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CRITICAL ENGAGEMENT VS. TECHNOPHOBIA: THE RISKS OF EMERGING TECHNOLOGIES (Editorial)

Abstract. *The contribution shows how the concept of risk has developed in the history of sociology, its relationship to science and technology (S&T), and the current challenges. It argues that the progress of S&T is a double-edged sword that can create risky situations, while also giving the means to frame (and overcome) those situations. As such, scientific and technological progress is at once both the cause and the solution to the problems and threats facing modern society, something that necessitates analyses which critically engage with the implications of their developments. Finally, this was also the thrust of discussions at the meeting of the Section of Sociology of Science and Technology (SSTNET) of the European Sociological Association (ESA) held in Ljubljana on 11–12 October 2018.*

Keywords: *sociology, risk, uncertainty, science and technology, active citizenship*

Introduction

Many theoretical and practical factors explain why the concept of risk has become a central topic in sociology. Environmental hazards and climate change, technological progression and globalisation along with mass migration, antibiotic resistance and digital divides are all recent phenomena indicating renewed interest in the risk concept.

Attention to the concept of risk mainly grew in sociological studies of modernisation processes during the early 1990s. As such, it has been used to develop a more critical and comprehensive approach to these processes. This is best seen in the works of well-known sociologists like Ulrich Beck (1992), Anthony Giddens (1990) and Niklas Luhmann (1991). These grand sociological theorists proposed distinguishing the category of danger, as recognised in traditional societies, from the category of risk, as established in modern societies. While in traditional societies, hazards were associated

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with events of the past and the loss of faith in (the) G(g)od(s), risk was intimately linked to modernisation and to the desire to control the future. Modern societies may thus be characterised by the omnipresence of risk. Today, individuals live in a world characterised not only by omnipresent risk but by the lack of shared orientation points like fixed identities, trustworthy institutions or effective policymaking mechanisms (Beck and Kewell, 2014).

Overlapping and subsequent to the works of Beck, Giddens and Luhmann, we note that several authors in sociology seem to have reoriented to towards theoretical and empirical studies of the modern risk society (Douglas and Wildavsky, 1982; Aven and Renn, 2010; Olofsson and Zinn, 2019). These new conceptual and methodological developments in sociology give opportunities to expand what we know about the risk concept so as to better understand modern social and human life. Perhaps the most important contribution of recent sociological studies of risk is the awareness that the concept cannot be used in conventionally quantitative ways (e.g. in cost–benefit analysis). Mary Douglas and Aaron Wildavsky (1982: 6), for example, note that "[t]he perception of risk is a social process", also suggesting that the concept of risk is intimately linked to power. Similarly, Terje Aven and Ortwin Renn (2010: 50) note that

> *risk [does] not only includes a multifaceted, multi-actor risk process but also calls for the consideration of contextual factors such as institutional arrangements and political culture, including different perceptions of risk.*

Hence, recent sociological studies of risk chiefly take qualitative and ethical considerations into account. While the risk concept has become an indispensable element of various management strategies, sociological investigations have never limited themselves just to this dimension. Indeed, the aim of sociological studies of risk is primarily to understand how risk makes up an inevitable part of various social subsystems of modern society. By taking account of the importance of social factors in explaining the concept of risk, sociological studies are also particularly interested in identifying how risk, uncertainty, trust etc. correlate with each other (for more, see: Burzynski and Burzynski, 2014; Taylor-Gooby and Zinn, 2006). Piotr Sztompka, for instance, defines the sociological concept of risk as a variable that refers to "humanly created future, threats due to the actions of other people (personal, social, political, economic risks)" (Sztompka, 1999: 30).

Science and Technology (S&T), risk and uncertainty

The works of Beck, Giddens and Luhmann make it clear that science and technology (S&T) is part of our society, which in turn is intimately associated with risk. The progress of S&T is therefore a double-edged sword that creates (sometimes, unpredictable) risky situations while also giving the means to frame (and overcome) those situations. In his classic work *Risk society,* Beck (1992: 163) states that

> *Not only does the industrial and technological utilization of scientific results create problems; science also provides the means—the categories and the cognitive equipment—required to recognize and present the problems as problems at all, or just not to do so. Finally, science also provides the prerequisites for 'overcoming' the threats for which it is responsible itself.*

We learn from this that scientific and technological progress is at once the cause and solution to the problems and threats facing modern society, something that calls for analyses that *critically engage* with the implications of their developments.

The advance of emerging technologies (sometimes known as converging technologies because they cover the info-, nano-, bio- and cogno-sciences) in the last 20 years further reinforces the Janus-faced aspects of modern S&T. On one hand, these emerging technologies are already bringing (or expected to bring) many benefits for human and social life. On the other hand, the uncontrolled progression of these technologies holds the potential to significantly challenge society's ethical norms. Emerging technologies come with novel types of risks and uncertainties while at the same time the possibilities seem endless. Indeed, we are living in one of the most exciting periods in the development of S&T, something that might be called a paradigm shift. For the first time, what may be regarded as the essence of humans is available for use in direct S&T manipulations. What is at stake is no longer simply how the socio-political realities can accommodate S&T breakthroughs, but a two-way reflection on how we understand ourselves as a species, and what it means to be human. S&T used to shape and tame that regarded as the intransigent natural world to suit our plans and desires, but today we are increasingly becoming the object of our own S&T manipulations.

This new situation forces recent sociology of science to establish new types of analysis and inquiries of the risks accompanying the development/deployment of emerging technologies. To help cope with these complex risks, recent works within sociology of science offer more interdisciplinary

oriented discourses that bring together different, yet interconnected theoretical perspectives on risk (Burzynski and Burzynski, 2014). Sociology of science, sociology of risk and environmental sociology are all based on the conviction that risk, uncertainty, danger etc. are concepts with deep roots in societal processes of interaction and interpersonal communication. These theoretical perspectives also contend that technology must be viewed from what is essentially an ethical perspective. In the process, As such, they stress the need to conceptualise how society uses S&T in terms of responsibility and blame.

Modern sociological studies of the risks brought by S&T differ from traditional social science approaches. In those approaches, the risks of S&T were not of any particular interest simply because S&T was initially regarded as a social subsystem which, like studies in the natural and medical sciences, seeks to produce reliable knowledge in methodologically objective and controlled ways. Modern sociology of science accounts for a somewhat different situation. The absence of natural processes and mechanisms inducing causal relations in nature makes it very difficult (perhaps not even necessary) to precisely define the risks created by S&T. Instead, other issues are of interest, such as the framing of risk (Groboljsek and Mali, 2012), the temporality of risk (Adams, 1998; Nixon, 2011; Fortun, 2014) and the spatiality of risk (Müller-Mahn, 2013).

The above examples show that emerging technologies are forcing us to think about different ethical issues and risks (for comparison, see Kastenhofer, 2011). One example is recent progress made concerning genetic engineering technology: the CRISPR Cas 9 technology. This genetic engineering tool is based on germline edits and was initially used in biomedicine. It is today the source of great hope in biomedicine as it may help eradicate many forms of disease like painful genetic disorders that have plagued humans for centuries (Bates, 2016). Yet, germline edits also come with their own risks by possibly changing into 'eugenic'[1] genetic engineering intent on manipulating the existing genetic framework for reasons other than biomedical therapy (Baltimore et al., 2015; Lanphier et al., 2015). This raises questions about ethics and risks: questions that have so far been largely a non-issue. Germline edits are heritable and may have unpredictable effects on future generations because we cannot predict where and when off-target mutations will occur and which effects they might produce.

[1] *The term "eugenics" was first used in the late 19th century to define the goal of improving human species by giving what was regarded as more suitable races a better chance of prevailing over less suitable ones. While the old (state-mandated) eugenics required continual selection to breed the fit, and cull the unfit, modern (neoliberal) eugenics can permit the conversion of all of those unfit to the highest genetic level. As such, new genetic engineering holds the potential to create new genes and new qualities still to be imagined by the human species today.*

Although the act of replacing a defective gene with a normal one may seem harmless, any long-term outcome is difficult to predict. For example, these engineered traits might be driven through an entire population, not just re-engineering single organisms but enforcing the change in all descendants, thereby reshaping entire species and ecosystems.

Recent sociology of science and active citizenship

The example above shows the difficulties of simply labelling the effects of emerging technologies as *either* positive *or* negative. Here, the thought of objective risks is challenged. Instead, the focus is given to questions like *for whom* do emerging technologies appear to be positive or negative (experts, policy decision-makers, the lay audience, social interest groups?), and *how* are these technologies framed in, for example the media (Groboljsek and Mali, 2012), by experts (Mali, 2016) and policy decision-makers (Pustovrh, 2010). Put differently, depending on how emerging technologies are framed, various stakeholders are likely to perceive these technologies in different ways. Here, sociology of science helps to interpret, for instance, the lay audience's concerns about potential risks of emerging technologies as a result of their lack of trust in the expert and policy institutions *through which* the risks of S&T are assessed and regulated. Looking back, we see that distrust among lay people was already growing in the latter part of the 20th century, triggered by the catastrophic nuclear and chemical accidents at Three Mile Island, in Bhopal and in Chernobyl. The progress of emerging technologies, and how these technologies are framed, have done little to address this distrust. For example, while anyone – not only specialists – with an interest in questions raised by synthetic biology might find fears about the invention of a new species somewhat amusing (or misleading), the media's claims made about the same (Togensen and Schmidt, 2013) can still trigger concerns among the general public. At the same time, future synthetic biology applications will no doubt lead to ethically problematic situations, again demonstrating the complexity of how to think about the potential risks and benefits created by emerging technologies.

In the past, two main models were used to structure the relationships between scientific experts and policy decision-makers. On one hand, the decisionist model assumed that political governance was the true and sole responsibility of the political system that, in itself, would create the required normativity. On the other hand, expertocratic (technocratic) approaches to political decision-making tended, to varying degrees, to emphasise the role of experts as informal or even formal decision-makers (for comparison, see Weingart, 2001). Both models appear outmoded today with respect to how S&T risk is assessed and governed when it is instead argued that it is

important to build a wider perspective on the risks of S&T. To that end, it is also necessary to overcome the unproductive division between technophobic anxieties regarding the progress of emerging technologies and the technophilic (and somewhat technodeterministic) assumptions made about these technologies being the solution to the problems facing humankind. Emerging technologies of today are not developing according to a logic of their own but to what we develop and deploy. They are thus part and parcel of social structures and are thereby intimately linked to the agendas of experts, policy decision-makers, the lay audience and social interest groups. Here, it is crucial that the lay audience is actively and responsibly engaged if we are to properly address the social and ethical implications of the current progress of S&T.

One way to approach the active and responsible engagement of the lay audience is seen in recent works in policy studies that highlight the ways in which ordinary citizens (not only experts and policy decision-makers) perceive and manage the risks of S&T (for comparison, see Kasperowski and Kullenberg, 2019). Several sociological analyses (Collins and Evans, 2007) have extensively elaborated on the various controversies among/between experts and laymen. These controversies can become quite heated (and also appeal to emotions) and therefore often lead to strongly separated opinions on the risks and safety of emerging technologies. Saying this, sociology of science notes that the lay audience's perceptions which, more than technical experts, are based on what Roeser and Pesch (2016: 27) call "moral emotions", might also contribute to a more robust understanding of the risks brought by S&T. Hence, by taking account of the shared perspectives held by the different stakeholders, we can more robustly assess and more trustworthily govern the risks of S&T (for comparison, see: Wynne, 2011; Felt and Wynne, 2007; Irvin, 2007; Irwin and Mike, 2003; Jasanoff, 2007). Put differently, defining the risks of S&T cannot depend solely on the criteria set by (technical) experts but it must also account for what the lay audience (including social groups) perceives and accepts. Accordingly, recent sociology of science challenges the exclusive role played by expertocracy in risk assessment and the strong reliance on a purely "technical" definition of risks, while calling for new forms of deliberative cooperation and communication in which experts, politicians and representatives of the lay audience come together to develop new risk strategies. Different types of citizen engagement are already seen in many European countries. One example is the Netherlands with its well-established tradition of including the citizens in scientific and technological concerns (Van der Molen et al., 2019). Other attempts to incorporate the public's voices in R&D decision-making processes (including risk governance) include forms of focus groups, consensus conferences, and citizens' juries.

If we wish to challenge the idea of the social and ethical implications created by S&T progress as a black-and-white version of the world, another available alternative is to combine precautionary and proactionary approaches. This combination allows us to reach beyond the two seemingly dichotomous and equally problematic strategies concerning the risks of S&T: a total ban on S&T progress or a laissez-faire approach to S&T. Precautionary principles serve as good policy responses in the event of potential danger to humans, animals or plants, or as a means to protect the environment, especially when scientific evidence about the risks (or benefits) is absent. Saying this, the dogmatic philosophy of precautionism, which might stifle innovativeness in S&T, is now no longer an option. Today's S&T policy decision-makers must establish the conditions for proactionary approaches to stimulate technological innovativeness and, at the same time shape agendas for socially-robust risk research. S&T policy actions should thus prevent undesirable outcomes of S&T progression and simultaneously promote its opportunities. This can only happen with the active engagement of critical citizens. Thereforeand as stated above, it is precisely the inclusion of citizens, in and via various mechanisms, that is able to legitimise policy actions in today's risk society. Sociology of science is aware of this and strongly supports the kind of risk assessment and risk governance that rises above any narrow understanding held by the experts or lay audience.

Conclusion

The risks of S&T in general and emerging technologies in particular have become a central topic of investigation of European sociologists of science, many of whom are active in the Section of Sociology of Science (SSTNET) of the European Sociological Association (ESA). Not surprisingly, the last scientific meeting of SSTNET was held under the title "Critical engagement vs. technophobia: The risks of emerging technologies". It was held at the Faculty of Social Sciences, University of Ljubljana on 11–12 October 2018 and organised by the Centre for Social Studies of Science (CSSS). In the last 10 years, the CSSS has focused on various dimensions of risk and uncertainty and, while the concept of risk has received great attention, many aspects, especially in relation to sociological inquiries, are still in their infancy. The SSTNET meeting in Ljubljana aimed to provide the opportunity to discuss and develop these aspects. Almost 30 sociologists of science from 14 European countries came together at this two-day scientific meeting to present papers on a range of risk and ethical issues raised by emerging technologies. This thematic section of *Teoria in Praksa* is an outcome of th event. We are happy to present four intriguing contributions that in different ways address various dimensions of risk and uncertainty with respect to emerging technologies. What

unites them is their critical engagement with how these technologies are developing and society's capacities to shape them.

Artur de Matos Alves introduces the concept of platform humanism to critically analyse Facebook's approach to transparency and social responsibility in the last five years. In doing so, he believes it is important to interrogate the idea of transparency promoted by Facebook as well as the communication model underlying the mode of the company's relationship with its users and the sociopolitical contexts. De Motes Silvia employs a critical discourse analysis to address certain ethical and political challenges raised by self-regulatory approaches in transparency practices by describing the contradictions of platform humanism.

Roberto Carradore looks at the process of social acceptance in relation to virus-based biotechnical innovations (BTI). He discusses some critical assumptions and beliefs concerning the regulation of pesticides and virus-based biotechnological innovations in agriculture, seen through the lens of a sociological model of risk analysis. While current research is increasingly focused on the ecological role of microorganisms like bacteria and viruses in terms of *biocontrol*, viruses are commonly associated with a negative social image. Carradore states that this points to a knowledge gap between experts and laypeople, something that calls for a re-framing of the role played by viruses as well as a re-definition of our risk culture.

Matjaž Vidmar explores the newly emerging narratives about the future of outer space exploration and industry, particularly in relation to human missions to, and settlements on, Mars. To that end, he proposes the concept of "risk re-normalisation" as a major tool for reframing various aspects of the public discourse on risk through the premediation of visions and imaginaries. Vidmar concludes that the risk re-normalisation process offers a novel and original approach to understanding the framing of the current risk (assessment) discourses within the public governance of techno-scientific development.

Jennie Olofsson and Franc Mali investigate some ways in which risks concerning electronic waste or e-waste are *done* and *undone* in relation to the concept of the circular economy. The authors draw on two theoretical approaches: *the doings* and *undoings of risk* along with money and waste as *global fluids*. The findings suggest that, while difference is being created as e-waste is subjected to global trade, its oscillating statuses should not be seen in terms of a linear chain of assumptions where e-waste attains the status of *either* a risk *or* a resource. Instead, the article underlines the *mutual dependency* of the status of e-waste as a resource *and* as a risk.

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