and EC policy officer René von Schomberg has provided a frequently cited definition of RRI that goes into a bit more detail:

"Responsible Research and Innovation is a transparent, interactive process by which societal actors and innovators become mutually responsive to each other with a view to the (ethical) acceptability, sustainability and societal desirability of the innovation process and its marketable products (in order to allow a proper embedding of scientific and technological advances in our society)." (Von Schomberg, 2011).

Two aspects of RRI should be distinguished: its goal, which is, in short, to take into account societal needs as well as ethical criteria in research and innovation, and the way in which this goal should be reached. It is particularly about the latter aspect that many views exist. However, there is a fair amount of consensus that RRI can only be realized if societal actors work together more and are stimulated to take societal needs and ethical criteria into account, to the extent that they do not already do so. It is also held that these societal actors should include all relevant stakeholders, most centrally government actors,

industry, universities, civil society actors (non-governmental organisations that represent the interests of citizens), as well as the general public.

RRI is currently a key component of EU research and innovation policy that is especially manifested in its research funding program, Horizon 2020, in which it is a cross-cutting theme. This means that the EU strives to incorporate RRI in many if not all research projects that it funds. In practice, this means that part of the funding in a research proposal is reserved for consideration of ethical aspects and/or engaging social actors with the project and/or other activities aimed at better aligning the research with societal needs. In addition to RRI being a key component of EU policy,
several European nation states also have policies in place to support RRI, or some version of it, in their national research and innovation policies.

RRI offers philosophers of technology opportunities to be involved in multidisciplinary research and innovation projects in which they can be involved in helping to solve social problems and in making technology more responsive to societal needs and better in line with ethical criteria. The kinds of projects and activities supported in EU research policy enable both engineering-oriented contributions, for projects that are targeted at new technologies and technological innovations, policy-oriented contributions, since the EU also funds projects and activities that help it in devising better policies, and use-oriented contributions, since projects it funds include ones that either address the use of technology in society or in organizations or depend for their success on the successful introduction of a technology into society. This is not just a theoretical observation: many dozens of such projects have already been initiated or concluded in Europe in which philosophers of technology have played a role.[3]

Engineering-Oriented Philosophical Research

Having observed that, at least in the European Union, the conditions are in place for the emergence of a constructive philosophy of technology, I will now turn to the three classes of constructive philosophy of technology that I distinguished earlier, and will consider in more detail how they may be approached. The first I will consider is engineering-oriented research, which was defined as philosophical research that addresses and aims to shape the practices, methods, beliefs and goals of technology developers. Engineering-oriented

[3] It should be cautioned, however, that no studies have been done of the effects of having philosophers in these programs and the degree to which they helped improve the outcome of them.

philosophical research can take various directions: it can be research in the philosophy of engineering that aims to conceptualize good engineering science and good design practice; it can be investigations into the nature of technological artifacts and the relation between design features and implications for users and for society (ref.); it can be investigations into the ethical specifications that designed products should meet and how these can be met in engineering design methodology; or it can be investigations into the professional responsibility of engineers and other technology developers. I will now highlight three specific approaches that are particularly promising, all in the realm of ethics.

One promising approach is that of *value-sensitive design* (VSD) (Friedeman, Kahn and Borning, 2006; Manders-Huits and Van den Hoven, 2009; Brey, 2010b), an approach for designing technological products and systems in such a way that they conform to a desired set of (moral) values. Elaborate VSD methodologies have been developed to integrate considerations of value into the design process. The underlying assumption of VSD is that designed artifacts are not morally neutral but harbor tendencies to promote certain values or norms, or to violate them. For example, web browsers and apps may be either designed to protect the user's privacy, or they may offer no such protection or even actively violate user privacy. As another example, an ATM may be designed to be usable by all users, including the blind and people who speak different languages, or they may only be usable for those who have the required linguistic, bodily and sensory abilities, which goes against the value of universal access and, perhaps, of fairness.

VSD is a design methodology that involves identification of relevant values, translating them into design requirements and design features, and doing so in a way that is sensitive to contexts of use and that makes appropriate trade-offs between values. In this way, VSD is one of the first approaches that takes values seriously in design processes and that presents methods for systematically taking them into account. Many engineers, however, are still unfamiliar with VSD even the very idea that values can be included in designs. VSD offers a great possibility for ethicists of technology to collaborate with engineers to incorporate VSD methodology into specific design and innovation projects as well as to collaborate on incorporating VSD into standard design methodology in various engineering fields.

Ethical impact assessment (EIA; Wright, 2014, 2011) has a broader scope than VSD. It is directed not only at technological design processes but also at larger innovation and infrastructural projects. EIA is not so much a methodology for incorporating values into design processes as it is one for assessing the ethical issues that may result from the project as currently planned. However, EIA is also concerned with taking mitigating measures if serious ethical issues or risks are identified. Wright defines an EIA as "a process during

which an organization, together with stakeholders, considers the ethical issues or impacts posed by a new project, technology, service, program, legislation, or other initiative, to identify risks and solutions" (Wright, 2014: 163). Unlike VSD, EIA centrally includes stakeholders in the process, and has its focus on the assessment of (proposed) designs rather than on the design process itself.

An EIA is similar to a social impact assessment or environmental impact assessment. It is a way of determining and assessing a project's implications for society. EIA focuses on ethical implications, such as whether a new information service that is being developed will sufficiently safeguard privacy and freedom of expression, or whether a new building will be designed in such a way that it upholds values like public accessibility, sustainability, and safety and security. An EIA's main steps include preparing an EIA plan, identifying stakeholders, consulting with stakeholders and analyzing ethical impacts, identifying risks and possible solutions, formulating recommendations for actors involved in the project that help mitigate unethical impacts and risks thereof, and working with these actors to implement these recommendations. Organizing and managing an EIA is another way in which philosophers of technology can collaborate with technology developers in projects.

A third approach is that of *ethical parallel research* (Van der Burg and Swierstra, 2013), also called *embedded ethics*. In this approach, an ethicist becomes part of a technological project, interacts with engineers to learn from their research, performs ethical analyses of the research and the new technology that is being developed, and helps the researchers identify and deal with ethical issues in their research. Ethical parallel research could take the form of an EIA or employ VSD methodology, but it need not do so, and can use any kind of approach to address ethical issues.

These are three major ways in which the philosophy of technology can be directly involved in technology development. All three involve collaborations with technology developers in projects. This requires a mutual willingness of philosophers and technology developers to engage in such collaboration. As said, the RRI framework in the EU supports such collaborations. From philosophers, such collaborations may require new knowledge and skills, including a more than superficial understanding of how technology development projects work, what the technologies are that are being developed, and how their own contribution can be useful for technology developers. But if they can overcome these challenges and can succeed in assisting technology developers to recognize and address issues of ethics and valuation in their work, it is likely that products and services that are developed will make a better fit with morality and the values and needs of society.

Policy-Oriented Philosophical Research

Public policy consists of laws, mandates, regulations, funding priorities and courses of action initiated by governments to further their objectives, which normally include maintaining order and security, stimulating economic development, promoting the general welfare, and establishing justice. Although public policy is developed by government agencies and legislative bodies, non-governmental organizations, citizen groups and companies may also lobby for particular policies. There are two kinds of public policy to which philosophy of technology can contribute: technology and innovation policy, and policies for specific social and economic domains in which technology is involved. The latter category includes amongst others economic policy, environmental policy, health policy, educational policy, and social policy. The philosophy of technology can contribute to both types of policy by helping to ensure that policies incorporate a theoretically and empirically adequate conception of technology and its dynamics and impacts, and by helping to incorporate normative political and ethical analyses of technology. Such contributions will involve collaborations with policy makers and scholars working in governance studies, particularly the area of technology governance (Edler, Kuhlmann & Behrens, 2003).

An important way in which philosophers of technology can aid public policies that involve new technologies is through the *ethical assessments of new and emerging technologies*. When new technologies are in development, such as nanotechnology or synthetic biology, assessments are needed of ethical issues associated with them, and recommendations are needed of how to incorporate such assessment into policies. This is where philosophers can make a contribution. Such assessments identify potential ethical issues with new technologies and with applications that may result from them and may also suggest ways of mitigating or avoiding such issues through policies. The approach of *anticipatory technology ethics* (ATE) that I have developed (Brey, 2012) is suited for such analysis at the policy level, although it can also be used for engineering-oriented analysis in a way similar to EIA. ATE does broad ethical assessments of new technologies and the artifacts, uses and impacts that may result from them. It makes use of futures studies and technology assessment to make projections of possible and likely future developments and does broad ethical assessments to identify a large range of ethical issues at different levels of analysis.

A second way in which philosophers of technology can contribute to policy is by proposing *distributions of responsibility* for risks and harm resulting from the development and use of technologies (Doorn, 2010; Van de Poel, Royakker and Zwart, 2015). It is part of the expertise of ethicists to analyse various notions of responsibilities and to make and

justify attributions of (moral) responsibility. In determining effects of technology on society, there are usually many actors involved, and so there is a need to distribute responsibilities over these actors for potential negative outcomes. For example, if a self-driving car causes an accident, what is the responsibility of manufacturers, engineers, owners, and others for it? Such responsibility assignments can be the basis for laws and other policies that assign liability.

Philosophers can also contribute by proposing *models for stakeholder involvement* in technology development or political decision-making about new technologies. Many philosophers of technology have argued for the democratization of technology (Winner, 1995; Feenberg, 1992), meaning that all who have a stake in the development of technology can exert influence over it. But democratization of technology requires realistic models for stakeholder involvement that uphold democratic values, and philosophers may be in a position to develop such models.

Philosophers of technology can also help explicate *the role of technology in policy*. Technologies can help realize policy goals but they can also thwart their realization. An understanding is therefore needed of these processes. Technologies can help achieve policy goals because they have political properties (Winner, 1980) and because they are able to influence and steer people's attitudes and behavior (Latour, 1992; Illies and Meijers, 2012). For example, recent studies have considered so-called persuasive technologies that change the behavior of users through persuasion and social influence can be used to promote sustainable consumptive practices (Verbeek and Slob, 2006). Policy makers can make use of these properties of technology for policy. At the same time, policy makers should be aware of subversive effects of technologies for their policy goals, and take actions to mitigate such effects.

Use-Oriented Philosophical Research

Technology users come in two basic kinds: *individual users* and *organizational users*. An organizational user is an organization, considered as an agent, which has adopted a particular technology.[4] Although the organization can be considered a user of the technology, there are in addition end-users of the technology, which are employees (and sometimes also customers) that make individual use of the technology. For example, when a hospital adopts a hospital information system, the hospital as organization is a

[4] In addition, both individual users and organizations can be organized into user groups.

user of that technology, but the end-users are the administrators and doctors working in that hospital. When an organization develops or acquires technology with purposes of making it available to customers or clients for use, like an Internet provider or car rental business, the organization is not itself a user but is rather the proprietor or owner of the technology, and its customers are end-users.

The philosophy of technology can contribute to the successful *implementation of technology in organizations*, understood in terms of it being able to perform its intented function without disruptive side-effects. It can make this contribution due to its ability to theorize and analyze the impacts of technology, for example on work, employee's well-being, and organizational culture, and to consider ethical issues that are in play, such as autonomy, privacy, and fairness (Brey, 1999). It can contribute to good choices in the initial adoption of a technology, as well as to good policies for its use in the organization. In the same way, the philosophy of technology can contribute to the successful *provision of technology by technology providers*. For example, it can consider social, cultural and ethical aspects of alternative technological arrangements made by internet service providers and help devise good arrangements as well as effective and ethical internet service agreements between providers and users (Vedder, 2001).

Another contribution the philosophy of technology can make is to an understanding and evaluation of individual uses of technology, regarding societal implications, implications for the individual, and ethical aspects. For example, it can provide analyses of implications of the Internet for friendship and social relations, and of the moral aspects of using stimulants in sports. Such analyses cannot only help users make informed choices about their use of technology, they can also help organizations that are faced with private technology users on their premises (e.g., restaurants, schools, airports) to develop effective and ethical policies regarding these users and their technologies, and can also help technology developers and makers of public policy. In addition, technological artifacts and services that are widely available to the public, such as smartphones, cars, commercial drones, Viagra pills, and (in some countries) guns, are good topics for public debate initated by or participated in by philosophers, because of the immediate effect they have on the way of life.

Conclusion: Further Steps

In this essay, I have argued for a new turn after the empirical turn in the philosophy of technology: the societal turn, which is the turn from academic philosophy to philosophy as a constructive enterprise that is directly involved in solving practical problems in society.

It is what I have called the turn from reflective philosophy of technology to constructive philosophy of technology. The essay spells out in some detail what this approach would look like and how it is practically feasible. I have argued that at least in the European Union, the conditions for a constructive philosophy of technology are favorable, due to the emergence in both policy and academics of the notion of Responsible Research and Innovation (RRI). Finally, I have described how the philosophy of technology can contribute to better technology development, better technology policy and better implementation and use of technology, through engineering-oriented, policy-oriented and use-oriented research, respectively.

Several challenges still lie ahead. Most importantly, as I have argued, a constructive philosophy of technology can only thrive in societies in which the appropriate conditions are present, which include policies, funding streams and alignments of actors that support the kind of multidisciplinary, applied, multi-actor research that is required for a constructive approach. Such conditions currently exist in the EU, but there are many countries where they are not present.

Even if these conditions are favorable, there are several other challenges. One challenge lies in ensuring that philosophers of technology that adopt a constructive approach have the required knowledge and skills to do so successfully. As claimed before, philosophers of technology will have to learn new knowledge and skills, including multidisciplinary skills, knowledge of nonacademic professional domains, and new philosophical approaches and methods. The many dozens of existing research projects that incorporate a constructive philosophical approach provide models of how to do this (or sometimes of how not to to it). In addition, though, philosophers of technology will have to experiment and develop their own techniques and approaches. The constructive approach does not come pre-packaged but will have to be developed in a process of trial and error.

Another challenge is for the field of philosophy of technology to find an adequate balance between reflective and constructive research. In a society in which most of the philosophical research is reflective, the opportunity is missed for the field to make direct contributions to society. But conversely, if most of the philosophical research is constructive, it risks becoming intellectually impoverished, because it cannot sufficiently feed on reflective studies. There is actually a risk in several EU countries for such a situation, since much of the funding for fundamental, reflective research has dried up in them, and most of the funding that is available is for multidisciplinary, applied projects.

A final challenge is that of maintaining critical distance. If philosophical research is undertaken together with often powerful societal actors, and is even funded or co-funded

by such actors, including for-profit companies or government agencies that aim to further certain policy objectives, there is the risk that the philosophical research will adapt itself to the goals and views of these actors. It will be difficult to strongly argue against central practices in genetic modification if one's research is (co)funded by genetic modification firms and involves collaboration with genetic engineers, or to severely criticize government policies on climate change if one's work is part of a government-funded multidisciplinary project to address climate change. Better safeguards are needed to protect the independence of philosophers and other scholars who participate in such projects, and there should always be enough funding available for truly independent, critical research.

Even if all these challenges are overcome, there is not yet a guarantee that a constructive philosophy of technology will actually be effective in addressing social and ethical problems that other fields have not been able to adequately address in the past. Yet, there are hopes that the philosophy can do so, because it is special as a field in that it adopts a broad agenda regarding technology and its role in society, unique methods of philosophical analysis and synthesis, and a unique emphasis on (ethical) normativity. A turn towards constructive philosophy of technology is already occurring in many countries. I hope that this essay will help create awareness of this turn and will inspire more dialogue in the philosophy of technology on the benefits and pitfalls of constructive approaches and how to develop them in the best way possible.

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